LAKE WATER AND SEDIMENT GEOCHEMISTRY

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA (64L, 74I)

by

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Table of Contents

Tables

Figures

Figures

Introduction

During July 1979 detailed sampling of surface lake waters and centre-lake bottom sediments was carried out over portions of the Athabasca Basin - Wollaston metasedimentary belt (designated as the NEA-IAEA Test Area). Lakes not previously sampled either by C.E. Dunn, Saskatchewan Geological Survey, in 1976 or during the Federal-Provincial (Saskatchewan) Uranium Reconnaissance Program (U.R.P.) - National Geochemical Reconnaissance (N.G.R.) survey in 1977 (Geological Survey of Canada, 1978), were sampled in July, 1979. In addition, repeat sampling of some previously (1976 and/or 1977) sampled lakes was carried out. Lake water and sediment samples were collected from approximately 500 sites in the 1200 km^2 area providing an average sample site density of 1 per 2.4 km^2.

This detailed geochemical survey was designed to determine the distribution patterns of uranium and associated elements in lake waters and sediments in order to test the response of these sample media with regard to geological and environmental influences within the surveyed portion of the Athabasca Basin and the Wollaston and Mudjatik lithostructural domains.

General Geology

The geology of NEA/IAEA Athabasca Basin-Wollaston Lake Test Area (Figure 1) has been described by Sibbald (1979, 1980) and Ramaekers (1979).

Two Precambrian basement lithostructural domains are represented in the area, the Mudjatik and Wollaston (Sibbald et al., 1977). The Mudjatik domain is exposed as granitoids (possibly Archean basement) in only the northeast corner of the test area (Sibbald, 1980). The Aphebian supracrustals of the Wollaston domain, exposed along the eastern margin of the test area, consist

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

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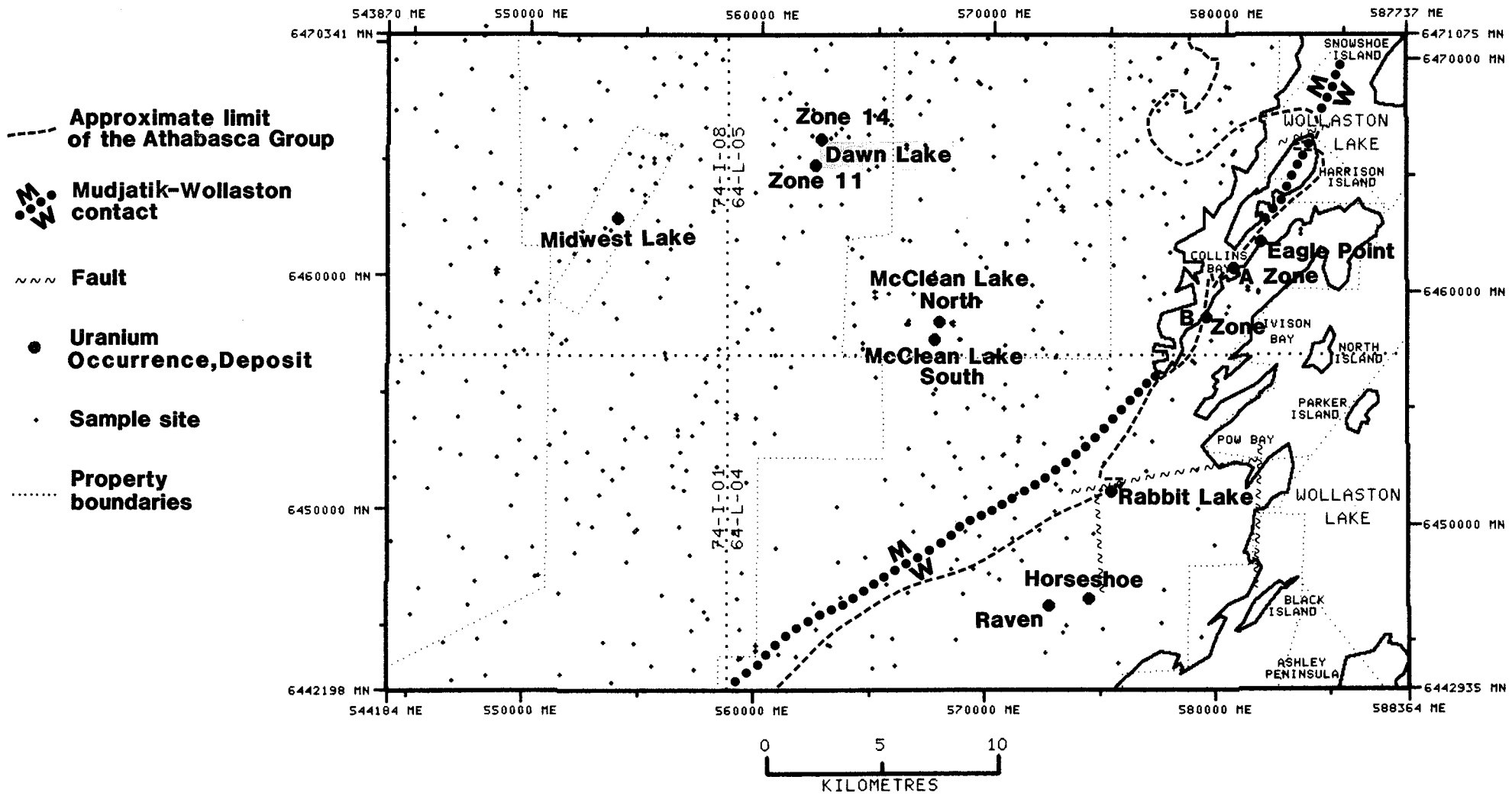

FIGURE 1: General Geology: NEA-IAEA Athabasca Basin-Wollaston Lake Test Area (after Sibbald, 1979 and 1980).

of two stratigraphic units : a meta-arkose unit, which intertongues with pelitic and semipelitic gneisses in the north, overlain by a quartzite - amphibolite unit (Sibbald, 1980).

The test area includes the eastern edge of the Helikian Athabasca Group which is composed here largely of the conglomeratic and sandy braided stream facies of the Manitou Falls Formation (Ramaekers, 1979).

Unconformity type uranium deposits occur at or close to the contact of granitoid gneiss "massifs" with the supracrustals (i.e. Midwest Lake, Collins Bay 'A' and 'B', McClean Lake North and South, and Eagle Point) and also within the supracrustal belts (i.e. Asamera '11' and '14' zones, Rabbit Lake, Raven and Horseshoe)(Sibbald, 1980).

Sampling Techniques and Analytical Procedures

Sample Collection

Lake sediment samples were obtained using a G.S.C. sampler from a Hughes 500-C turbo helicopter. Sediment (top 5-10 cm), at the sediment- water interface was avoided to exclude any recent contamination (Coker and Nichol, 1975). Organic-rich sediments were collected from the central- deepest part (profundal basins) of permanent lakes and ponds. The physical nature of the sediment did not vary much from lake to lake, commonly being a green-brown (olive) thixotropic gel. No difficulty was experienced in collecting such samples. In a few cases where organic material was unavailable clastic sediment was recovered from the centre-lake site, but with difficulty.

Surface lake waters (0.5 m depth), which were generally very clear or light yellow-brown, were collected directly into 500 mL polyethylene bottles.

Measurements of the surface water pH, Eh, dissolved oxygen content,

temperature and conductivity were made using a Martek Mark V Water Quality Analyzer. Unfortunately, the physicochemical conditions of the surface waters were measured at only a few sample sites due to an equipment malfunction caused by faulty electrical wiring in the helicopter. The available Martek, data, although felt to be somewhat unreliable, are summarized for reference purposes in Table 1.

A number of standard observations (catchment basin rock type, lake water depth, lake sediment composition and colour) as given in the appendices, as well as the Martek data, were recorded on lake water and lake sediment field data cards for the corresponding sample taken at each sample site.

Sample Preparation

Air drying generally resulted in the organic-rich lake sediments becoming extremely hard. The 1979 lake sediment samples were disaggregated, using a mortar and pestle and a ceramic ball mill, to obtain a powder which could pass a minus 80-mesh (180 μm) sieve. Lake sediment sample preparation was carried out by Golder Associates, Ottawa. The Dunn 1976 lake sediment samples were prepared, as above, from a new portion of the original, unprepared, material. The U.R.P.-N.G.R. 1977 lake sediment samples were previously prepared (in 1977) exactly as were the 1979 samples.

Sample Analyses

Analyses of all lake sediment samples (including the Dunn 1976 (newly prepared) and U.R.P.-N.G.R. 1977 (original material prepared and analyzed in 1977)) for Zn, Cu, Pb, Ni, Co, Ag, Mn, Fe, As, Mo and loss-on-ignition (LOI) were carried out by Chemex Labs. Inc., Vancouver, B.C..

Table 1: Surface Lake Waters - Martek* Physiochemical Data: Summary Statistics

		Total	Athabasca Group	Mudjatik Lithostructural Domain	Contact zone Athabasca-Mudjatik	Wollaston Lithostructural Domain	Contact zone Athabasca-Wollaston
Normal	Temperature (°C)	17(1) 15, 17, 18	17(1) 15, 17, 18	18(-) -	18(-) -	17(1) 16, 17, 17	17(1) 16, 17, 17
	pH	6.5(.4) 5.0,6.5,7.8	6.4(.4) 5.0,6.5,7.2	6.6(-) -	6.9(.2) 6.7,6.9,7.0	6.9(.6) 6.1,7.1,7.8	6.9(.6) 5.5,7.0,7.7
	Conductivity (μmhos/cm)	10(16) 1,7,178	7(4) 1,6,20	16(-) -	10(3) 4,12,12	16(11) 5,14,35	14(10) 2,16,33
	Oxidation Reduction Potential (mV)	+106(28) +48,+117,+175	+110(27) +48,+119,+175	+110(-) -	+116(4) +112,+121,+121	+71(10) +57,+78,+82	+72(20) +55,+67,+129
	Dissolved Oxygen (ppm)	8.1(.2) 6.1,8.1,8.6	8.1(.2) 7.4,8.1,8.5	6.1(-) -	8.2(.1) 8.1,8.2,8.4	8.1(.3) 7.8,8.0.8.6	7.9(.1) 7.7,7.9,8.2
n		189	161	1	5	6	12

16(11) = arithmetic mean (standard deviation)
5,14,35 = minimum, median, maximum

n = number of samples

* Measurements made approximately 0.5 metre below lake water surface using a Martek Mark V Water Quality Analyzer (N.B. Data are not reliable due to electrical source problems in the helicopter).

A 1 g sample of minus 80-mesh (180μm) lake sediment was digested in a test tube with 6 mL of 4M HNO_3-1M HCl overnight. The test tube was then immersed in a hot water bath at room temperature and brought up to, and held at, 90°C for 2 hours with periodic shaking. The sample solution was cooled to room temperature and diluted to 20 mL with distilled water and mixed. The contents of Zn, Cu, Mn, Fe, Pb, Ni, Co, and Ag were determined by atomic absorption spectrophotometry using an air-acetylene flame. Analyses for the last four elements were carried out using simultaneous, automatic background correction.

Arsenic in the lake sediment was determined colorimetrically using silver diethyldithiocarbamate. Decomposition was by heating a 1 g sample with 20 mL of 6M HCl at 90°C for 1.5 hours. Colorimetric measurements were made at 520 nm.

For molybdenum a 500 mg sample of minus 80-mesh lake sediment was decomposed in 1.5 mL conc. HNO_3 at 90°C for 30 minutes, then 0.5 mL conc. HCl was added and the digestion continued at 90°C for an additional 90 minutes. After cooling, 8 mL of a 1250 ppm Al solution were added and the solution was made up to 10 mL with distilled water, then aspirated directly into the nitrous oxide-acetylene flame of an atomic absorption spectrophotometer.

Loss-on-ignition (LOI) was determined on a 500 mg sample of lake sediment by ashing during a three hour time-temperature controlled rise to 500°C. The organic carbon (C) content of a lake sediment sample is proportional to the percent weight loss-on-ignition (LOI) (Coker and Nichol, 1975: $LOI=(2.4 \pm 0.2)C$).

Analyses of the 1979 lake sediment samples and reanalyses of selected Dunn 1976 and U.R.P.-N.G.R. 1977 lake sediment samples for U was carried out by Atomic Energy of Canada Ltd.. Uranium was determined by neutron activation with delayed neutron counting. A 1 g sample was weighted into a 7 dram polyethylene vial, capped and sealed. The irradiation was provided by the "Slowpoke" reactor with an operating flux of 10^{12} neutrons/sq cm/sec. The samples were pneumatically transferred from an automatic loader to the reactor where each sample was irradiated for 60 seconds. After irradiation, each sample was transferred pneumatically to the counting facility where after a 10 second delay the sample was counted for 60 seconds with six BF_3 detector tubes embedded in paraffin. Calibration was carried out twice a day as a minimum using natural materials of known uranium concentration.

As the Dunn 1976 and U.R.P.-N.G.R. 1977 lake sediment samples (Geological Survey of Canada, 1978) had been analyzed previously for uranium by the same technique used on the 1979 samples it was considered unnecessary to reanalyze all of these samples for uranium. However, to verify the quality of the data and ascertain that there was no overall shift in background levels, a number of samples, covering the general range of the data, were reanalyzed. These data are summarized in Table 2. The data quality and precision are excellent, even though the Dunn 1976 samples, analyzed in 1979, are another newly prepared portion of the same sample. There is no justification for the reanalyses of all Dunn 1976 and U.R.P.-N.G.R. 1979 lake sediment samples for uranium.

Combining chemical data from the water samples collected during the three surveys proved difficult and, in most cases, impossible because: lake water samples were collected at different times of the year, were preserved in

Table 2: Reanalyses of URP-NGR 1977 and Dunn 1976 Samples in 1979

U.R.P.-N.G.R. 1977		Dunn 1976	
Original Analysis 1977	Reanalyses 1979	Original Analysis 1976	Reanalyses 1979
0.9	0.9	0.7	0.6
2.7	2.5/4.0	0.9	0.9
4.2	4.3/4.4	2.0	2.0/2.6
4.6	4.6/4.8	2.6	2.5
11.3	10.6/11.3	4.9	5.0
20.2	21.7	5.1	5.5/5.5
33.0	33.3	6.9	5.9/7.6
39.7	40.6/41.1	8.4	19.7/20.0
42.8	44.0	8.7	9.6
108.0	109.0/112.0	10.1	10.0
226.0	231.0/235.0	13.1	11.9
		19.6	19.5

2.5/4.0 repeat analyses of the same sample during 1979 analyses for U.

different fashions, and analytical data for a given element were often determined by different analytical techniques. Reanalyses of the Dunn 1976 or U.R.P.-N.G.R. 1977 lake water samples were not feasible as the water samples either were discarded or may have changed in composition while in storage.

Most data reported are from the 1979 water samples, although F^- (selective-ion electrode) data for the Dunn 1976 lake water samples and pH (combination glass-calomel electrode) and F^- (selective-ion electrode) data for the U.R.P.-N.G.R. 1977 lake water samples are also given.

Conductivity (conductivity electrode with a cell constant = 0.1) and pH (combination glass - calomel electrode) measurements were made on the 1979 lake water samples in the laboratories of the Resource Geochemistry Subdivision, Geological Survey of Canada, Ottawa.

The U contents of the 1979 lake water samples were determined by laser-induced fluorometry utilizing the Scintrex-UA3 Uranium Analyzer in the laboratories of the Resource Geochemistry Subdivision, Geological Survey of Canada, Ottawa.

The 1979 lake water samples were analyzed for the anions, F^-, Cl^-, PO_4^{3-}, NO_3^-, and SO_4^{2-}, utilizing the Dionex system, by Barringer Magenta Ltd., Toronto, Ontario.

Evaluation of the quality of the analytical data was based on a blind duplicate and reference control sample system. Each of these samples were present on a random 5 percent frequency basis. In each block of 20 samples there were 18 routine field samples, one blind duplicate, and one reference control sample. The blind duplicate is a split of one of the 18 field samples and the reference control sample is a split from one of several reference bulk samples available. Rejection or acceptance of data for each block of 20

samples was determined by statistical criteria involving the blind duplicate and reference control sample data. Rejected data were replaced by new data after repeat analyses.

Lake Water and Sediment Data: Interpretation Methodology

Geologic Subpopulations

The NEA-IAEA Athabasca Basin - Wollaston Lake Test Area is characterized by distinctly different bedrock lithologies. To identify geochemical variations in the lake waters and/or sediments characteristic of the underlying lithologies, the lake water and sediment samples were coded (Appendix II and III) on the basis of the underlying bedrock. As a result, five subpopulations of lake water, and corresponding sediment samples were created (Figure 2).

"Abnormal" Lake Water and Sediment Data

A number of samples, which were felt to have "abnormal" (i.e. highly elevated (>>99th percentile)) levels of any of the measured geochemical parameters, were not included in the five geologic subpopulations (i.e. in the coding these were left blank (Appendix II and III and X on Figure 2)). This was done to prevent these "abnormal" samples from possibly overly influencing the statistical analyses of the geochemical data and the distribution and contour patterns obtained on the various areal data displays produced.

The statistical analyses of the lake water and sediment data included the "abnormal" samples in the total water and sediment populations but excluded the "abnormal" samples in the geologic subpopulations. These data are summarized in Tables 4 and 6 and will be discussed later.

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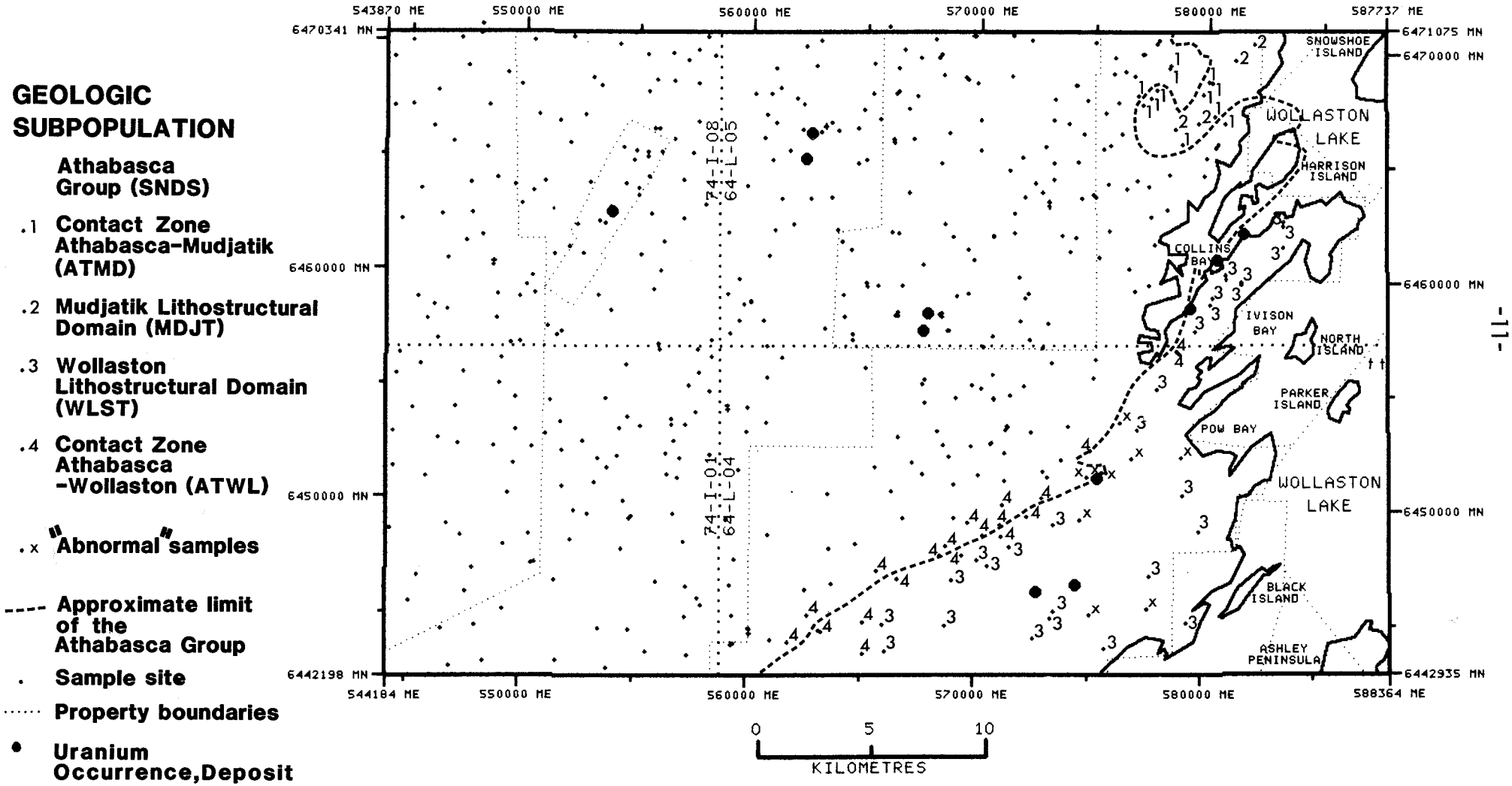

FIGURE 2: Lake Water and Sediment Samples: Geologic Subpopulations.

However, in order to include the "abnormal" samples in the data used for the various areal data displays (i.e. Applicon coloured maps and three dimensional (3D) surface plots discussed later) the parameters thought to be "abnormal" were reset to the highest "natural" (i.e. highest value obtained in an uncontaminated lake) levels, each geologic subpopulation being treated independently, and then recoded as per the appropriate geologic subpopulation (Table 3). These reset and recoded data along with all other original data were made into a RESET file used in the production of the Applicon coloured maps and the three dimensional (3D) surface plots.

Applicon 1:250,000 Coloured Maps

The 1:250,000 scale coloured maps and annotative material were prepared directly from digital data by a computer mapping package (APPMAP) being developed in the Resource Geochemistry Subdivision, Geological Survey of Canada, Ottawa. This package makes use of an Applicon colour plotter and Applicon library software resident on a CDC Cyber 74 computer at the Computer Science Centre of the Department of Energy, Mines and Resources, Ottawa. The legend, border and annotative material were entered through APPMAP directives. The irregularly spaced data were interpolated by APPMAP to a regular grid which, for these data, was 400 m^2 on the ground. The interpolation is in the form of a moving average where weighting is by an inverse distance function ($1/d^3$) using the nearest five data points. The effect of this moving average is to filter out the minor irregularities in the spatial data and emphasize the broader scale and regional features. Data percentiles were used for contour interval selection.

The 1:250,000 scale coloured maps, prepared using the RESET file

Table 3: Possibly "Abnormal" Samples With Reset "Natural" Levels

Survey	1979 Survey				URP-NGR 1977 Survey				Dunn 1976 Survey	
Sample Number	64L 796142	64L 796143	64L 796145	64L 796146	64L 771223	64L 773193	64L 773194	64L 773205	64L 761112	64L 761113
Geologic Subpopulation*	WLST	WLST	WLST	ATWL	WLST	ATWL	WLST	WLST	ATWL	ATWL
Conductivity (µmhos/cm)	186/41	76/41	115/41							
Cl^- (ppb)	2630/310	2410/310	2940/310							
SO_4^{2-} (ppb)	77700/1830	9700/1830	14500/1830							
U (ppb)		100.00/1.10	440.00/1.10	4.10/1.20		2300.00/**	8.00/**	16.00/**		
U (ppm)			605/228						N.A.	N.A.
Cu (ppm)	No Sediment Sample Obtained								52/27	53/27
Pb (ppm)			30/5							
Ni (ppm)			34/28						21/16	22/16
Mn (ppm)					560/435					
As (ppm)			3.0/1.5							
Mo (ppm)			6/4							
Fe (%)					9.45/5.70					

605/228 = "Abnormal" value / Reset "Natural" value

* = Mnemonic for geologic subpopulation (see Figure 2)

** = URP-NGR 1977 and Dunn 1976 uranium in water data totally eliminated from the data files as per p. 7 and 9

N.A. = Not analyzed

(see p. 12), indicate that for some of the geochemical parameters the water and/or sediment samples from one (or more) geologic subpopulation are enhanced relative to those from the other geologic subpopulations. An example of this is U in lake sediments (Figure 12) which is highly enhanced in lake sediments within both the Wollaston domain ($\bar{x}$ = 9.0) and the contact zone Athabasca - Wollaston ($\bar{x}$ = 12.4) relative to those in the Athabasca Group ($\bar{x}$ = 1.5) (Table 6). This results in the most significant U in lake sediment patterns occurring in the Wollaston domain and contact zone Athabasca - Wollaston. Significant U levels in lake sediments from the Athabasca Group are almost completely surpressed. To rectify this phenomenon, in order to give equal weighting to the most significant levels of each parameter in the lake water and sediment samples in each of the geologic subpopulations, a RESCALED file was prepared. Within each geologic subpopulation the maximum value was assigned a rescaled value of "100" the minimum value a rescaled value of "1". Intervening data were assigned proportional rescaled values using the following equation:

$$\text{RESCALED VALUE} = \left(\left(\frac{\text{VALUE} - \text{MINIMUM}}{\text{MAXIMUM} - \text{MINIMUM}}\right) X \ 99\right) + 1$$

Three Dimensional (3D) Surface Plots

The three dimensional (3D) surface plots were prepared from the RESET file (see p. 12) using the APPMAP package, APPLICON software and a computer data display system DISSPLA (Integrated Software Systems Corp., 1978). The irregularly spaced data were first interpolated to a regular grid of 600 m^2 on the ground. The interpolation is in the form of a moving average where

weighting is by an inverse distance function ($1/d^3$) using the nearest five data points. This regularly spaced grid was then passed through a program which set all the grid values within Wollaston Lake to a negative value (equal to (-1 x (one Z axis interval)). As a result, Wollaston Lake shows up as a depression on the three dimensional (3D) surface plots and the shoreline of Wollaston Lake, the actual edge of the survey area, is clearly depicted. This modified data grid was then passed to a subroutine in DISSPLA and the three dimensional (3D) surface plots produced using a viewpoint southwest (215^o) of the area, elevated 20 degrees in the air, and out from the centre of the plot 5000 kilometres. The X (western edge) and Y (southern edge) axes are labelled in U.T.M.'s as kilometres (i.e. each interval equals 1 kilometre). The Z axis (vertical) interval equals one-half of the 98th precentile of the data and its length is based on the range of the regular grid values.

Geochemical Association Map

Data in excess of the 90th percentile, based on the RESET (p. 12) data, for all geochemical parameters measured in both the lake water and sediment samples within each of the five geologic subpopulations were identified and plotted on a map. When two or more adjacent samples have the same geochemical parameter in excess of the 90th percentile these samples are grouped together. These 90th percentile groupings, derived using an empirical form of cluster analyses (Figure 29), are indicative of geochemical associations and trends in the parameters measured in the lake waters and lake sediments within the survey area.

Results and Discussion

Lake Waters

Overview

The predominantly clear or light yellow-brown lake waters which occur throughout the study area contain low levels of dissolved ionic species, and generally only slight variations in physical properties. As a result the maps which depict the physicochemical conditions are outlining, with a few local exceptions, only subtle variations. This is in accord with the consistently pure quality of lake waters found throughout the boreal forests of Canada.

Despite the overall purity of waters, it is of interest that some parameters appear to reflect lithological, structural and/or glacial trends, and areas of known mineralization. Of particular note are the distribution patterns of chloride and phosphate. Selected waters were analyzed for a wide range of trace elements, of which Mg and Ca appear to be related to lithological contacts and to some areas of U mineralization.

Summary statistics for the lake water geochemical data are given in Table 4. Statistical data for the total population, includes all data, and for each of the geologic subpopulations, excluding "abnormal" samples (see p. 10), are summarized.

The correlation matrix and schematic representation of the significant chemical associations in the surface lake waters and lake sediments are given in Figure 3.

Table 4 : Surface Lake Waters - Geochemical Data: Summary Statistics

		Total	Athabasca Group	Mudjatik Lithostructural Domain	Contact zone Athabasca-Mudjatik	Wollaston Lithostructural Domain	Contact zone Athabasca-Wollaston
Normal*	pH	6.3(.5) 4.7,6.4,7.6 [403]	6.3(.4) 4.7,6.4,7.3 [345]	6.3(.3) 6.0,6.4,6.5 [3]	6.3(.3) 5.9,6.4,6.6 [11]	6.2(.5) 5.0,6.1,6.9 [24]	6.4(.7) 4.8,6.7,7.0 [19]
	Conductivity (μmhos/cm)	13(13) 5,12,186	11(4) 5,11,24	14(4) 11,-,17	14(4) 6,16,18	22(11) 11,22,41	18(9) 6,20,35
Lognormal**	F^- (ppb)	41(.2043) 3,46,250 [484]	41(.1853) 3,45,128 [417]	46(.0409) 40,47,50 [4]	46(.2172) 20,53,97 [12]	43(.1777) 20,39,79 [27]	32(.4441) 3,45,250 [20]
	Cl^- (ppb)	79(.3588) 5,80,2940	75(.3029) 5,80,600	102(.1491) 80,-,130	89(.1654) 50.90,190	53(.4506) 20,50,310	101(.6740) 5,180,420
	PO_4^{3-} (ppb)	51(.1053) 50,50,1100	51(.1111) 50,50,1100	50(-) -	50(-) -	50(-) -	50(-) -
	NO_3^- (ppb)	227(.6416) 25,420,3800 [307]	209(.6396) 25,400,3800	1060(.2108) 750,-,1490	288(.6071) 25,570,1490	225(.7436) 25,570,880	474(.4684) 25,600,1410
	SO_4^{2-} (ppb)	468(.2761) 25,480,77700	453(.1984) 25,480,1180	187(.4503) 90, -,390	393(.2149) 180,380,900	512(.3716) 240,550,1830	440(.4257) 25,500,1500
	U (ppb)	0.06(.3768) 0.05,0.05,440.00	0.05(.0860) 0.05,0.05,1.20	0.05(-) -	0.05(-) -	0.18(.6229) 0.05,0.50,1.10	0.26(.5475) 0.05,0.60,1.20
n		308	276	2	8	6	12

*Normal data
6.3(.5) = arithmetic mean (standard deviation)
4.7,6.4,7.6 = minimum, median, maximum
[409] = [number of samples if different from "n"]

**Lognormal data
41(.2043) = geometric mean (log_{10} standard deviation)
3,46,250 = minimum, median, maximum
[490] = [number of samples if different from "n"]

n = number of samples

A

		Sediments (n=473)											Waters (n=308)							
		LOI	Fe	Mo	As	Mn	Co	Ni	Pb	Cu	Zn	U_S	U_w	SO_4^{2-}	NO_3^-	PO_4^{3-}	Cl^-	F^-	Cond.	pH
Waters	pH	-.50	.37	.30	.18	.35	.28					.31	.19				.36	.53	.27	
	Cond	-.36	.18	.26		.22	.20				-.23	.60	.47	.58			.48	.30		
	F^-	-.33	.26	.22		.29	.17					.17					.24			
	Cl^-	-.31	.27	.28	.21	.24	.23					.35	.34	.39		.19				
	PO_4^{3-}																			
	NO_3^-													.22						
	SO_4^{2-}							.28	.26	.32		.35	.42							
	U_w							.20	.19	.20		.62								
Sediments	U_S	-.22	.27	.27	.17	.18	.35	.50		.42										
	Zn	.42	.42	.24	.20	.34	.52	.40		.59										
	Cu	.40	.16	.23			.44	.71												
	Pb		-.18				-.21													
	Ni	.14		.18			.49													
	Co		.65	.36	.42	.48														
	Mn	-.25	.69	.35	.38															
	As	-.15	.60	.54																
	Mo		.56																	
	Fe	-.19																		
	LOI																			

(LOI, Cond and pH normal data, all others log-transformed data. Correlation coefficients significant at the 99% confidence level)

B

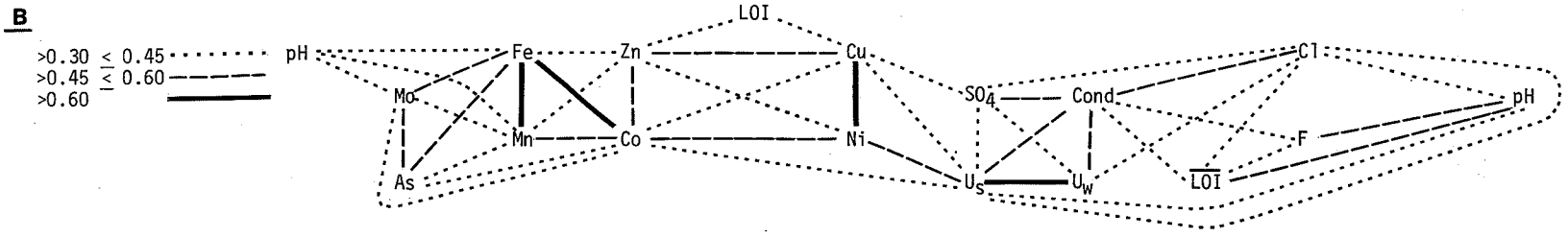

Figure 3: Correlation matrix (A) and schematic representation (B) of significant chemical associations in surface lake waters and lake sediments

pH (range 4.7-7.6; Arithmetic Mean 6.3; Median 6.4.)

The region is characterized by slightly acid waters (Figure 4). Other than a few isolated lakes of neutral pH, the only region to show an appreciable area with neutral to alkaline waters is southwest of Pow Bay, in the vicinity of Gulf Minerals Rabbit Lake uranium mine. This feature could be due to contamination, or more probably it results from the presence of carbonates associated with the shear zone which hosts the uranium mineralization. In the Carswell area of northwestern Saskatchewan lake waters attain a maximum pH of 8.7 due to the effects of surrounding carbonates (Dunn, 1980).

The most acid waters occur within swampy regions, and their yellowish-brown coloration reflects the presence of relatively high concentrations of organic acids (especially humic and fulvic acids: cf. Jackson et al., 1978).

No clearly defined trends of pH, nor spatial association with areas of known uranium mineralization (except Rabbit Lake) can be discerned. Bedrock geology does not here play an important role in controlling pH : values are similar in lakes overlying the Athabasca Group and basement rocks of the Wollaston and Mudjatik domains.

Correlation coefficients (Figure 3) show that pH has a strong sympathetic relationship with F^-, and slightly weaker associations with conductivity, Cl^-, U in waters, and U, Co, Mn, As, Mo and Fe in the sediments. The latter association reflects trace metal scavenging by Fe and Mn oxide and hydroxide complexes, the formation of which are sensitive to slight physicochemical fluctuations (i.e. Eh and pH) (Coker et al., 1979).

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

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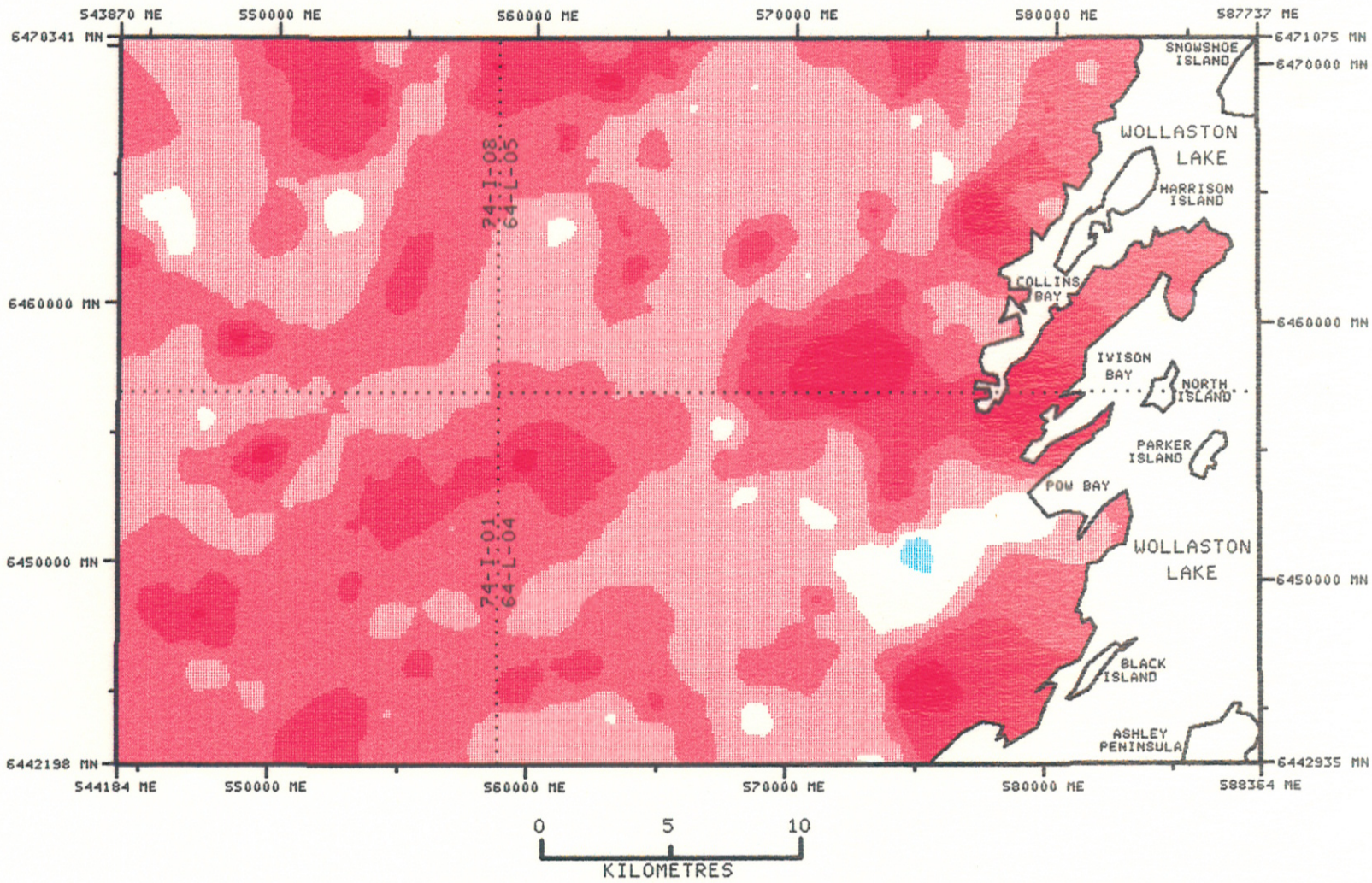
FIGURE 4

PH
IN
LAKE WATERS



PH	%TILE
7.6	MAX
8.4	100
8.0	100
7.6	100
7.2	99
6.8	90
6.4	50
6.0	25
5.6	7
4.7	MIN

403 SAMPLES

Conductivity (Range 5-186 µmhos/cm; Arithmetic mean 13 µmhos/cm; Median 12 µmhos/cm.)

The very low conductivity of the waters reflects their purity (Figure 5). The notable exception occurs in the southeast where the underlying lithology comprises Aphebian metasediments of the Wollaston domain. The relatively high values (18-41 µmhos/cm) may be due in part to contamination from the operations around the Rabbit Lake mine. However, evidence from earlier studies suggests that the anomaly may be natural: in 1974, ninety-five waters collected from this area yielded an arithmetic mean value for conductivity of 33.3 µmhos/cm (Cameron and Ballantyne, 1977). Evidently, a further five years of mining operations and exploration has had a negligible effect on the regional conductivity of the waters.

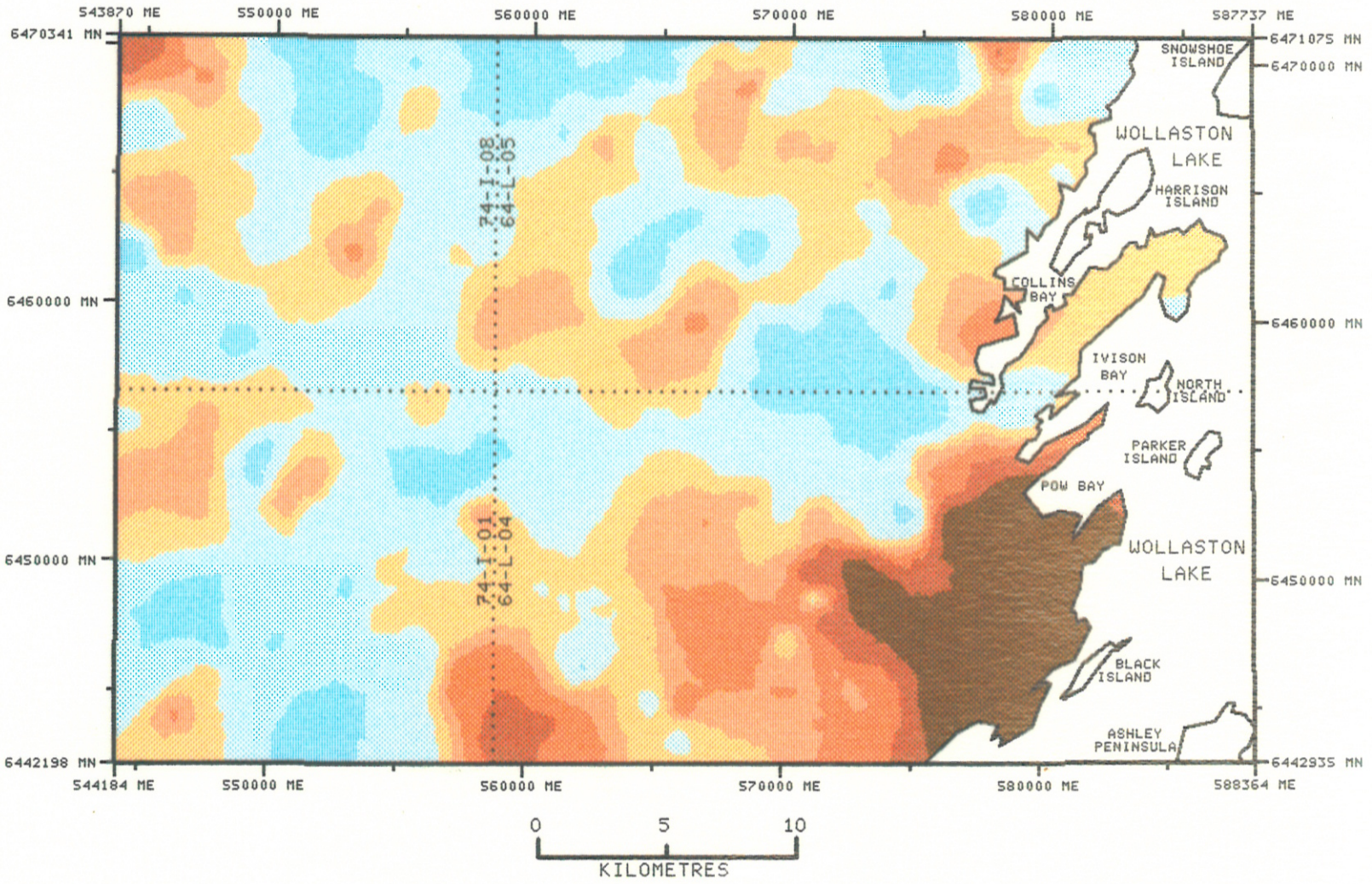
Within the Athabasca Group two areas of slightly elevated levels of water conductivity stand out: a) in the south, near Lampin Lake, close to the contact between the Athabasca Group sediments and the Aphebian metasediments; and b) in the northwest, north of Henday Lake, where nitrate and fluoride are also high.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 5

CONDUCTIVITY
IN
LAKE WATERS



uMHOS/cm	%TILE
41	MAX
30	98
22	95
18	90
15	75
12	50
8	25
5	MIN

308 SAMPLES

Fluoride (Range <6-250 ppb; Geometric mean 41 ppb; Median 46 ppm)

There are three areas with anomalously high fluoride: a) in the northwest, extending northward from Henday Lake; b) in the southeast, around Rabbit Lake; and c) southwest of Rabbit Lake in the vicinity of Kewen and Lampin Lakes (Figure 6). The latter two occurrences are of interest in that they are close to both the margin of the Athabasca Group, and the sub-Athabasca contact between metasediments of the Wollaston and Mudjatik domains.

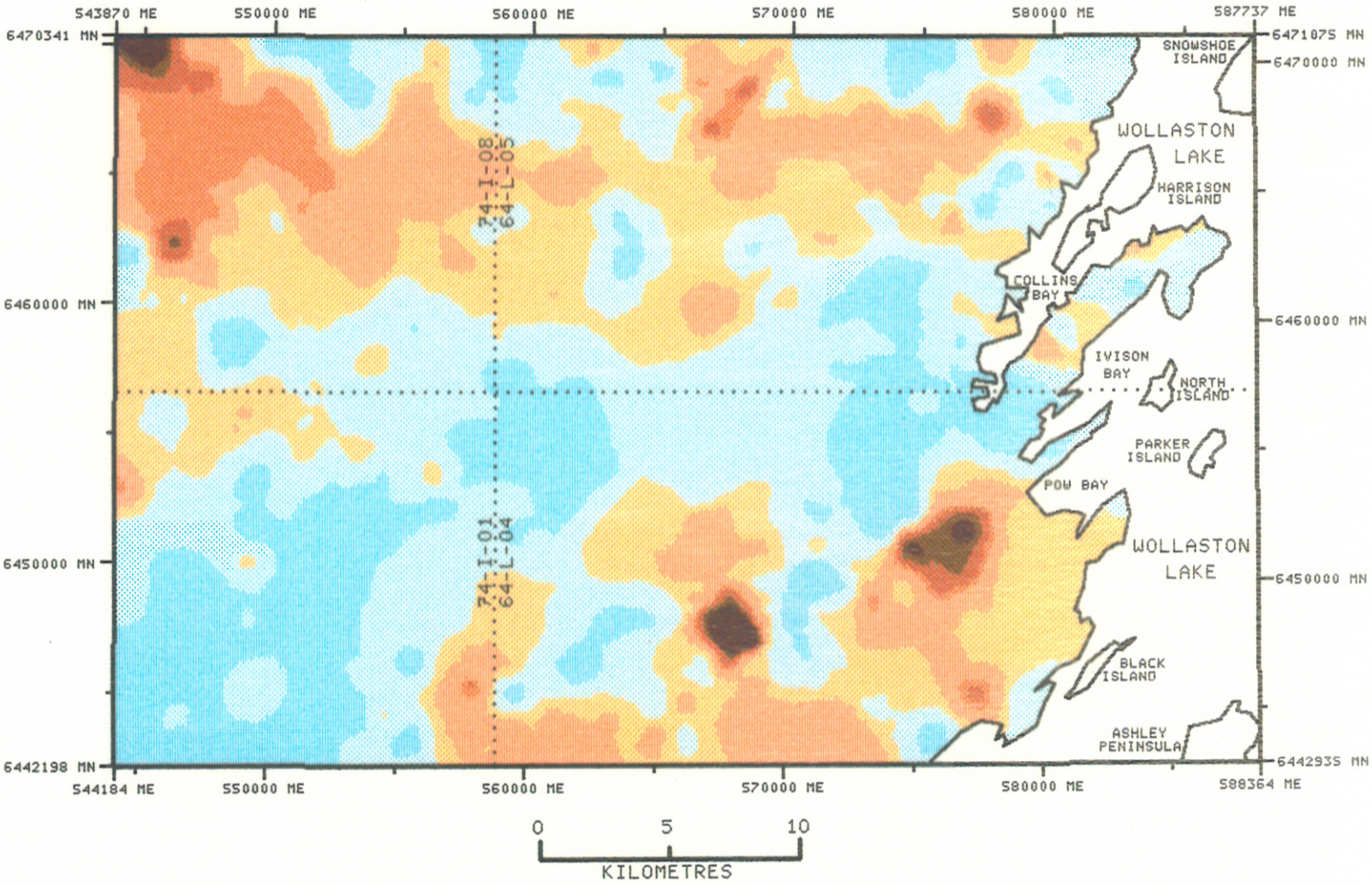
The reason for the Henday Lake anomaly is unknown. Twelve kilometers further to the northwest (near Murphy Lake) anomalous radon values have been recorded (up to 785 pCi/L) in lake waters (Saskatchewan Dept. Mineral Resources assessment file for King Resources Co., No. 74108-002, 1969). This is the only significant geochemical anomaly known to the authors in the area, and could be related to the fluoride anomaly in that the radon is derived from uranium, and fluoride is associated with uranium in this general vicinity (Dunn and Ramaekers, 1979).

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 6

FLUORIDE
IN
LAKE WATERS



PPB	%TILE
250	MAX
97	99
88	98
75	95
69	90
54	75
46	50
32	25
3	MIN

484 SAMPLES

Chloride (Range <10-2940 ppb; Geometric mean 79 ppb; Median 80 ppb.)

There is a notable relationship between areas with anomalous chloride and known uranium mineralization, particularly at Rabbit Lake and Midwest Lake, and to a lesser degree at Dawn and McClean Lakes (Figure 7). The association is not, however, consistent, because chloride values near the Raven, Horseshoe, and Collins Bay deposits fall below the median value. Conversely, small chloride anomalies occur in areas of no known U mineralization. Data in Figure 3 show that there is a sympathetic relationship between chloride and uranium in both waters and sediments. A similar situation prevails in the Cluff Lake region of uranium mineralization (Dunn, 1980).

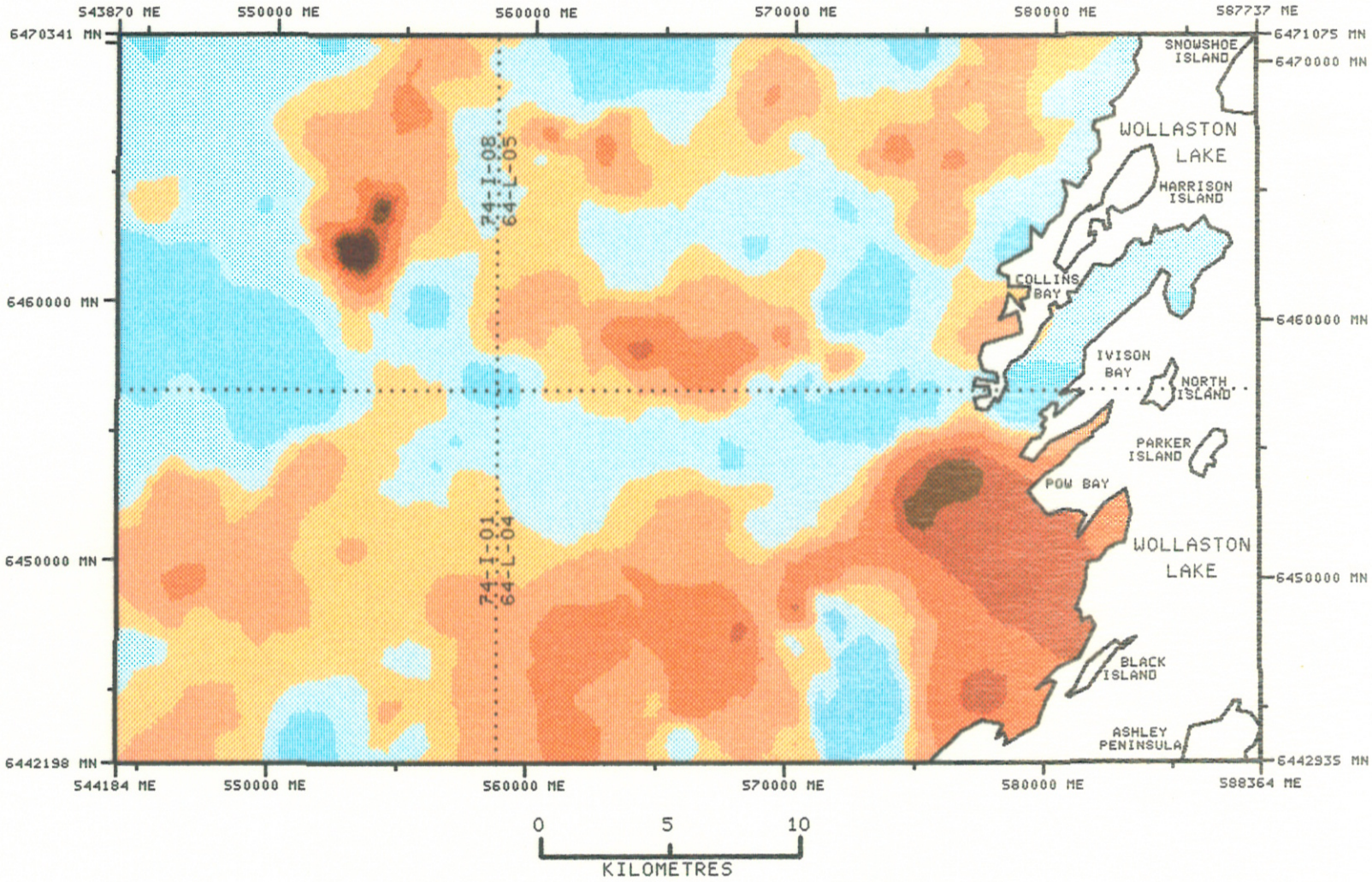
In the lithosphere chlorine is enriched in late-stage crystallization products. Pegmatitic phases contain relatively high contents of chlorine which, when degraded by faulting or radiogenic alteration, release the chloride ion into solution. It follows that anomalies of chloride in waters may reflect the local presence of altered basement rocks, which in turn may be exploration targets, since they constitute favourable hosts to mineralization.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 7

CHLORIDE
IN
LAKE WATERS



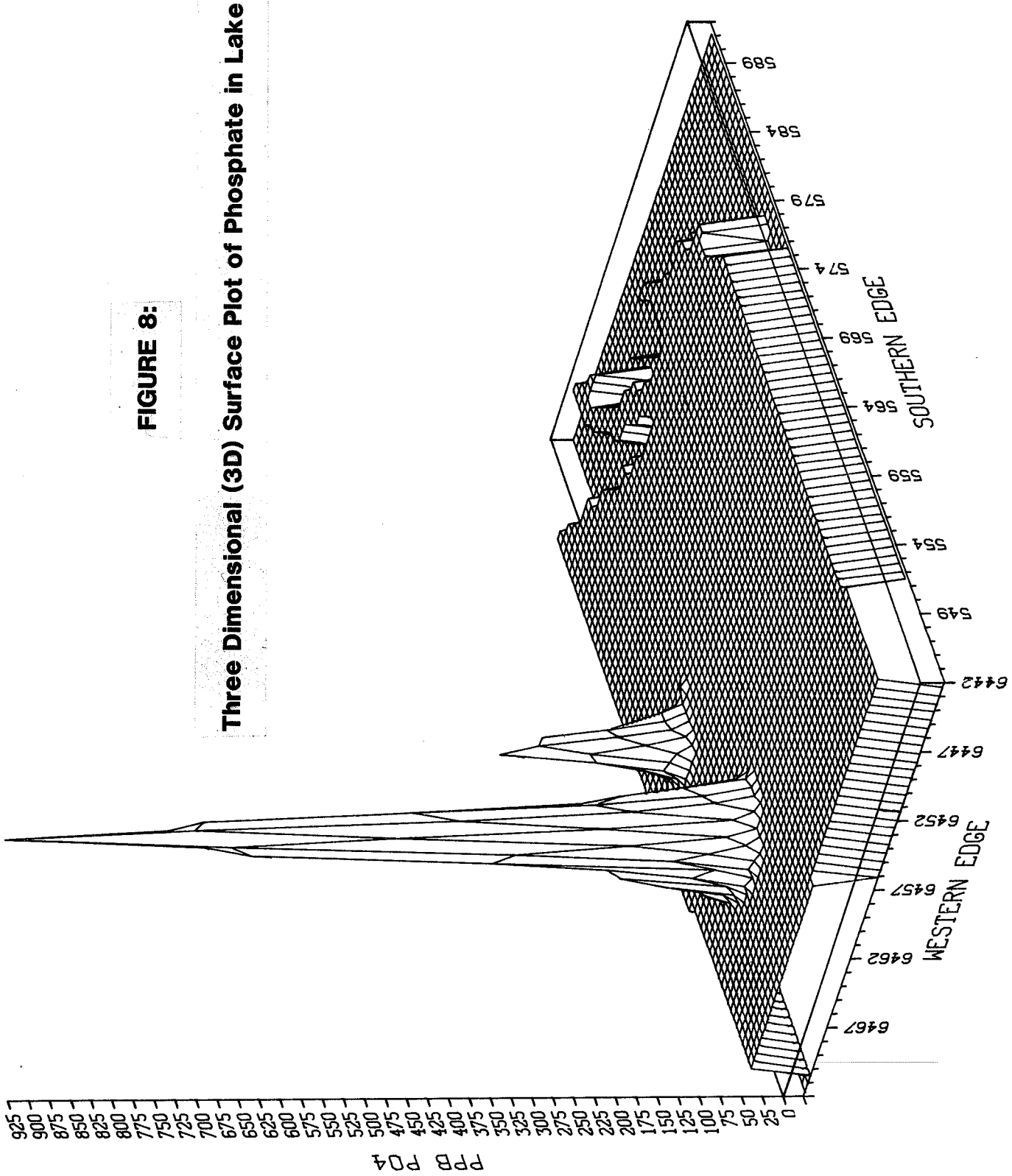
Phosphate (Range <100-1100 ppb.)

Over 98 percent of the water samples contained less phosphate than the detection limit of 100 ppb. Consequently, the three dimensional (3D) surface plot shows a plateau of values interrupted only by a small anomaly in the vicinity of Dawn Lake, and a more prominent peak at Midwest Lake (Figure 8).

Lakes usually contain less than 100 ppb phosphate (Hutchinson, 1957), but are very sensitive to human contamination, e.g. detergents. It is possible that the anomalies shown here are due to contamination, but since no anomalies occur in the Rabbit Lake area, where the possibility of contamination is greater due to extensive mining operations, it is probable that the values constitute natural levels of phosphate.

FIGURE 8:

Three Dimensional (3D) Surface Plot of Phosphate in Lake Waters.



Nitrate (Range <50-3800 ppb; Geometric mean 227 ppb; Median 420 ppb.)

Diffuse northeast/southwest trends occur which coincide with the direction of glacial transport and basement structural trends. The principal anomalies coincide with areas of relatively high lake water conductivity and fluoride content, and that in the southeast is restricted to rocks of the Wollaston domain (Figure 9). Correlation coefficients of the total data population (Figure 3) show that nitrate does not maintain any consistent relationship with any element or measured parameter other than a relatively weak correlation with sulphate. Data in Table 4 imply an enrichment of nitrate in lakes on the Mudjatik domain: this is a spurious anomaly because only two lakes were sampled.

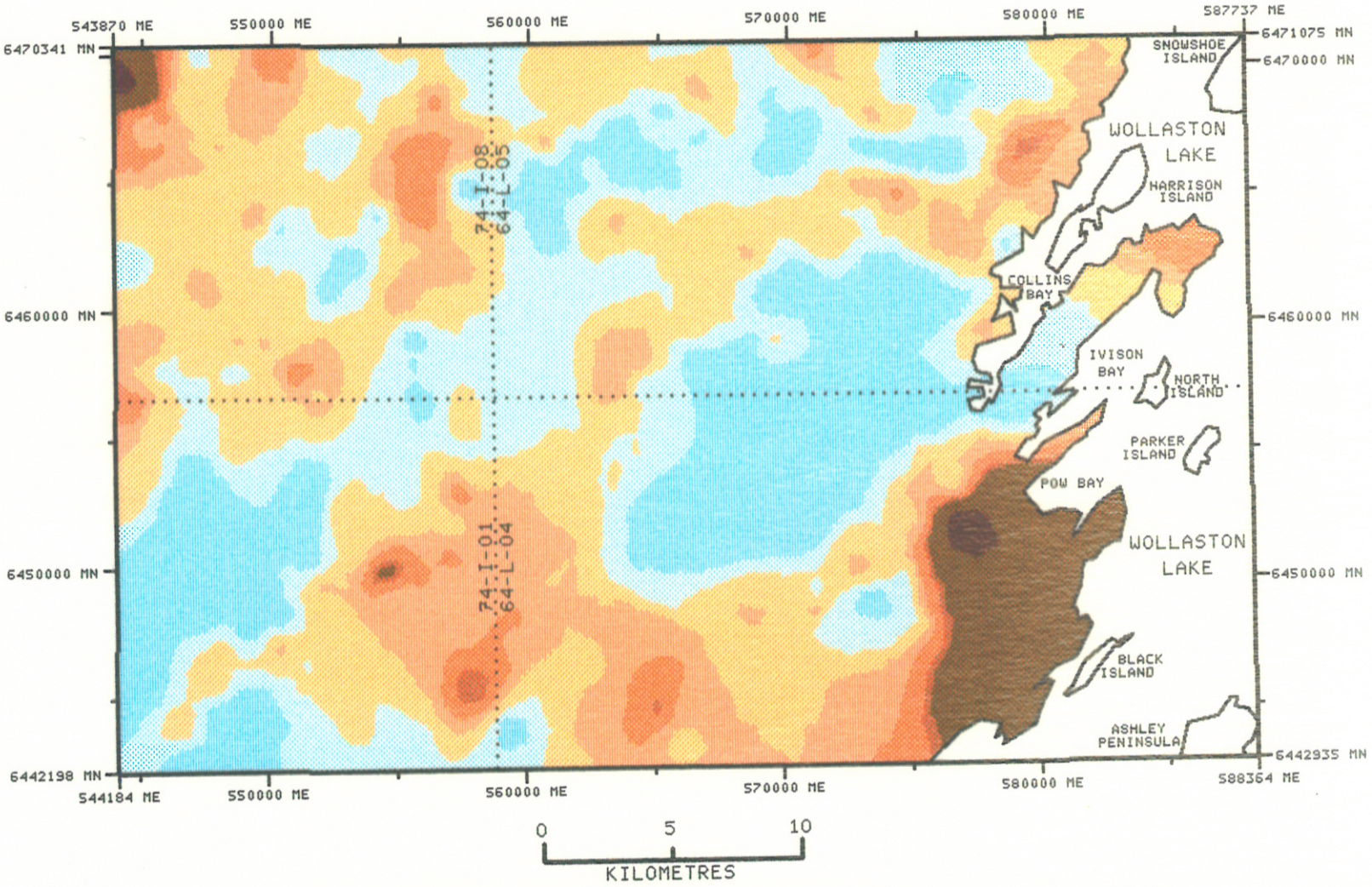
Nitrates occur in the more oxidizing environment of the biosphere, hence the map of nitrate distribution may reflect simply the better oxygenated waters of the area. Areas of uranium mineralization tend to occur where the nitrate content of the waters is moderately low.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 9

NITRATE
IN
LAKE WATERS



PPB	%TILE
3800	MAX
2700	99
1490	98
1300	95
940	90
690	75
420	50
180	30
25	MIN

307 SAMPLES

Sulphate (Range <50-77,700 ppb; Arithmetic mean 821 ppb; Geometric mean 468 ppm; Median 480 ppb.)

The large difference between the median and arithmetic mean values is due to weighting of the latter by a few samples rich in sulphate: the 98th percentile for sulphate is 1180 ppb. Three "abnormal" samples, containing 9700-77,700 ppb sulphate, were omitted from statistical calculations for the geologic subpopulations (Table 4) and reset (see p. 10 and 12) for the Applicon colour map, because they were probably contaminated by mining and exploration activities. Two came from the "Link" Lakes, down drainage from the Rabbit Lake mine, and one from Parks Lake, eight km to the south.

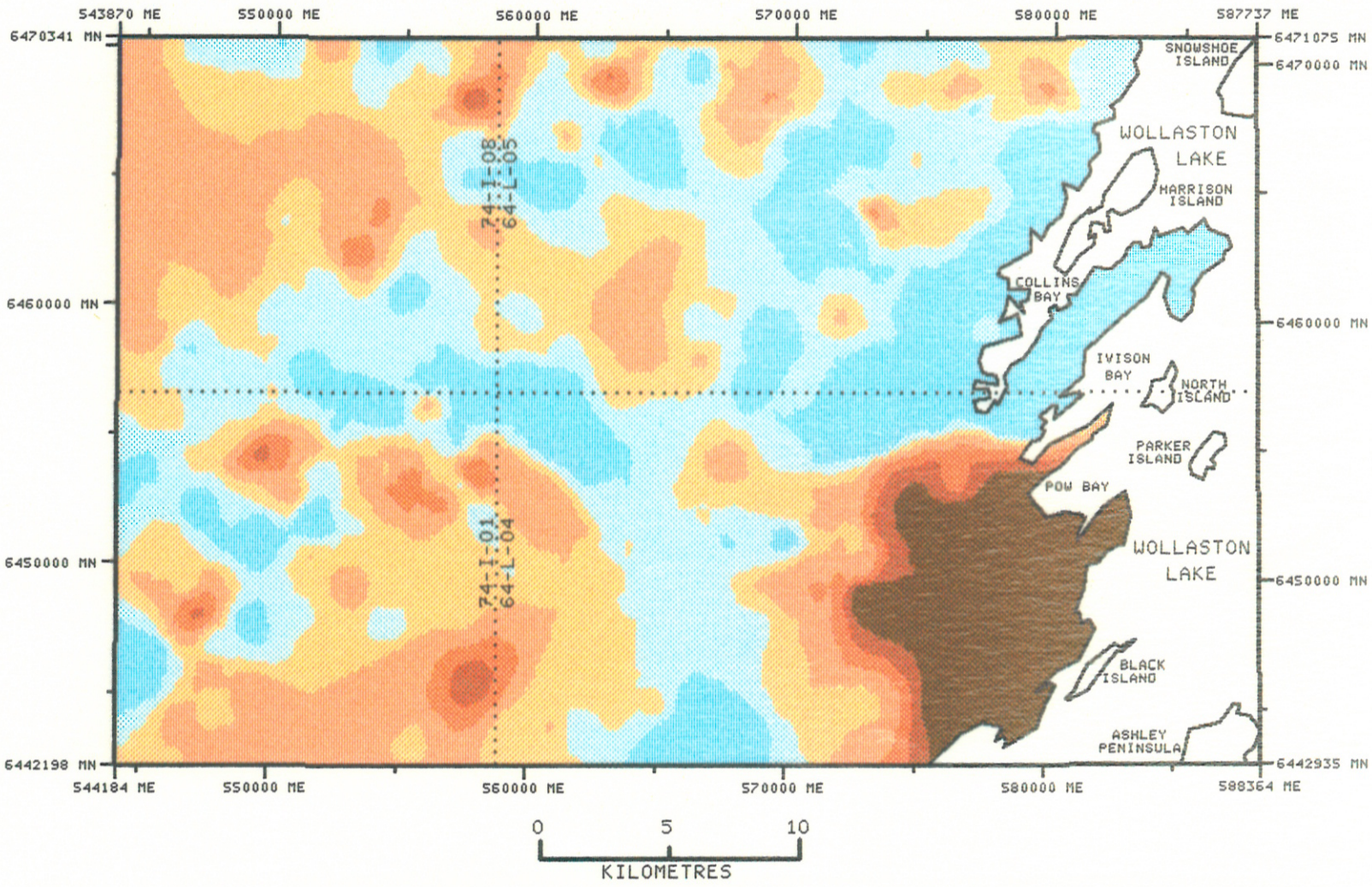
As in the case for a number of other anions, the Wollaston domain is the region exhibiting the strongest sulphate enrichment (Figure 10). In view of the large volumes of sulphur used in the uranium processing at Rabbit Lake, this anomaly is probably the result of contamination, hence does not warrant further discussion. Elsewhere in the study area the sulphate content of waters is very low, and the minor anomalies that do exist are isolated and follow no clear trends. Figure 3 indicates sympathetic relationships between sulphate and U, and with the typically chalcophile elements Cu, Pb, and Ni.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 10

SULPHATE
IN
LAKE WATERS



Uranium (in Waters)(Range <0.1-4400 ppb)

Only two waters (from the "Link" lakes, situated down drainage from Rabbit Lake) contained in excess of 4.0 ppb U, and evidently are the result of contamination from the uranium mining operations. The map shows a uniformly low content of U in lake waters, with the exception of the southeastern area (Figure 11). Waters collected during this study yielded very similar U analyses to those collected in the southeast during 1974 (Cameron and Ballantyne, 1977), indicating that no detectable regional contamination of the natural waters by U has occurred during this period.

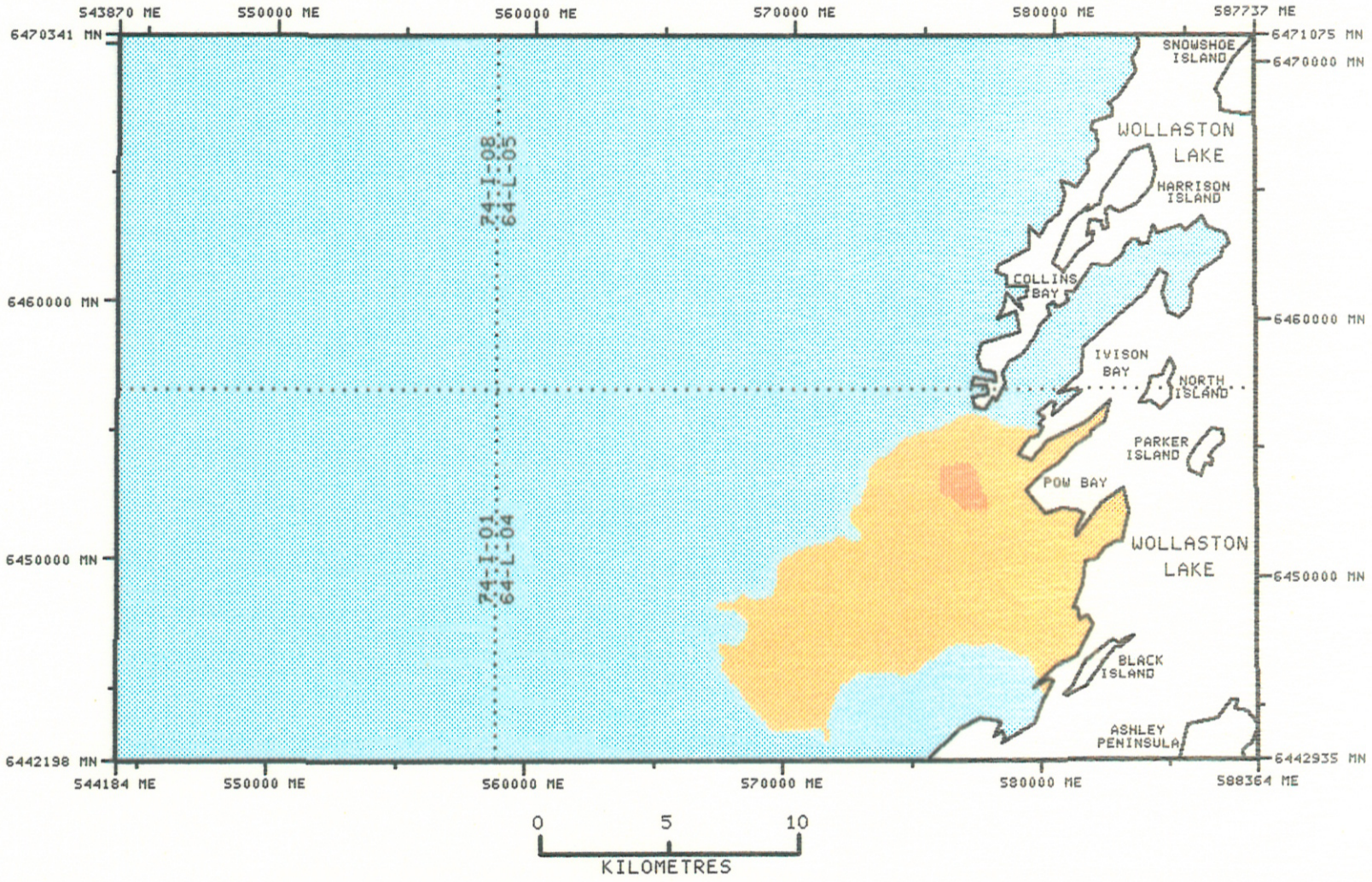
Figure 3 provides an insight into elements which are related to U in the waters: strong statistical relationships occur between dissolved uranium, chloride, sulphate, and conductivity of the waters, and in addition there is sympathetic variation between U in the waters and U, Cu, Pb and Ni in the sediments.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 11

URANIUM
IN
LAKE WATERS



Other Elements

Forty-one waters from three east-west-traverses across the area were analyzed for an additional twenty-seven elements by an inductively-coupled argon plasma spectrometer at the University of Regina. The only elements detectable were Mg, Fe, Ca, Si and Sr. Table 5 summarizes the data.

Table 5: Trace Elements (ICP) in Lake Waters

	Detection Limit	Minimum	Maximum	Arithmetic Mean
Mn (ppm)	0.4	<0.4	2.03	.44
Fe (ppm)	0.013	0.01	0.84	.086
Ca (ppm)	0.01	0.26	3.35	1.20
Si (ppm)	0.25	<0.25	4.16	.97
Sr (ppm)	0.004	<0.004	0.091	.010

One sample was collected from one of the "Link" lakes, situated down drainage from the Rabbit Lake mine. The waters and sediments of this lake are contaminated by the mining operations, hence data are omitted from the above statistics. The analysis of this water (in ppm) was Mg 3.54, Fe 0.09, Ca 6.13, Si 0.38, and Sr 0.022: from these data it is evident that only Mg and Ca are concentrated in this lake.

From the remaining forty lakes Mg and Ca attain their highest concentrations in lakes which are in the southeast, close to the contact between the Athabasca Group and basement rocks of the Wollaston domain. Calcium is also slightly enriched (2 ppm) in Midwest Lake, and in the far northwestern corner of the area. Iron attains its highest concentration in a small lake ("Caribou" Lake), about 1 km south of Moffatt lake. Elsewhere in the study area Fe concentrations are consistently

close to .01 ppm. The small silica anomalies are randomly scattered across the study area, and bear no discernible relationship to lithological contacts, nor known mineralization. Strontium values are uniformly low except for an isolated anomaly of 0.9 ppm from the Dawn Lake area.

Other elements sought but not detected were (with detection limits in ppm in paranthesis):-

Ti (.01), Al (.2), P (.4), As (.2), Au (.04), B (.02), Ba (.02), Be (.008), Bi (.7), Co (.03), Cu (.08), Mo (.04), Ni (.08), Pb (.18), Pd (2.9), Sc (.008), Se (.5), Sn (.5), V (.02), Y (.01), Zn (.03), Zr (.28).

Lake Sediment

Overview

Most of the lake sediments are rich in organic matter, derived from the surrounding vegetation and from an abundance of diatoms. Additional components are clay minerals, quartz grains, and iron hydroxides. These oozes contain over 90 percent water (cf. Dunn, 1980), and range from dark greenish-black with a creamy texture to pale brown and gelatinous. All analyses are quoted on a dry sample basis (i.e. oven dried to constant weight at 110°C).

Summary statistics for the lake sediment geochemical data are given in Table 6. Statistical data for the total population, includes all data, and for each of the geologic subpopulations, excluding "abnormal" samples (see p. 10), are summarized.

The correlation matrix and schematic representations of the significant chemical associations in the surface lake waters and lake sediments are given in Figure 3.

Many of the Applicon colour maps show linear trends in accord with the southwestward dispersion of glacially derived material. Subglacial lithology plays an important role in the chemistry of the lake sediments: lakes overlying metasediments of the Wollaston domain have higher concentrations of trace metals than those upon the Mudjatik domain, which in turn are enriched in comparison with much of the area underlain by sediments of the Athabasca Group.

Several elements are enriched in lakes close to the sub-Athabasca junction between the Wollaston and Mudjatik domains (e.g. U, Ni, As, Zn). Numerous elements are concentrated in lakes close to areas of known U mineralization (notably Midwest Lake, Rabbit Lake, and south of Dawn Lake).

In addition several areas of no known mineralization show multi-element anomalies: notably near Moffatt Lake, west of Collins Bay, and two regions in the southwestern quadrant of the study area.

Elements which appear to best define U mineralization are U, Ni, and As.

Table 6 : Lake Sediments - Geochemical Data: Summary Statistics

		Total	Athabasca Group	Mudjatik Lithostructural Domain	Contact Zone Athabasca-Mudjatik	Wollaston Lithostructural Domain	Contact Zone Athabasca-Wollaston
Lognormal*	U (ppm)	2.0(.3051) 0.1,1.7,605.0 [469]	1.5(.2442) 0.1,1.6,9.0 [399]	4.0(.5113) 0.7,8.0,8.4	3.7(.3873) 1.3,1.9,19.6	9.0(.5370) 0.5,8.3,228.0	12.4(.7689) 0.5,19.3,174.0
	Zn (ppm)	47(.2160) 6,50,200	47(.2218) 6,51,200	50(.0812) 38,49,86	44(.1891) 20,49,86	58(.1594) 27,60,109	42(.1792) 18,46,86
	Cu (ppm)	8(.2350) 1,8,53	8(.2247) 1,8,24	8(.1291) 6,8,12	9(.1642) 5,10,16	12(.2237) 5,12,40	8(.2170) 4,8,27
	Pb (ppm)	1(.2482) 1,1,30	1(.2432) 1,1,16	1(-) -	1(.2123) 1,1,5	1(.2743) 1,1,13	1(.1892) 1,1,5
	Ni (ppm)	8(.2002) 1,8,34	7(.1895) 1,7,29	7(.2515) 4,11,13	8(.1468) 4,10,12	11(.2188) 4,11,28	8(.1892) 2,9,16
	Co (ppm)	4(.2505) 1,4,17	4(.2523) 1,4,17	5(.3339) 3,4,15	4(.2243) 1,4,8	5(.1905) 2,5,15	4(.2205) 1,4,12
	Mn (ppm)	115(.3542) 20,110,2650 [479]	112(.3632) 20,100,2650	124(.1551) 75,160,160	73(.1550) 35,80,135	178(.2431) 40,190,435	127(.3423) 30,120,890
	As (ppm)	0.8(.3911) 0.5,0.5,170.0	0.8(.4027) 0.5,0.5,170.0	0.9(.5396) 0.5.0.5,6.0	0.6(.1684) 0.5,0.5,1.5	0.5(.4732) 0.5,0.5,1.5	0.8(.0918) 0.5,0.5,44.0
	Mo (ppm)	1(.2507) 1,1,17	1(.2554) 1,1,17	1(-) -	1(.1857) 1,1,3	1(.1455) 1,1,4	1(.2272) 1,1,4
	Fe (%)	1.09(.5098) 0.10,0.95,26.50	1.06 (.5227) 0.10,0.90,26.50	2.47(.6768) 0.80,2.10,23.50	0.93(4535) 0.30,0.90,10.40	1.39(.3295) 0.15,1.60,5.70	1.20(.4543) 0.20,1.30,15.20
Normal**	LOI (%)	43.5(16.5) 2.2,41.2,93.2	43.3(16.4) 2.2,41.0,92.4	48.5(16.5) 25.8,54.6,64.8	44.1(13.3) 32.2,42.6,68.8	45.9(16.5) 9.8,45.4,91.0	48.5(21.5) 14.4,44.0,93.2
n		473	401	4	12	27	20

*Lognormal data 1.5(.2442) = geometric mean ($\log_{10}$ standard deviation)
0.1,1.6,9.0 = minimum, median, maximum
[399] = [number of samples if different from "n"]

*Normal data 43.5(16.5) = arithmetic mean (standard deviation)
2.2,41.2,93.20 = minimum, median, maximum

n = number of samples

Uranium (in Lake Sediments)(Range <0.2-605 ppm; Geometric mean 2.0 ppm; Median 1.7 ppm.)

The map clearly demonstrates the relatively great abundance of uranium in sediments from lakes situated on metasediments of the Wollaston domain, (Figure 12). An anomaly of lesser magnitude occurs in the northeast where rocks of the Mudjatik domain subcrop beneath the glacial veneer. Table 6 shows the U concentrations with respect to underlying lithologies, and demonstrates the relative abundance in lakes close to the Athabasca-Wollaston contact zone. Lake sediment oozes, exposed after draining Rabbit Lake, were collected in 1976 and found to contain the highest concentrations of the entire region: in excess of 1000 ppm U (Dunn, 1976). These were undisturbed sediments collected 20 cm beneath the exposed lake bed, and thus represent the natural level of U prior to mining operations. These data were not included in this study.

The three-dimensional (3D) surface plot of the U data serves to give a different and more dramatic representation of the relative intensity of the U anomaly over rocks of the Wollaston domain (Figure 13).

The map of rescaled U values give a broadly similar picture to that of the raw data, except that it supresses anomalies in the southeast, whilst intensifying those which occur upon sediments of the Athabasca Group (Figure 14). The Midwest Lake area stands out on the rescaled map as a prominent anomaly trending northeast-southwest. A noteworthy feature of the anomaly is that sediments collected in 1976 yielded the same U concentrations (8 ppm) as those collected in 1979 from approximately the same sites. Evidently the extensive drilling through the lake bottom which has taken place during the

intervening years has made no perceptible difference to the U content of the sediments.

A few km to the east, another anomaly trends parallel to that over Midwest Lake, and extends from the vicinity of Mallen Lake (just to the north of the study area) through the zone of U mineralization beneath Dawn Lake.

The McClean Lake mineralization is not apparent from the lake sediments, but a small anomaly occurs a little to the northeast in the vicinity of Moffatt Lake.

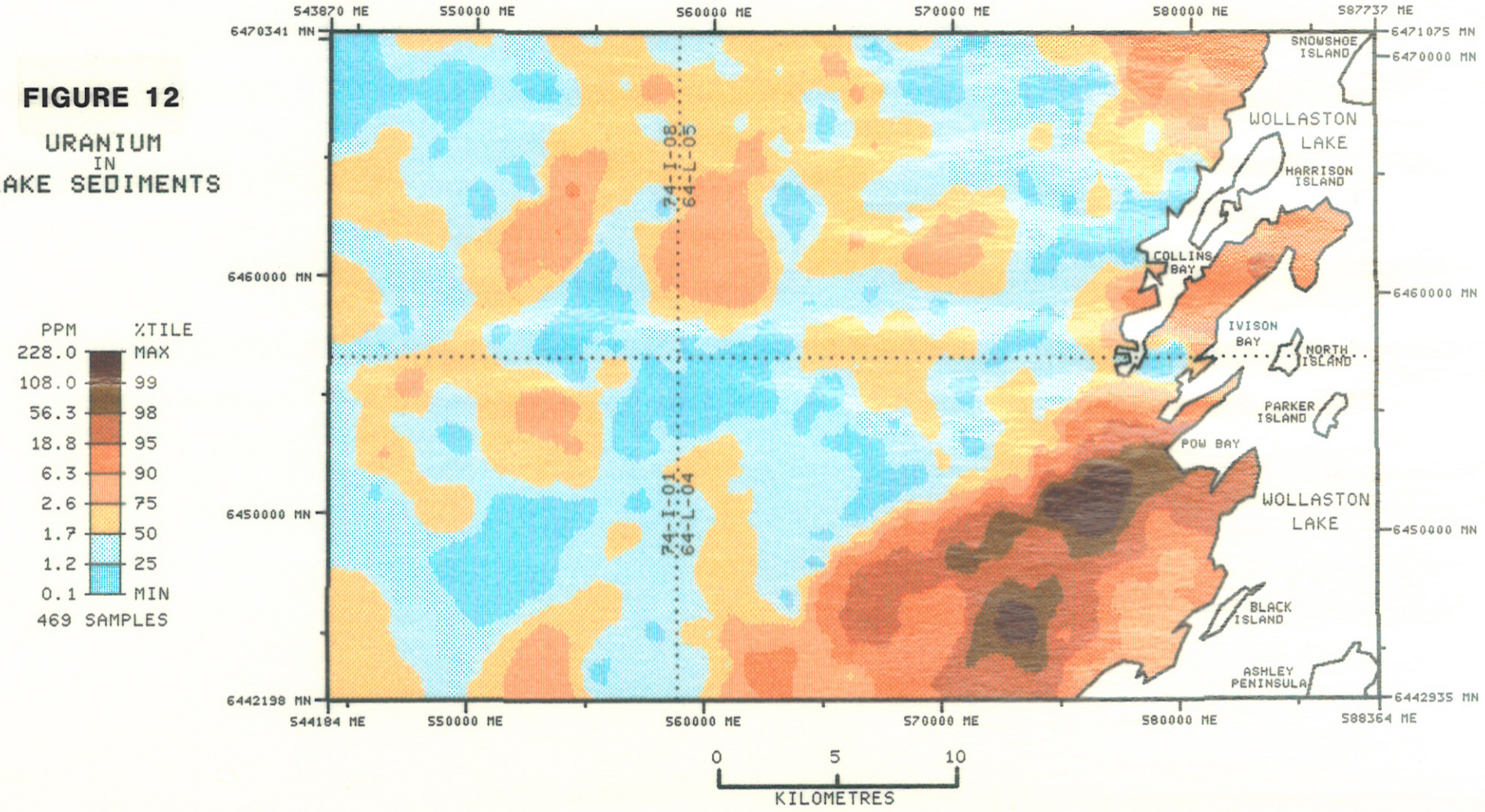
Other occurrences worthy of mention are located in the southwest quadrant of the map. No mineralization is known in this area, however several elements (notably Ni) are associated with slight enrichments of U.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 12

URANIUM
IN
LAKE SEDIMENTS



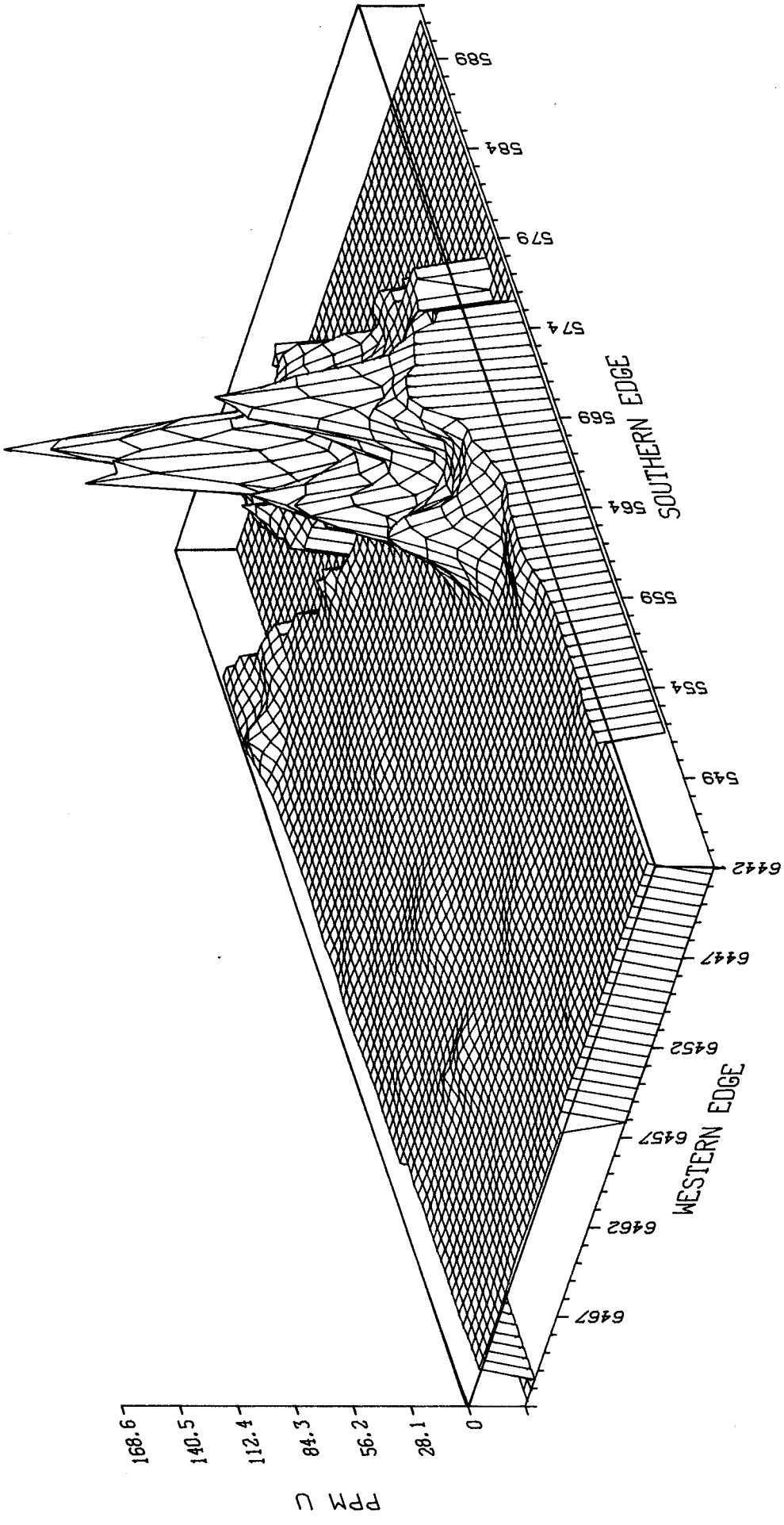


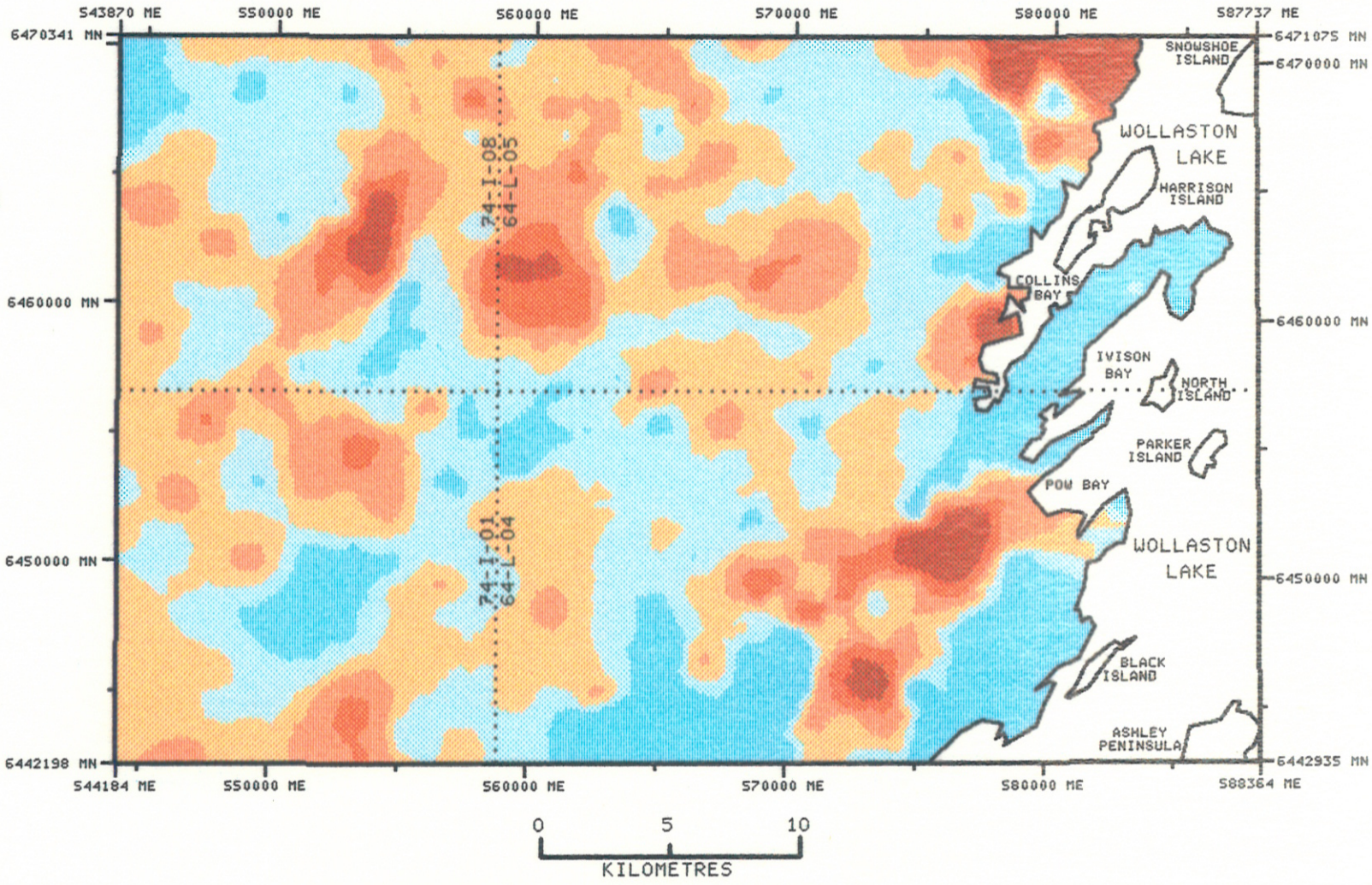
FIGURE 13: Three Dimensional (3D) Surface Plot of Uranium in Lake Sediments.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 14

RESCALED URANIUM IN LAKE SEDIMENTS



Zinc (Range 6-200 ppm; Geometric mean 47 ppm; Median 50 ppm.)

Zinc concentrations are generally higher in sediments from lakes on the Athabasca Group than those on the basement rocks (cf. Dunn and Ramaekers, 1979). Table 6 indicates, however, that on average the differences encountered across the area are subtle. Anomalies are isolated, and no clear trends emerge (Figure 15). Values are lower than those encountered in lakes farther south on the Precambrian Shield (geometric mean of 88.5 ppm Zn, Hornbrook and Garrett, 1976) due to the higher clay content, hence higher adsorbtive capacity, of the more southerly lakes (Sopuck et al., 1980).

By rescaling the Zn values, anomalous regions on the Wollaston and Mudjatik domains are enhanced without altering the basic pattern of isolated Zn anomalies in the sediments of lakes on the Athabasca Group (Figure 16).

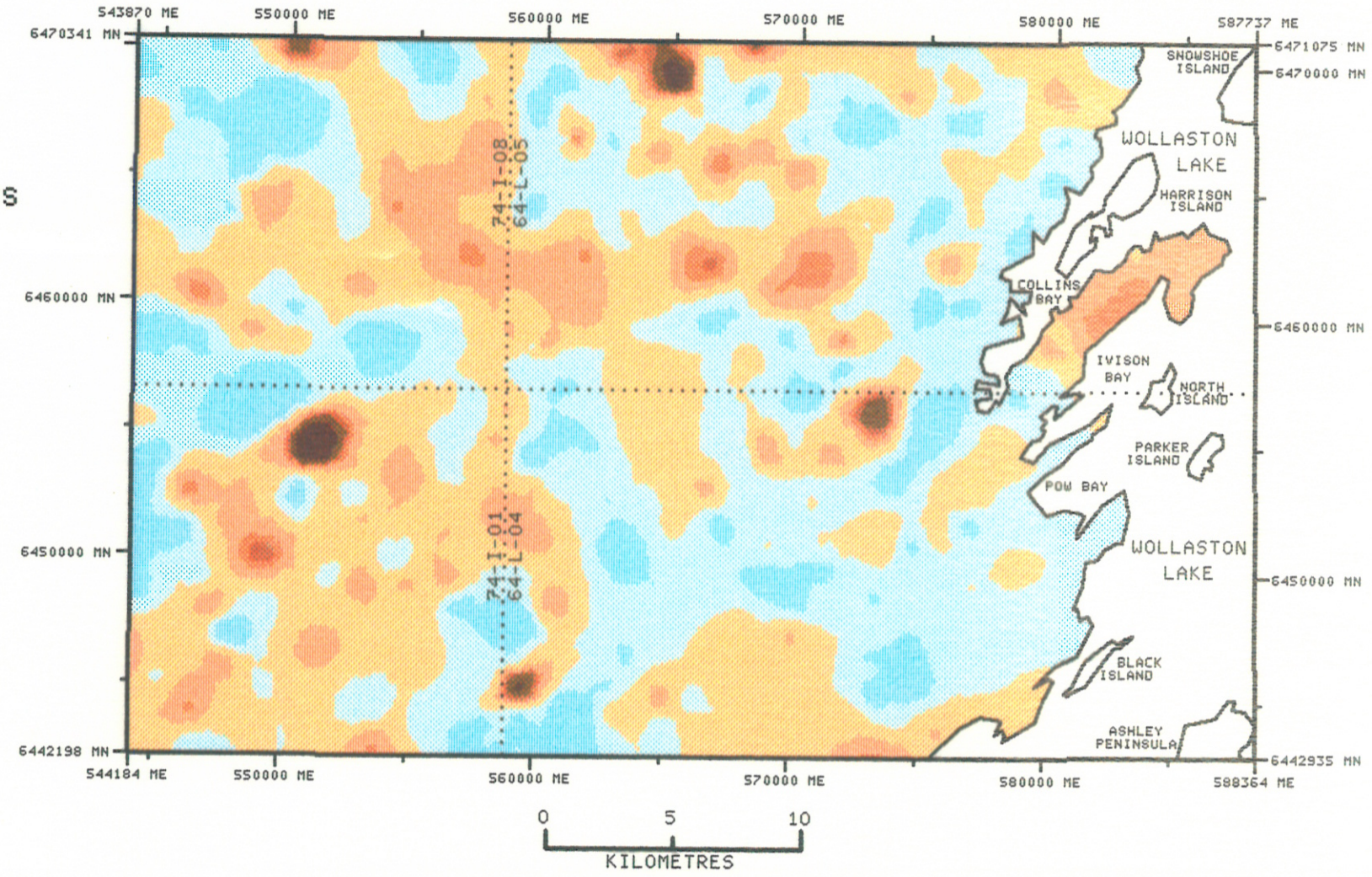
Zinc is one of the few elements to exhibit a sympathetic relationship with organic matter (LOI). This is probably due, at least in part, to the fairly high Zn content of the plants from which much of the organic matter is derived. Data in Figure 3 indicate that Cu is associated with Zn primarily in the organic fraction of the sediment. Other elements showing sympathetic variation with Zn include Ni, Co, Mn, and Fe, suggesting that some Zn is incorporated with the iron and/or manganese oxide and hydroxide components of the sediments (cf. Coker et al., 1979; Sopuck et al., 1980; Dunn, 1980).

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 15

ZINC
IN
LAKE SEDIMENTS

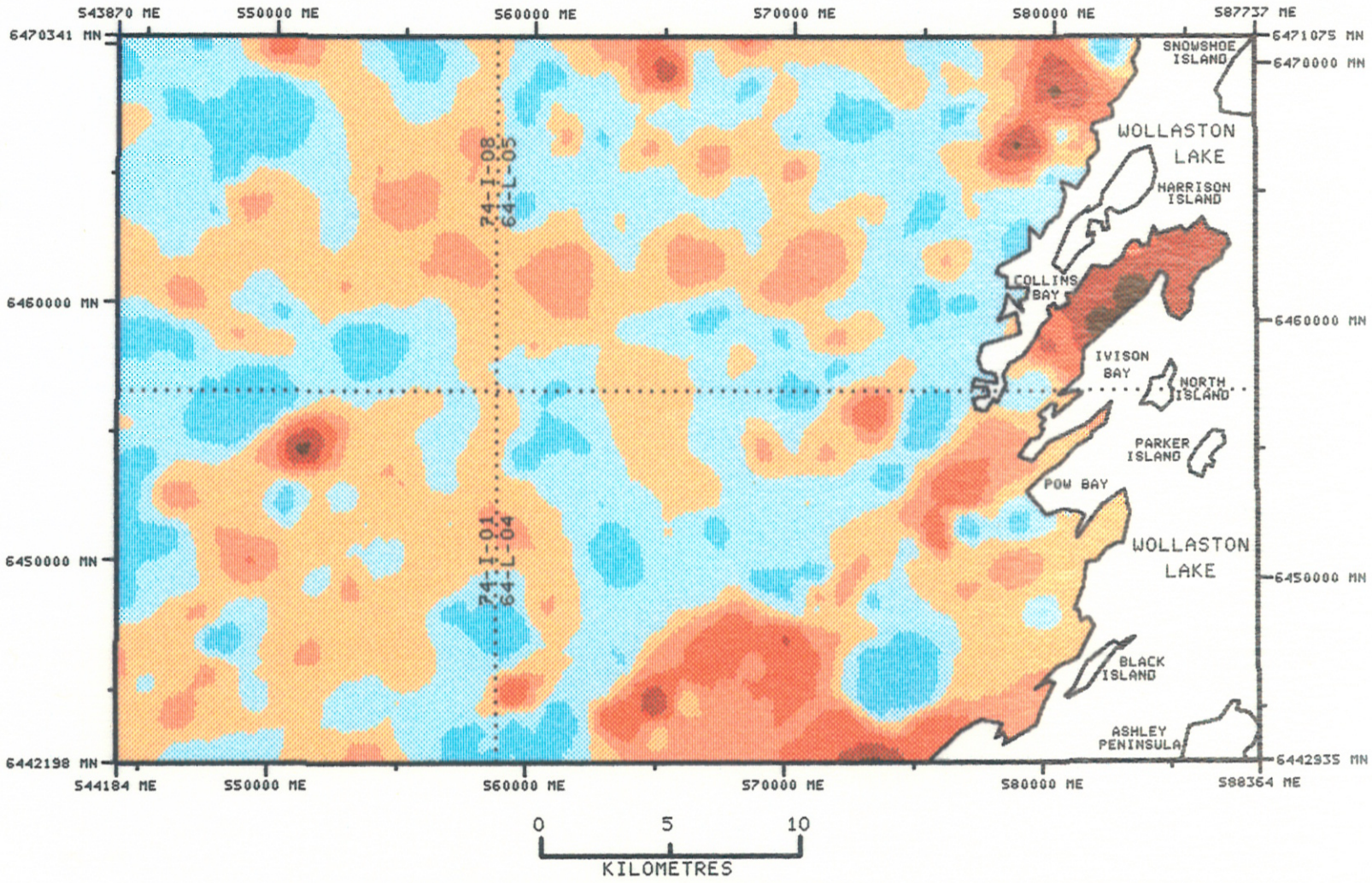


NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 16

RESCALED
ZINC
IN
LAKE SEDIMENTS



Copper (Range <2-53 ppm; Geometric mean 8 ppm; Median 8 ppm.)

The influence of the underlying lithology on the lake sediment composition is again apparent: the Wollaston domain stands out clearly as the region exhibiting the highest Cu content in lake sediments (Figure 17), despite the fact that the median value (Table 6) is only a few ppm higher than in the other geologic subpopulations. Trends are vague on the Athabasca Group, and the north-central region emerges as that with a slight enrichment of Cu, notably north of Dawn Lake, and to a lesser degree a few km to the southeast near Moffatt Lake.

Comparison of the Cu map with that of U shows that there is a moderately good correlation between the distribution of the two elements (r=.42), which is better defined in the Wollaston domain than in the region underlain by Athabasca Group sediments.

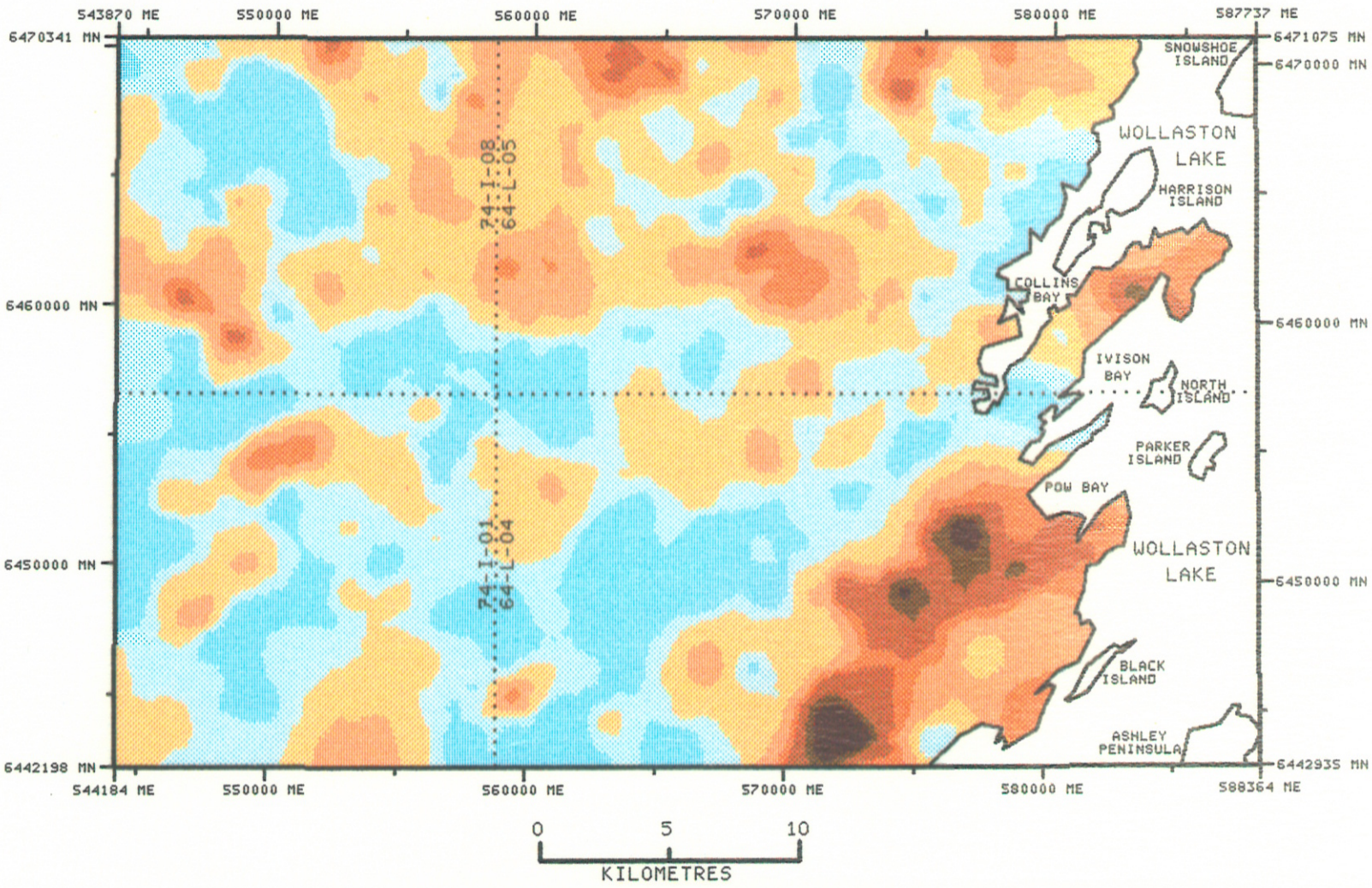
Statistics suggest (Figure 3) that the Cu tends to be concentrated with Zn mainly in the organic fraction of the sediment (r=.40 with LOI), but it shares its affinities with Ni and Co in the Fe-rich fraction. The data further indicate that the affinity which Cu has for U is confined to the Fe-rich rather than the organic fraction of the sediment, because U shows a negative relationship to the latter.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 17

COPPER
IN
LAKE SEDIMENTS



Lead (Range <2-30 ppm; Geometric mean <2 ppm; Median <2 ppm.)

The pattern of Pb distribution is markedly different from that of most other elements (Figure 18), and concentrations are very low (Table 6): lower in fact than those recorded from lake sediments elsewhere in northern Saskatchewan (Hornbrook and Garrett, 1976; Dunn and Ramaekers, 1979). The three-dimensional (3D) surface plot of Pb distribution gives a good visual impression of the low "undulating" geochemical relief (Figure 19). Comparison of the data distribution patterns with plots of other elements show very few similarities. The few relationships of statistical significance with Pb bear out this observation (Figure 3).

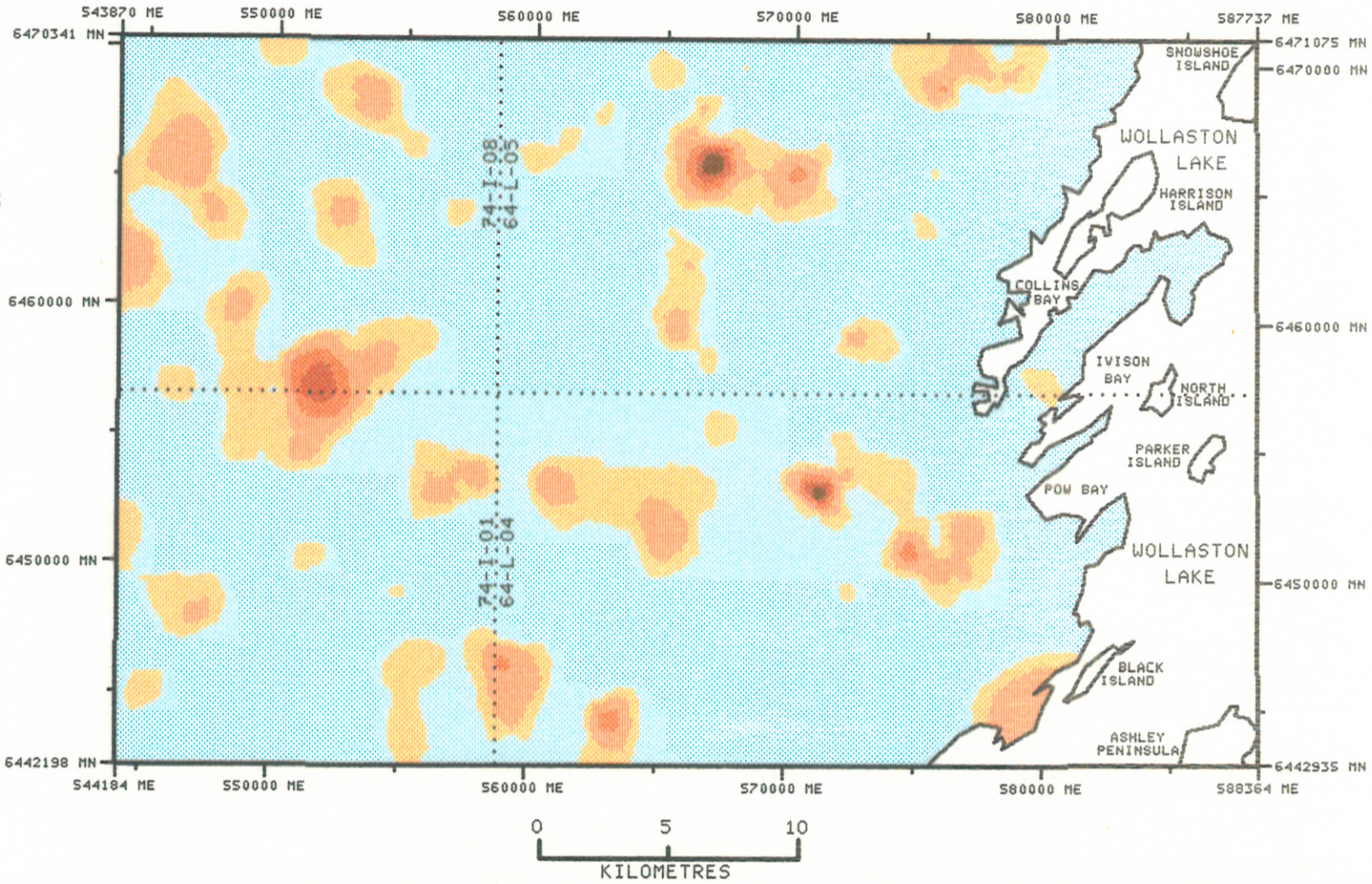
To the southwest of Midwest Lake a small Pb anomaly may be related to glacial dispersion of sediments down-ice from the mineralized area. A similar situation occurs to the southwest of Rabbit Lake. The cause of the double anomaly in the northeast quadrant, north of Moffatt Lake, is unknown.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 18

LEAD
IN
LAKE SEDIMENTS



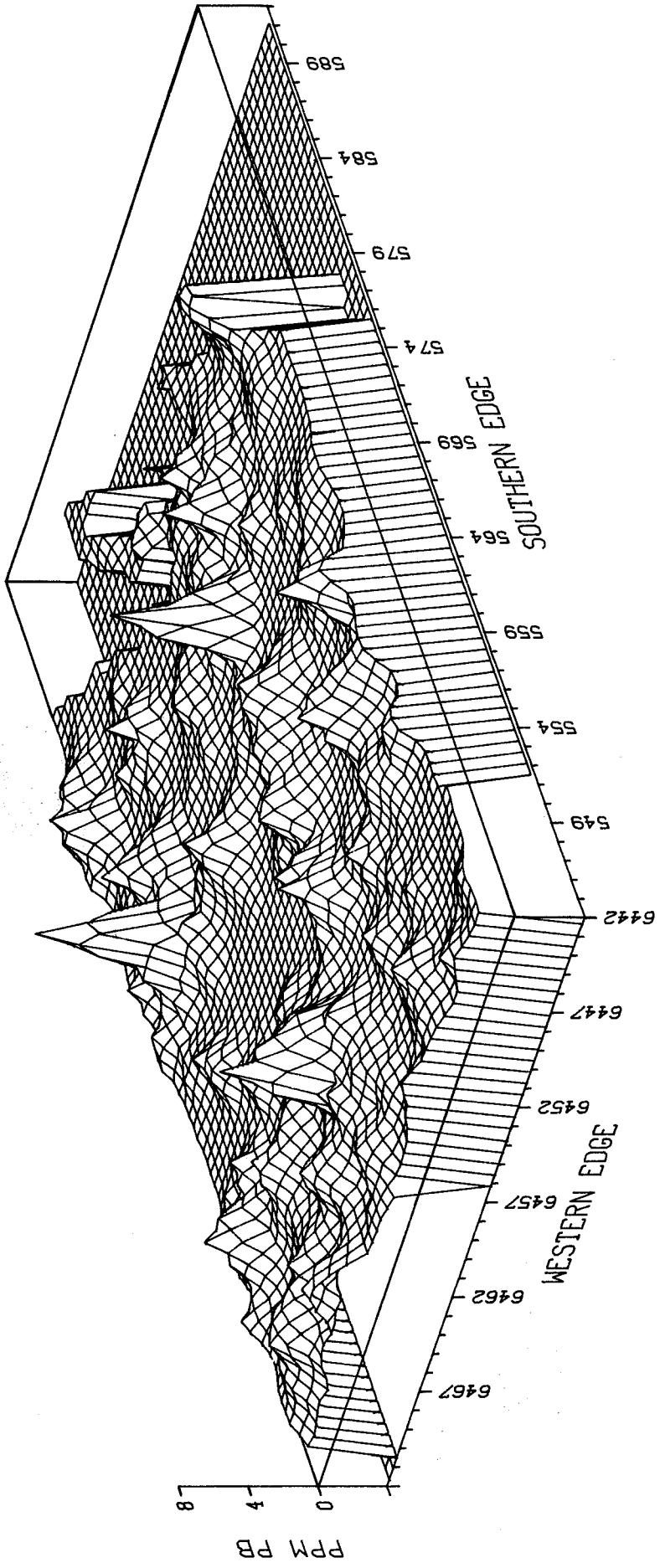


FIGURE 19: Three Dimensional (3D) Surface Plot of Lead in Lake Sediments.

Nickel (Range <2-34 ppm; Geometric mean 8 ppm; Median 8 ppm.)

The strong association between Ni and U which commonly occurs in the Athabasca environment is again evident here (r=.50, Figure 3), although it appears from the map (Figure 20) that the data are biased by lake sediments from the Wollaston domain (cf. Table 6). There is a weak Ni anomaly at Midwest Lake, another south of Dawn Lake, but none in the McClean Lake area. There is an anomaly in the north-central part of the map, north of Dawn Lake, and another occurs in the Moffatt Lake area. Two anomalies in the southwest quadrant are coincident with relatively high U concentrations. Another notable anomaly occurs on the west side of Collins Bay, at a site exhibiting enrichments of chloride and nitrate in lake waters, and U, Cu, Co and Mo in the sediments.

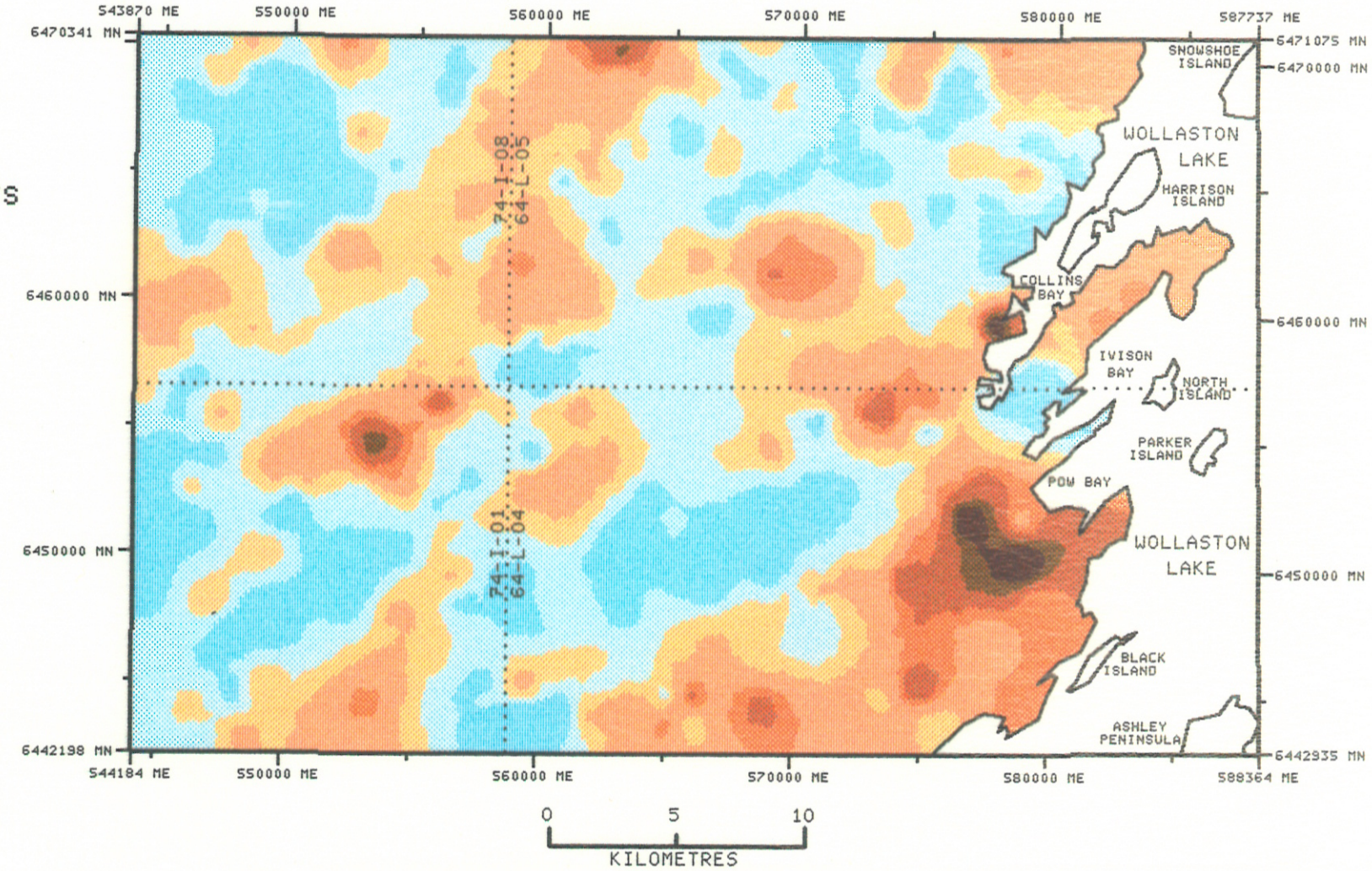
Strong northeast-southwest linear trends are apparent, particularly south-westward from Mallen Lake (situated just north of the study area, 10 km northeast of Dawn Lake), and an en echelon trend a few km further south.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 20

NICKEL
IN
LAKE SEDIMENTS



Cobalt (Range <2-17 ppm; Geometric mean 4 ppm; Median 4 ppm.)

Cobalt concentrations are low and do not follow any clearly defined trends, except for an indistinct conjugate set of enrichments in the central part of the map (Figure 21). There is a broad similarity with the Ni and U distributions and statistical correlations with these elements are strongly sympathetic (Figure 3).

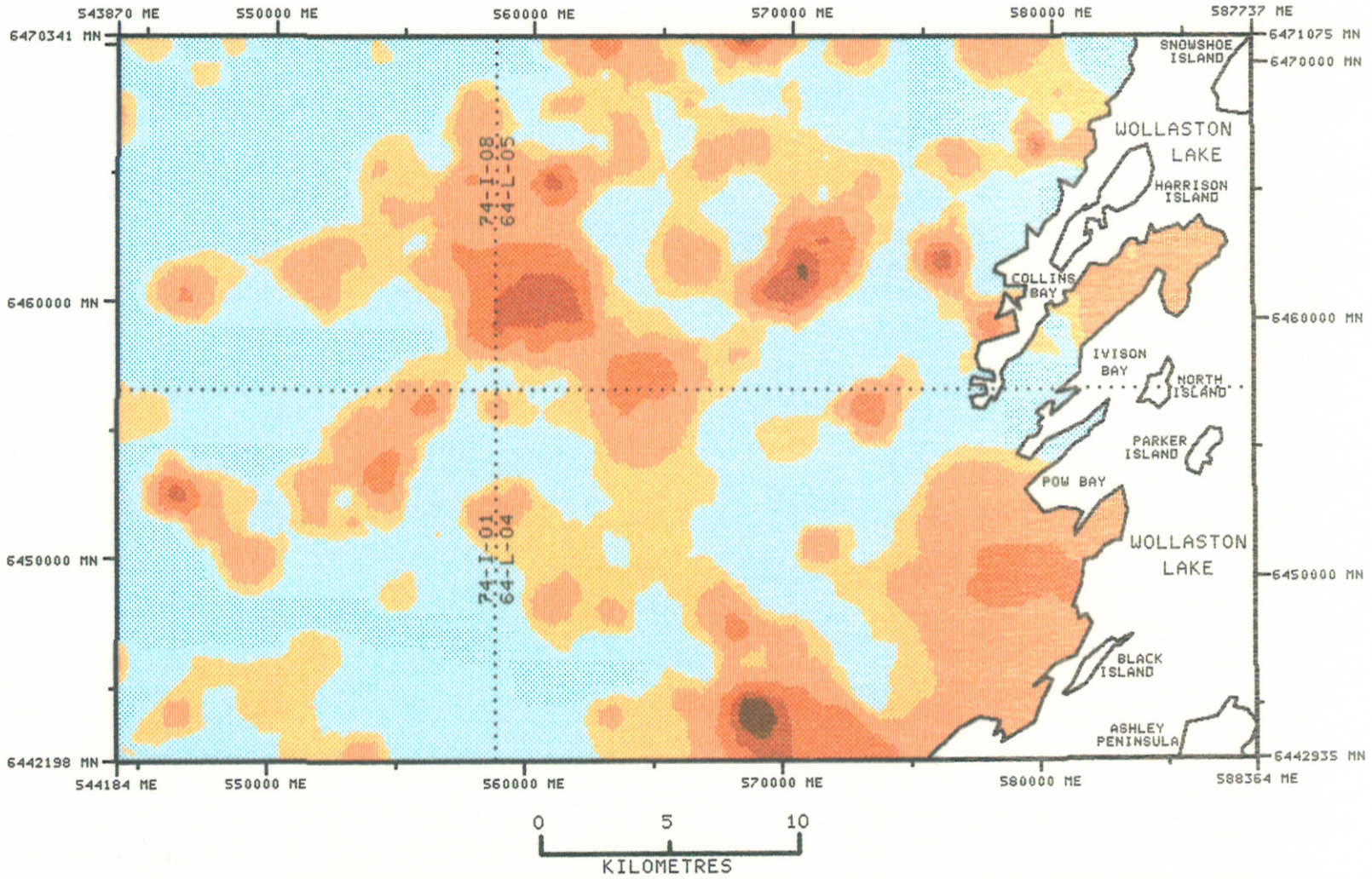
Lakes within the Wollaston domain reflect a slight general enrichment of Co in comparison with the rest of the area. However, weak anomalies of the same magnitude occur within the Athabasca Group to the south of Dawn Lake, and near Moffatt Lake. Midwest Lake (with concentrations only one to two times background) does not stand out as a well defined anomaly, and the McClean Lake area shows no discernible sign of mineralization from the slightly above background levels of Co. The strongest anomaly (in the southeast) is generated by a single sample from a lake half-way between the Raven Lake mineralization and Lampin Lake: the U content of the sediment from this lake is 12 ppm.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 21

COBALT
IN
LAKE SEDIMENTS



Manganese (Range 20-2640 ppm; Geometric mean 115 ppm; Median 110 ppm.)

Comparison of the raw data map (Figure 22) with the rescaled map (Figure 23) for Mn shows a considerable difference in the intensities of anomalies in the Wollaston and Mudjatik domains. This is because of the higher local Mn content of sediments from lakes on the Athabasca Group: the average Mn value from the latter area has been reduced by sediments from the many lakes (located in the blue areas on the map) that have less than 60 ppm Mn.

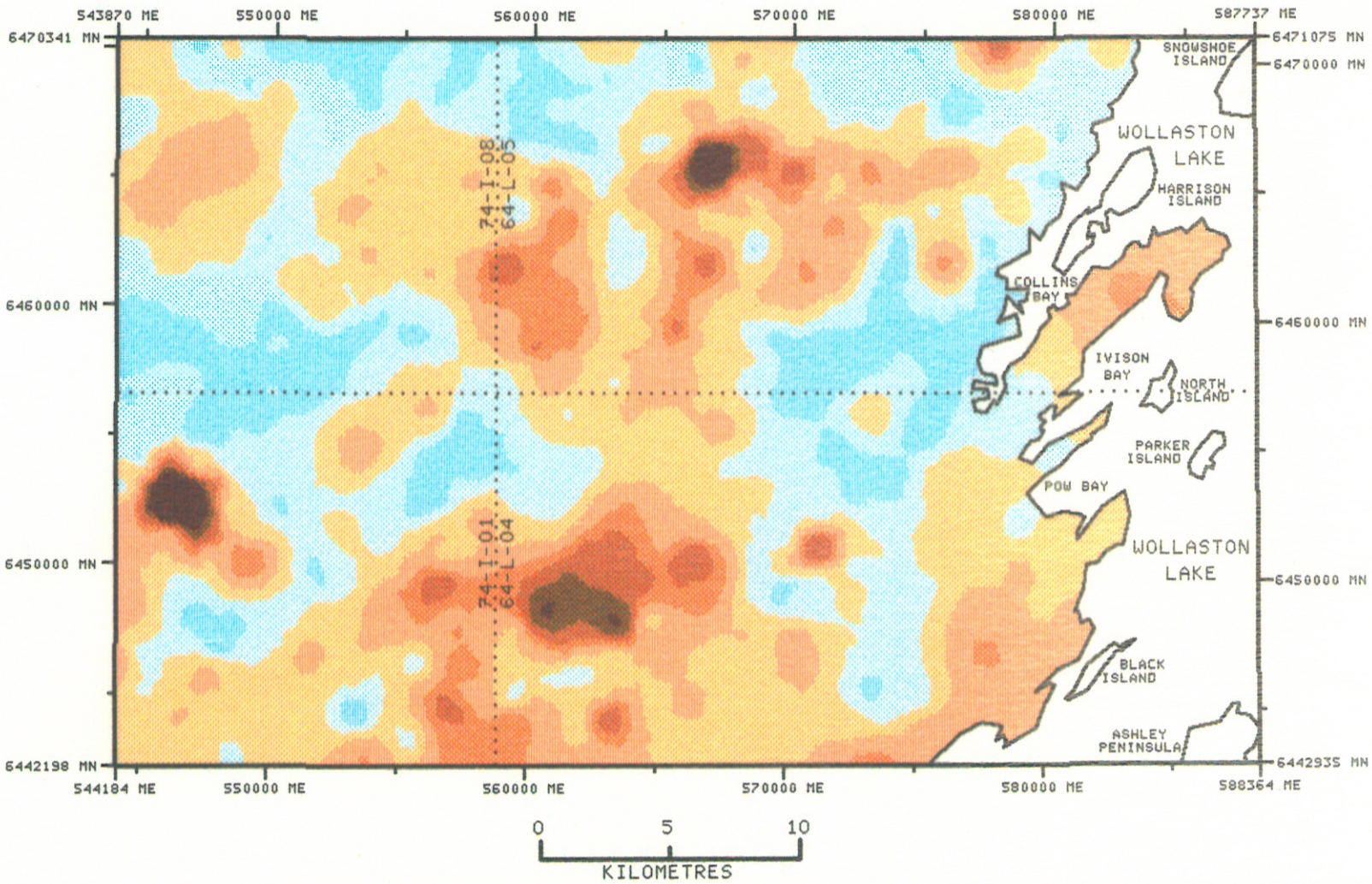
Anomalies tend to be intense and localized, and are the result of the sensitivity of the element to Eh/pH conditions. There is a strong tendency for Mn to co-precipitate with Fe and form, locally, ferro-manganese pellets, nodules and encrustations on the lake bottoms. There is no discernible relationship of Mn distribution to the locations of known U mineralization.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 22

MANGANESE
IN
LAKE SEDIMENTS

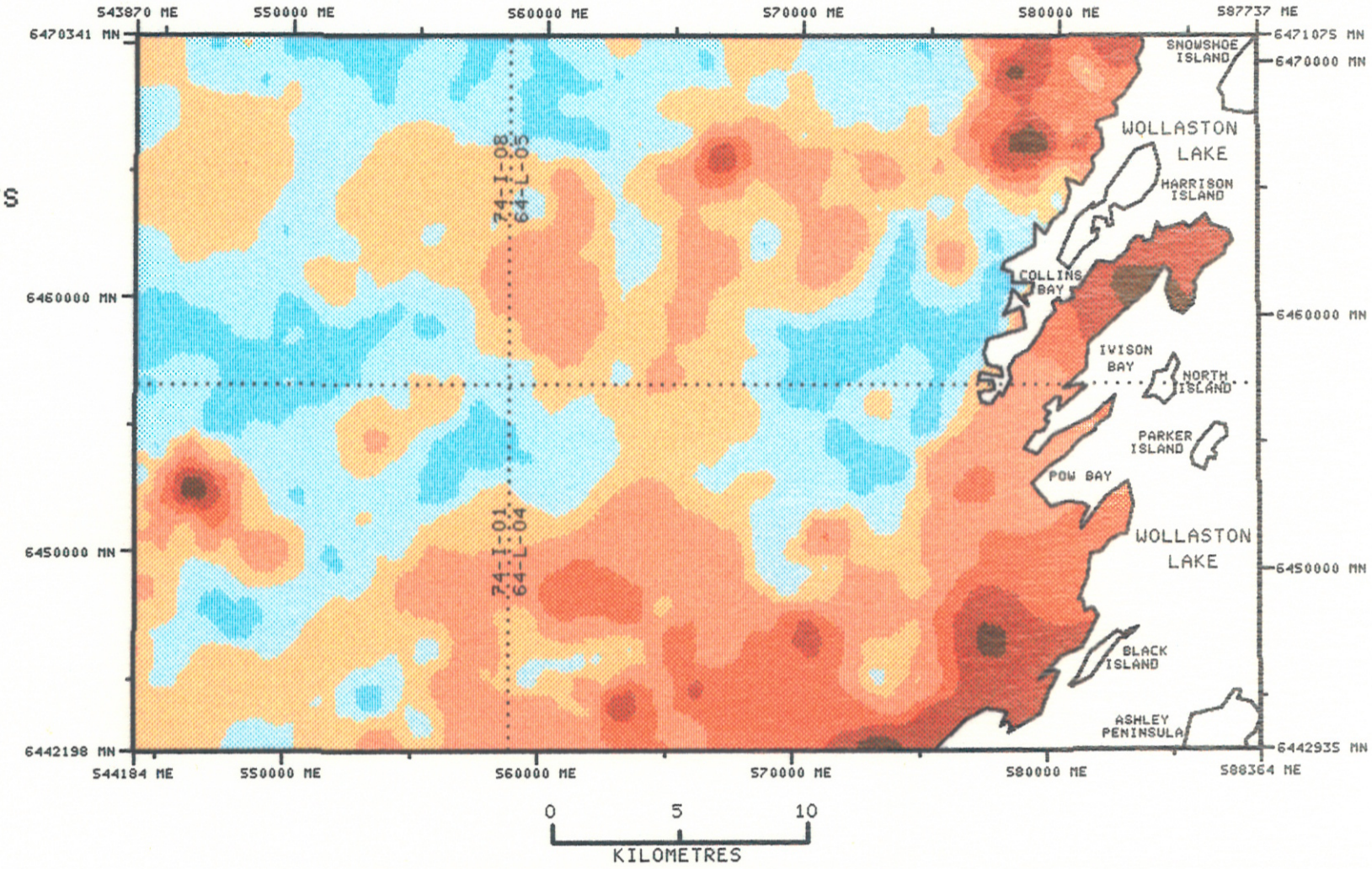


NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 23

RESCALED MANGANESE IN LAKE SEDIMENTS



Arsenic (Range <1-170 ppm; Geometric mean <1 ppm; Median <1 ppm.)

Arsenic is commonly associated with mineralization in the Athabasca environment, primarily in the form of nickel arsenides (Watkinson et al., 1975). The map of the raw data (Figure 24) shows a strong linear trend from a pronounced anomaly centred near Dawn Lake, which decreases in intensity southwestward (i.e. the direction of glacial dispersion). Lake sediments from Midwest Lake also yield anomalous As concentrations, and in the south two more anomalies are of similar magnitude but are not related to any known mineralization. The anomaly located furthest to the southeast is in the vicinity of Lampin Lake, and lies close to the sub-Athabasca junction between the Mudjatik and Wollaston domains, and at the southeastern margin of the Athabasca Group.

The three dimensional (3D) surface plot (Figure 25) provides a clear representation of the relative intensities of the As anomalies, and the rescaled map (Figure 26) brings out relative concentrations of As in the Mudjatik and Wollaston domains which are not apparent on the other As maps. Rabbit lake here appears as a distinctly anomalous area, and an anomaly extends toward the northwest from the Collins Bay peninsula. Anomalies on the Athabasca Group remain very similar in outline.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 24

ARSENIC
IN
LAKE SEDIMENTS

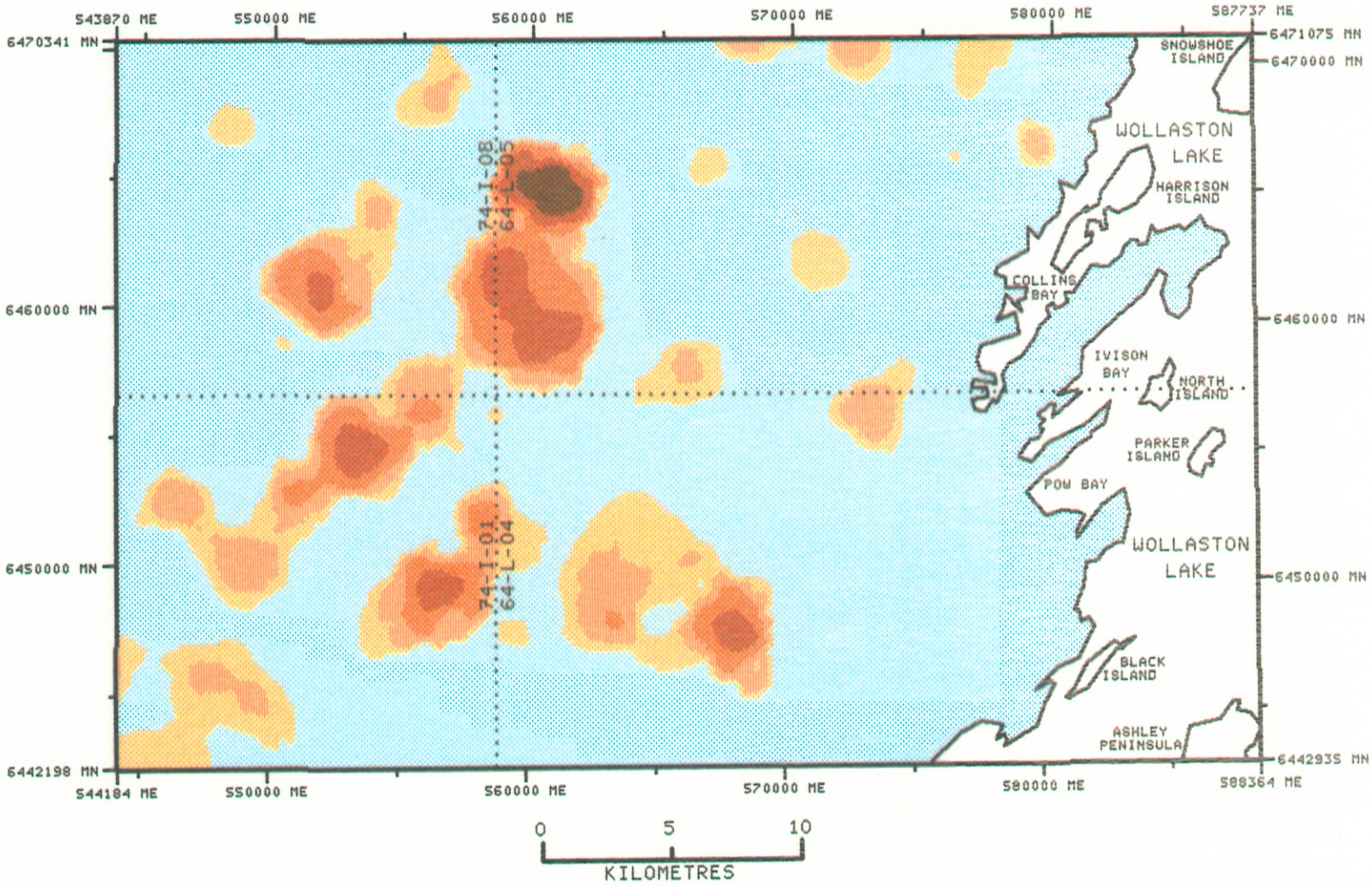
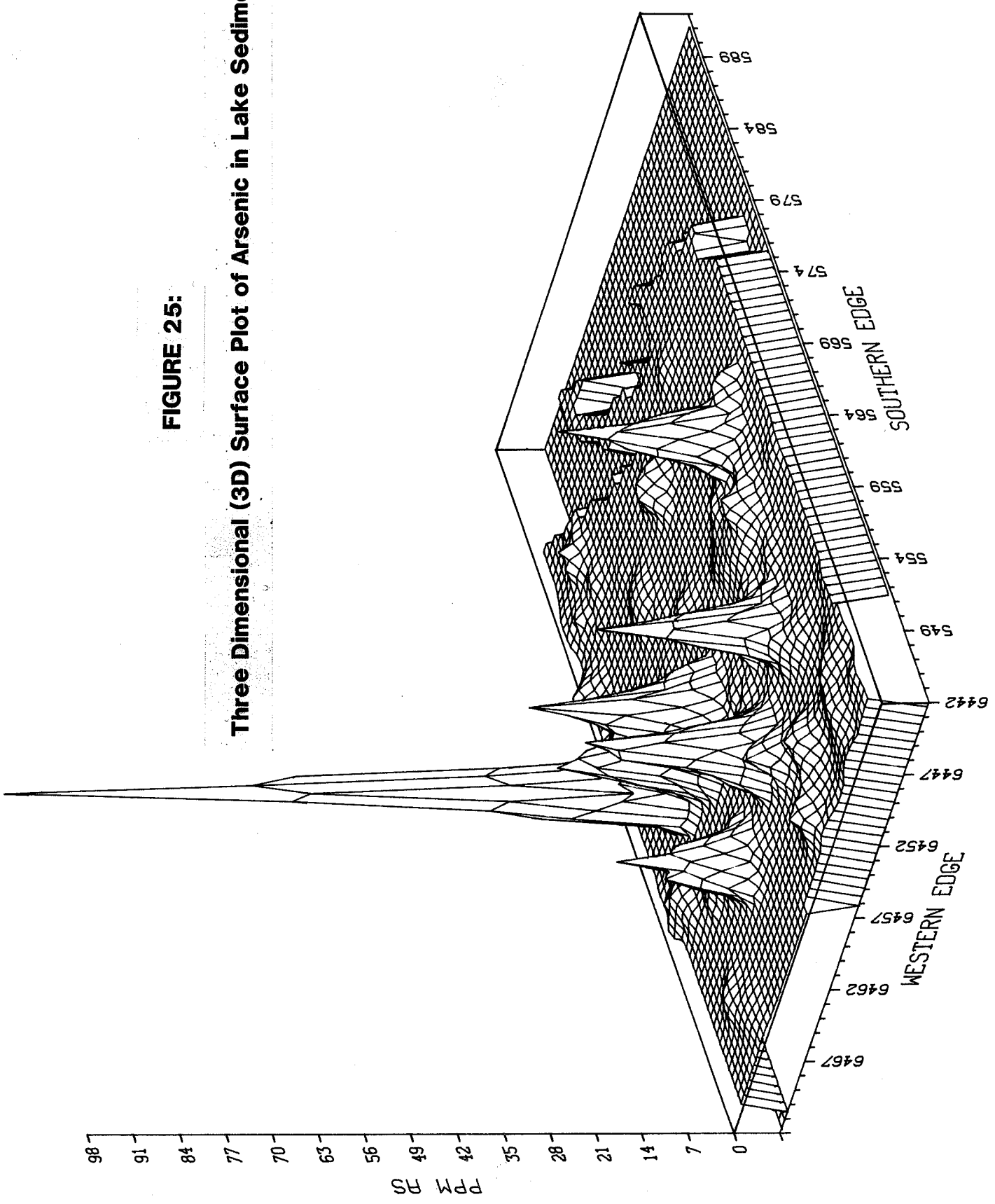


FIGURE 25:

Three Dimensional (3D) Surface Plot of Arsenic in Lake Sediments.

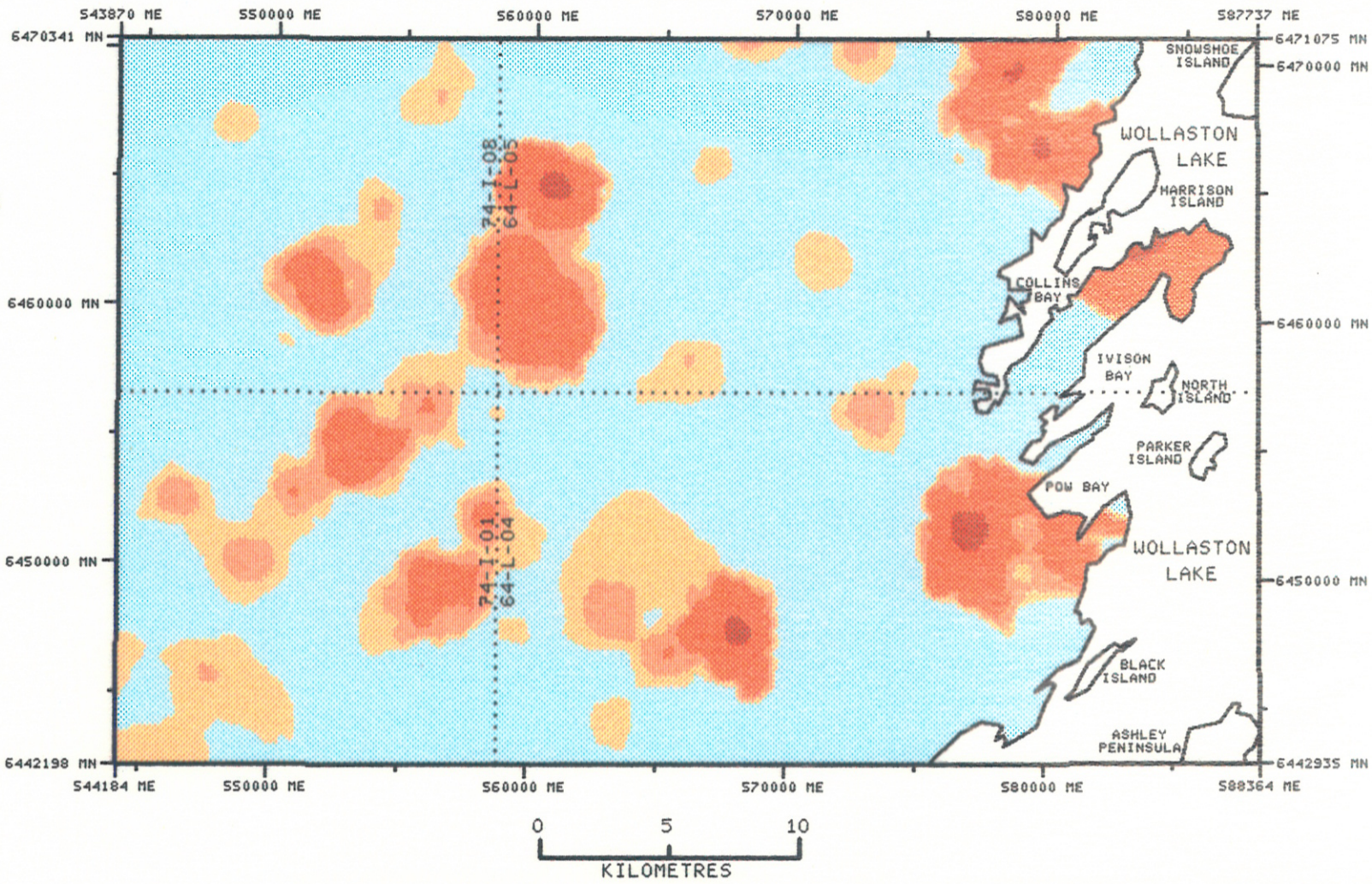


NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 26

RESCALED ARSENIC IN LAKE SEDIMENTS



PPM	%TILE
100.0	MAX
47.4	98
4.8	95
2.5	90
1.6	80
1.0	MIN

473 SAMPLES

Molybdenum (Range <2-17 ppm; Geometric mean <2 ppm; Median <2 ppm.)

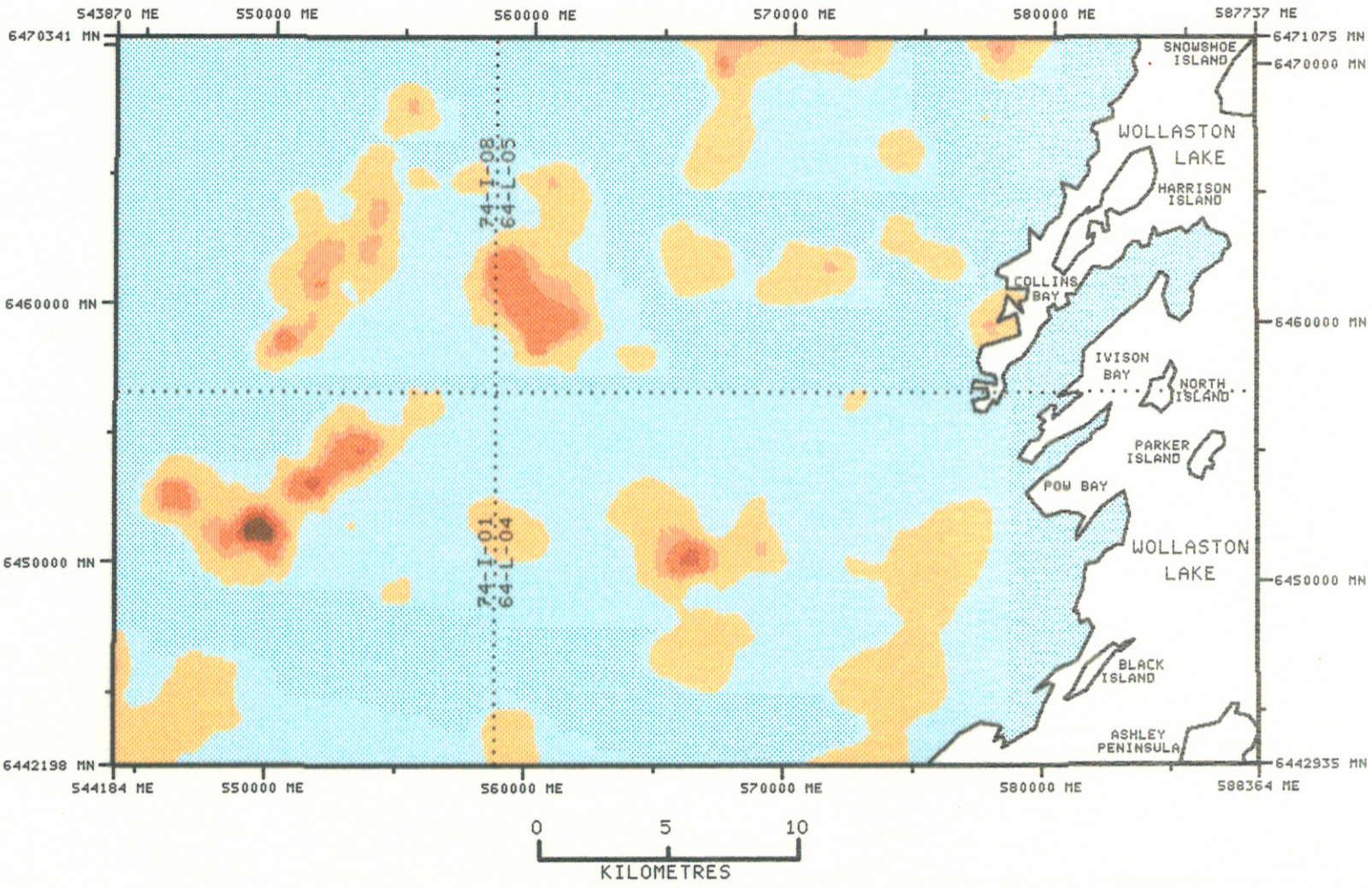
The usual low levels of Mo encountered in lake sediments are present throughout most of the area (Table 6). Anomalies are of low magnitude, localized, and related to some of the areas of known mineralization: Midwest Lake, south of Dawn Lake, and in the general vicinities of the Rabbit, Raven and Horseshoe deposits (Figure 27). The highest concentrations occur in the southwest quadrant, and have a close relationship to Fe, Co, and As anomalies. Examination of the correlation coefficient matrix (Figure 3) shows that the suite of elements Mo, As, Fe, Co, and Mn is interrelated (all coefficients of high statistical significance); U in sediments, and the pH and chloride content of the waters, also show positive correlations, but of lower magnitude.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 27

MOLYBDENUM
IN
LAKE SEDIMENTS



Iron (Range 0.1-26.5%; Geometric mean 1.1%; Median 1.0%.)

The Fe content of sediments from the lakes on the Athabasca Group shows very sharp geochemical relief (Figure 28). Iron solubility is sensitive to fluctuations in Eh, pH, complexing by inorganic anions, and the formation of organic chelates. The negative correlation with LOI (Figure 3) indicates that the latter process is not of significant importance in this region, whereas a correlation coefficient of .37 with pH bears witness to the response of Fe precipitation to changes in acidity.

Numerous localized Fe anomalies are dotted throughout the study area, and in many cases are restricted to the prevailing physicochemical conditions of an individual lake. The statistics alongside the map show that relatively few lakes are Fe-rich: the 75th percentile is only 2.2 percent, and the 90th percentile is 5.7 percent.

Examination of the Applicon colour maps shows that several elements have similar distribution patterns to Fe. Most notable of these elements are Mn, Co, As, and Mo, with a weaker association exhibited by U. Statistics in Figure 3 confirm these observations. It is probable that these elements co-precipitated with Fe or became adsorbed upon the surface of the Fe-rich component of the sediments.

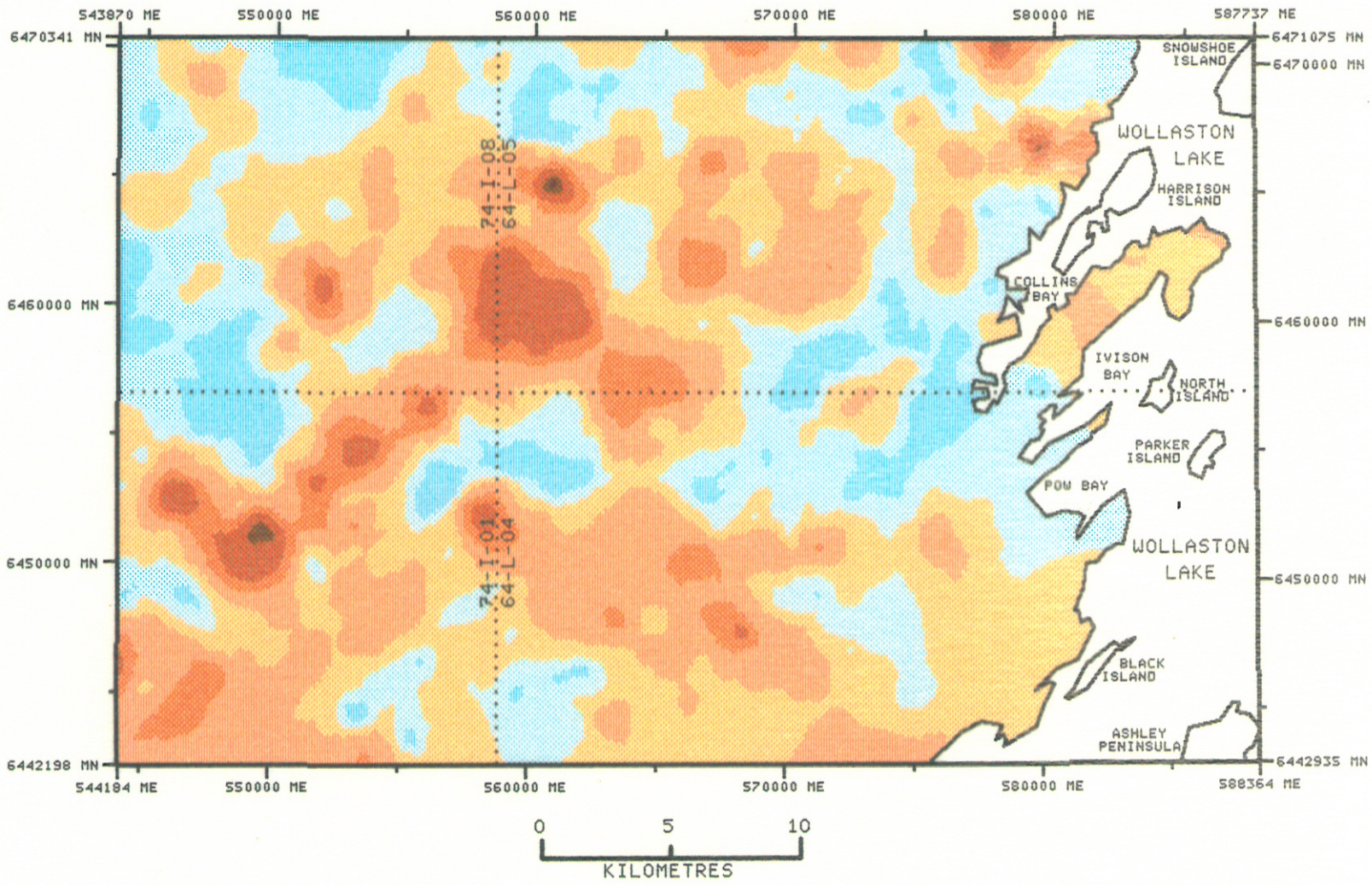
The dominant featuares of the Fe distribution map are the relative abundance of Fe on the Athabasca Group, and a strong northeast-southwest trend of Fe enrichment in the western part of the area. Locations of known U mineralization show no apparent relationship to the Fe distribution.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

FIGURE 28

IRON
IN
LAKE SEDIMENTS



Geochemical Associations

Lake water and sediment samples having geochemical parameters with values greater than the 90th percentile level, based on the RESET data (p. 12), are indicated by the simplistic cluster analysis (see p. 15) shown on Figure 29 (enclosed separately). The geochemical parameters which may or may/maynot be mathematically correlated, as depicted on Figure 3, are in many instances spatially related (Figure 29). A number of interrelationships are apparent on Figure 29:

1. Lake sediments with elevated U, As and Mo contents and lake waters enhanced in F^- reflect the Midwest Lake uranium deposit. Also, in the northwest arm of McMahon Lake there is an unexplained occurrence of elevated U and Zn in lake sediments and F^- in lake waters.
2. A large regional F^- in lake waters, with lesser NO_3^- in lake waters, anomaly occurs in the northwest corner of the survey area.
3. Extending southeast from the vicinity of Mallen Lake (just north of the survey area) is a region with lake sediments anomalous in U, Ni, Cu and Pb. Immediately east, the lake waters are anomalous in F^- and the lake sediments anomalous in Mo.
4. A very prominent anomaly of As, U, Mn, Fe, Co, Ni, Cu and Mo in lake sediments extends south-southwest from the area of Asamera's Zone 11 and Zone 14 deposits through the region of U mineralization beneath Dawn Lake.
5. In the southwest part of the area is a coincident anomaly of elevated Ni, Co, Mo. U, As and Cu in lake sediments and SO_4^{2-} in lake waters.

6. An isolated U anomaly in lake sediments occurs on the south edge of the survey area near the Athabasca-Wollaston contact zone.
7. A prominent east-west trending Mn, Fe and lesser As anomaly in lake sediments occurs across the south central part of the survey area. Several other lesser occurrences of elevated Fe and of Mn and Fe coincident with Zn occur in the lake sediments throughout the area. These associations are indicative of Fe-Mn oxide and hydroxide precipitation and trace metal coprecipitation phenomena (also see Figure 3).
8. To the east of McClean Lake is a small area with lake sediments anomalous in Ni, As, Zn and Co.
9. To the north of the McClean Lake North and South uranium deposits, in the vicinity of Moffatt Lake, the lake sediments are anomalous in Ni, U, Zn and Co. A zone of lake waters with anomalous Cl^- contents extends east-west through McClean Lake.
10. In the northeast part of the survey area, at the Athabasca-Mudjatik contact, the lake sediments are anomalous in Cu, U, Mo and Mn.
11. The area around the Rabbit Lake uranium deposit and extending to the west-southwest along the Athabasca-Wollaston contact is characterized by lake sediments anomalous in U, Ni and to a lesser extent Cu and Fe, and by lake waters anomalous in Cl^-, F^- and NO_3^-.

In addition there are several small areas of two to three lake sediment samples with anomalous trace elements, mainly Pb, Zn, Cu, As, Ni and Mo, primarily in the western half of the survey area. There are also several

solitary samples, with one or more geochemical parameters in excess of the 90th percentile level, which may be of significance. The individual geochemical parameter maps (Figures 4 to 28) should be compared with the geochemical association map (Figure 29) to optimize the interpretation of the data. Of particular note is a sample (64L 796109), just west of the southwest shore of Collins Bay, with U, Ni, Co and Mo values in lake sediments and conductivity values in lake waters in excess of the 90th percentile levels.

There are clearly a number of prominent linear northeast-southwest geochemical trends across the survey area (Figure 29). The main direction of glacial transport through the area was southwestward and accordingly the geochemical trends may be a reflection of the geochemistry of the northeast - southwest trending glacial deposits. However, the Archean basement lithologies and structures, as discerned from the gradiometer survey data (Geological Survey of Canada, 1980) by Sibbald (1980), as well as the uranium deposits themselves, trend and align in a northeast-southwest direction.

Summary and Conclusions

The detailed geochemical survey has determined the distribution patterns of uranium and associated elements in lake waters and sediments and the response of these sample media to the geological and environmental influences within the surveyed portion of the Athabasca Basin and the Wollaston and Mudjatik domains.

At the sampling densities employed, both lake waters and sediments can be utilized as geochemical sample media in the exploration for uranium in the Athabasca Basin and Wollaston and Mudjatik domains. Although the data are

complex a definite value is found in interpreting hydrogeochemical dispersion patterns in terms of the geochemical associations which are based on a knowledge of trace and minor element assemblages related to known mineralization, bedrock lithology, and lacustrine physicochemistry in the survey area.

The distribution patterns of the geochemical parameters determined appear to reflect lithological, structural and/or glacial trends, and areas of uranium occurrences and deposits. Parameters which appear to best define U occurrences and deposits are U, Ni and As in the lake sediments and Cl^-, PO_4^{3-}, and perhaps F^-, in the lake waters.

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Canada Wide Mines Ltd.

Canadian Occidental Petroleum Ltd.

E and B Exploration Ltd.

Gulf Minerals Canada Ltd.

Moss Lawson and Co. Ltd.

Noranda Mines Ltd.

Wyoming Minerals Corp.

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Appendix I

Sample Location Map

Figure 30 is a 1:250,000 scale sample location map, the same scale as all the Applicon colour maps.

Figure 31 is a 1:50,000 scale sample location map on a topographic base (enclosed separately). Each sample location site is indicated by a . on the 1:50,000 sample location map. The map sheet N.T.S. (64L, 74I) is not designated at each sample site but is indicated for the total map. The six digit number at each site, the same for both water and sediment, identifies the sample, with the first two digits identifying the source of the sample (i.e. 79XXXX = July, 1979 survey; 77XXXX = U.R.P.-N.G.R. 1977 survey; and, 76XXXX = Dunn 1976 survey). The U.T.M. grid coordinates (metres north = MN and metres east = ME) are indicated on the map border.

NEA-IAEA ATHABASCA BASIN-WOLLASTON LAKE TEST AREA

NTS 64-L-04, 64-L-05, 74-I-01, 74-I-08

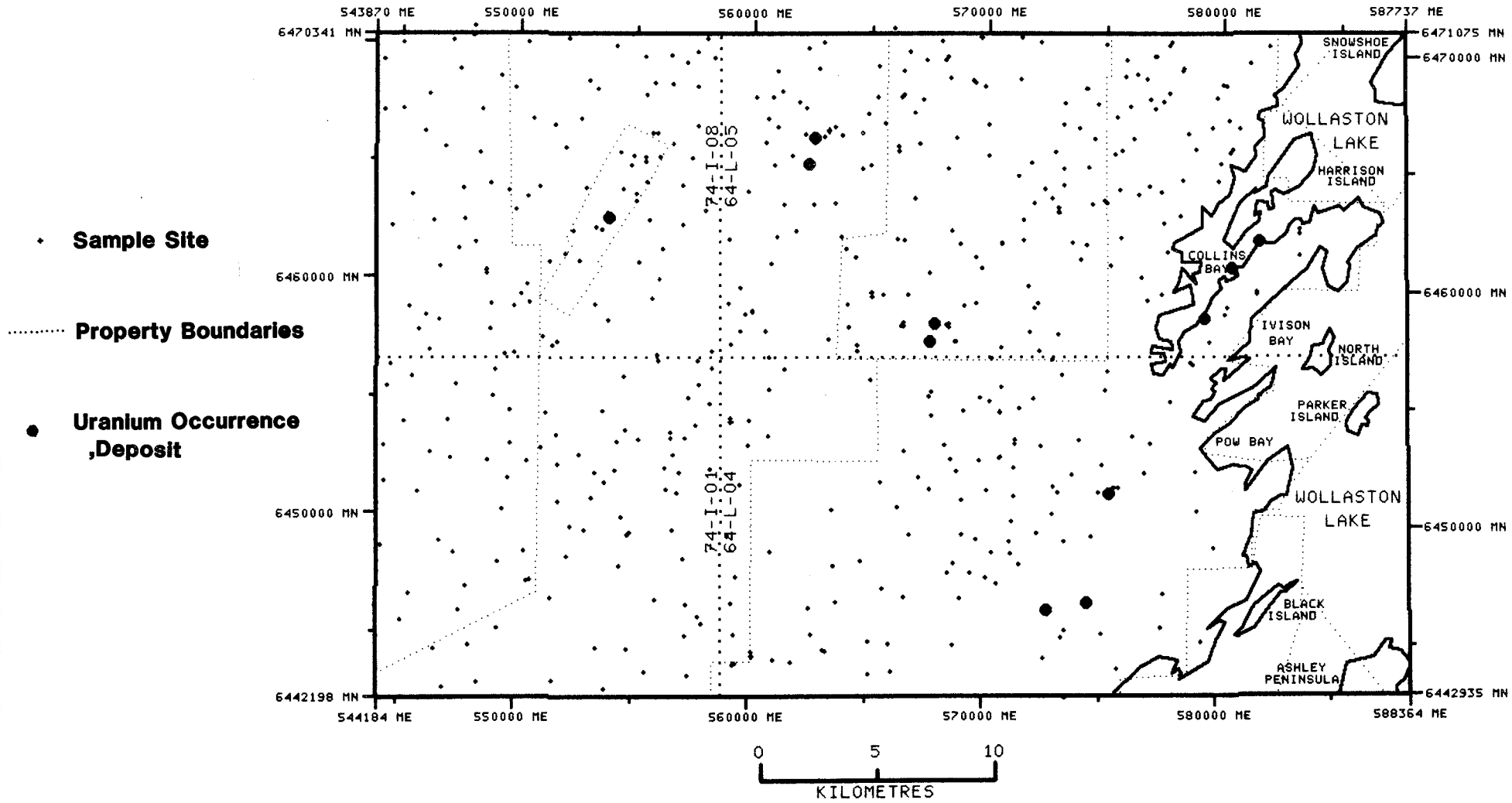

FIGURE 30: Sample Location Map.

Appendix II

Lake Water Geochemical Data

An explanation of the coding used on the lake water geochemical data listing is provided below:

MAP SHEET - National Topographic System (N.T.S.), lettered quadrangle (1:250,000 designation i.e. 64L or 74I).

SAMPLE NUMBER - Six digit sample number (as shown on the Sample Location Map, Figure)

UTM COORDINATES - Universal Transverse Mercator (U.T.M.) Coordinate System

(a) ZONE - Zone

(b) EAST - Easting (metres)

(c) NORTH - Northing (metres)

CATCH BASIN ROCK TYPE - Catchment basin rock type indicates a lake entirely within a given bedrock lithology, bedrock unit (group of bedrock lithologies) or contact zone with drainage into the lake also predominantly from within the designated geologic environment:

SNDS - Athabasca Group (sandstone)

MDJT - Mudjatik Lithostructural Domain

ATMD - Contact zone Athabasca - Mudjatik

WLST - Wollaston Lithostructural Domain

ATWL - Contact zone Athabasca - Wollaston.

Samples with a blank in this field are considered to have "abnormal" chemical characteristics.

			D.L./~½D.L.*
PH	-	pH	
COND µMHOS CM-		Specific conductance (µmhos/cm)	2/1
F PPB	-	Fluoride (F^-) (ppb)	6/3
CL PPB	-	Chloride (Cl^-)(ppb)	10/5
PO4 PPB	-	Phosphate ($PO_4^{\equiv}$)(ppb)	100/50
NO3 PPB	-	Nitrate (NO_3^-)(ppb)	50/25
SO4 PPB	-	Sulphate ($SO_4^{\equiv}$)(ppb)	50/25
U PPB	-	Uranium (ppb)	0.10/0.05

* Detection limit/Value recorded equals approximately ½ detection limit value.

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
SURFACE LAKE WATER GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	COORDINATES NORTH	CATCH BASIN ROCK TYPE	PH	COND uMHOS CM	F PPB	CL PPB	PO4 PPB	NO3 PPB	SO4 PPB	U PPB
64L	796002	13	560620	6466890	SNDS	6.5	11	50	320	50	1100	400	0.05
64L	796003	13	561900	6467610	SNDS	6.3	9	49	50	50	500	390	0.05
64L	796004	13	561210	6468080	SNDS	6.3	9	49	50	50	520	440	0.05
64L	796005	13	560800	6467840	SNDS	6.1	8	43	40	50	370	390	0.05
64L	796006	13	560080	6467790	SNDS	6.0	7	30	80	50	290	440	0.05
64L	796007	13	560960	6468950	SNDS	5.6	7	37	60	50	600	490	0.05
64L	796008	13	562760	6469090	SNDS	5.2	6	18	5	50	570	1020	0.05
64L	796009	13	562290	6469920	SNDS	6.1	9	61	40	50	640	390	0.05
64L	796010	13	562950	6470180	SNDS	6.4	9	51	40	50	640	440	0.05
64L	796011	13	565930	6470860	SNDS	5.7	5	49	5	50	25	630	0.05
64L	796012	13	565300	6469200	SNDS	5.8	5	22	30	50	500	440	0.05
64L	796013	13	566360	6469040	SNDS	6.6	16	79	40	50	830	390	0.05
64L	796014	13	566580	6469850	SNDS	6.5	13	67	20	50	690	190	0.05
64L	796015	13	567320	6469500	SNDS	6.8	17	55	80	50	570	630	0.05
64L	796016	13	568120	6469500	SNDS	6.6	13	49	90	50	370	540	0.05
64L	796017	13	567940	6470350	SNDS	6.5	10	43	80	50	370	540	0.05
64L	796019	13	571350	6470540	SNDS	6.3	12	46	50	50	1120	440	0.05
64L	796020	13	572200	6470370	SNDS	6.3	9	43	60	50	460	310	0.05
64L	796022	13	574980	6470270	SNDS	5.6	5	25	20	50	250	420	0.05
64L	796023	13	575860	6469620	SNDS	6.2	6	25	50	50	440	440	0.05
64L	796024	13	576320	6469060	SNDS	6.0	6	25	110	50	25	570	0.05
64L	796025	13	576720	6468830	SNDS	6.5	9	40	240	50	25	800	0.05
64L	796026	13	577070	6469840	SNDS	6.6	10	34	70	50	260	390	0.05
64L	796027	13	577740	6470430	SNDS	7.0	24	76	170	50	410	510	0.05
64L	796028	13	581150	6469640	MDJT	6.5	11	46	80	50	750	390	0.05
64L	796029	13	579980	6468650	ATMD	6.0	6	30	80	50	25	900	0.05
64L	796030	13	577720	6468250	ATMD	6.6	18	74	190	50	280	570	0.05
64L	796032	13	576900	6468010	ATMD	6.6	17	68	80	50	180	250	0.05
64L	796033	13	575470	6467200	SNDS	6.7	17	63	120	50	180	440	0.05
64L	796034	13	574640	6467760	SNDS	7.0	15	57	80	50	610	390	0.05
64L	796035	13	574140	6468420	SNDS	6.0	6	20	80	50	300	600	0.05
64L	796036	13	573240	6467750	SNDS	6.5	16	63	80	50	920	390	0.05
64L	796037	13	569840	6468430	SNDS	6.5	11	51	90	50	260	490	0.05
64L	796038	13	569320	6468680	SNDS	6.2	7	30	260	50	25	800	0.05
64L	796039	13	568340	6468740	SNDS	6.9	22	93	130	50	440	710	0.05
64L	796040	13	567200	6467840	SNDS	6.6	17	70	100	50	700	700	0.05
64L	796042	13	566820	6467280	SNDS	6.6	16	88	80	50	25	460	0.05
64L	796043	13	565240	6467900	SNDS	6.8	14	55	70	50	25	460	0.05
64L	796044	13	564860	6467150	SNDS	6.4	12	30	70	50	400	300	0.05
64L	796045	13	561020	6466560	SNDS	5.1	5	24	30	50	25	730	0.05
64L	796046	13	560520	6465870	SNDS	6.1	10	53	50	50	25	370	0.05
64L	796047	13	560910	6464900	SNDS	6.4	15	59	100	50	170	280	0.05
64L	796048	13	561620	6465350	SNDS	6.4	15	71	70	50	25	330	0.05
64L	796049	13	562160	6466260	SNDS	6.6	15	59	140	50	25	370	0.05
64L	796050	13	562620	6465930	SNDS	6.3	14	50	190	400	400	600	0.05
64L	796051	13	562980	6466170	SNDS	6.7	18	50	260	50	25	300	0.05
64L	796052	13	563460	6466570	SNDS	6.6	13	40	110	50	25	400	0.05
64L	796053	13	563740	6466220	SNDS	6.5	13	59	100	50	25	330	0.05
64L	796055	13	564600	6466370	SNDS	6.1	8	41	90	50	25	330	0.05

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
SURFACE LAKE WATER GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	COORDINATES NORTH	CATCH BASIN ROCK TYPE	PH	COND uMHOS CM	F PPB	CL PPB	PO4 PPB	NO3 PPB	SO4 PPB	U PPB
64L	796056	13	570000	6466800	SNDS	6.7	16	71	70	50	25	310	0.05
64L	796057	13	573200	6466870	SNDS	6.8	14	59	70	50	25	260	0.05
64L	796058	13	573880	6466700	SNDS	6.7	15	59	260	50	25	390	0.05
64L	796059	13	574510	6466270	SNDS	6.7	16	59	180	50	25	510	0.05
64L	796060	13	576190	6466290	SNDS	6.7	20	77	200	50	25	370	0.05
64L	796062	13	577110	6467570	ATMD	6.6	16	59	100	50	67	380	0.05
64L	796063	13	577440	6467880	ATMD	6.4	16	97	100	50	930	500	0.05
64L	796064	13	579750	6468100	ATMD	5.9	8	47	70	50	710	360	0.05
64L	796065	13	580740	6466840	ATMD	6.4	16	59	50	50	570	180	0.05
64L	796066	13	580270	6467130	ATMD	6.3	15	53	90	50	1490	360	0.05
64L	796068	13	579560	6466800	MDJT	6.0	17	47	130	50	1490	90	0.05
64L	796069	13	580440	6465920	SNDS	5.7	9	35	70	50	760	320	0.05
64L	796070	13	579920	6465290	SNDS	5.8	14	70	60	50	930	270	0.05
64L	796071	13	578260	6463040	SNDS	5.7	12	53	40	50	25	25	0.05
64L	796072	13	577560	6462730	SNDS	5.9	14	55	50	50	970	270	0.05
64L	796073	13	577420	6464030	SNDS	4.7	5	24	50	50	840	450	0.05
64L	796074	13	576920	6464290	SNDS	4.8	5	29	80	50	530	590	0.05
64L	796075	13	576440	6463920	SNDS	5.9	16	70	170	50	930	500	0.05
64L	796076	13	574970	6463640	SNDS	6.6	15	59	140	50	570	540	0.05
64L	796077	13	574280	6465050	SNDS	6.6	16	65	80	50	1100	410	0.05
64L	796078	13	573230	6464970	SNDS	6.4	16	59	90	50	930	320	0.05
64L	796079	13	573230	6464260	SNDS	5.7	5	24	60	50	180	990	0.05
64L	796080	13	572760	6463700	SNDS	6.4	15	59	50	50	490	270	0.05
64L	796082	13	572420	6464120	SNDS	6.7	14	49	40	50	380	330	0.05
64L	796083	13	572010	6463470	SNDS	6.6	13	44	50	50	490	330	0.05
64L	796084	13	571520	6462750	SNDS	6.4	12	62	80	50	550	380	0.05
64L	796085	13	568520	6462280	SNDS	5.5	6	27	40	50	760	380	0.05
64L	796086	13	563490	6463340	SNDS	5.9	8	27	80	50	760	560	0.05
64L	796087	13	559010	6459030	SNDS	6.8	17	49	120	50	380	560	0.05
64L	796088	13	559500	6459700	SNDS	6.7	16	50	110	50	400	400	0.05
64L	796089	13	560780	6460780	SNDS	6.8	16	55	120	50	300	560	0.05
64L	796090	13	561020	6461890	SNDS	6.8	15	49	110	50	210	560	0.05
64L	796091	13	561310	6463260	SNDS	7.0	14	49	90	50	25	420	0.05
64L	796092	13	562600	6463280	SNDS	6.5	13	49	50	50	590	420	0.05
64L	796093	13	563770	6461900	SNDS	6.0	7	27	80	50	270	560	0.05
64L	796094	13	564010	6461410	SNDS	5.7	6	27	60	50	420	660	0.05
64L	796095	13	566660	6459530	SNDS	6.7	19	60	120	50	500	400	0.05
64L	796096	13	567560	6460470	SNDS	6.7	18	60	140	50	550	520	0.05
64L	796098	13	569040	6459120	SNDS	5.9	8	50	100	50	25	300	0.05
64L	796099	13	569550	6459250	SNDS	5.8	6	30	240	50	600	300	0.05
64L	796100	13	569800	6460720	SNDS	6.6	13	51	80	50	80	420	0.05
64L	796102	13	569520	6461140	SNDS	6.5	13	38	90	50	25	380	0.05
64L	796103	13	570650	6461760	SNDS	6.9	13	41	90	50	25	360	0.05
64L	796104	13	571770	6459990	SNDS	5.7	7	24	5	50	80	590	0.05
64L	796105	13	573620	6461820	SNDS	6.6	12	35	50	50	25	360	0.05
64L	796106	13	574020	6461140	SNDS	5.2	6	3	5	50	25	410	0.05
64L	796107	13	575260	6460910	SNDS	6.5	13	35	70	50	25	270	0.05
64L	796108	13	576610	6460430	SNDS	6.6	16	53	80	50	25	360	0.05
64L	796109	13	577480	6459710	SNDS	6.8	22	50	160	50	800	400	0.05
64L	796110	13	578730	6456820	ATWL	4.8	9	3	5	50	25	25	0.05

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
SURFACE LAKE WATER GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	COORDINATES NORTH	CATCH BASIN ROCK TYPE	PH	COND µMHOS CM	F PPB	CL PPB	PO4 PPB	NO3 PPB	SO4 PPB	U PPB
64L	796111	13	575180	6456430	SNDS	5.9	6	35	40	50	25	320	0.05
64L	796113	13	572870	6456890	SNDS	5.6	6	30	40	50	25	180	0.05
64L	796114	13	572280	6457240	SNDS	5.4	7	35	20	50	25	90	0.05
64L	796115	13	571870	6458030	SNDS	5.1	7	30	160	50		400	0.05
64L	796116	13	570650	6457340	SNDS	5.4	7	35	40	50	25	450	0.05
64L	796117	13	570250	6456900	SNDS	5.7	7	33	50	50	25	450	0.05
64L	796118	13	568720	6457560	SNDS	5.8	8	35	40	50	25	270	0.05
64L	796119	13	568430	6458360	SNDS	6.2	9	20	260	50	25	400	0.05
64L	796120	13	566470	6458380	SNDS	6.7	16	40	300	50	25	600	0.05
64L	796122	13	565100	6455910	SNDS	6.0	11	37	50	50	360	370	0.05
64L	796123	13	564500	6457360	SNDS	6.8	16	44	100	50	180	510	0.05
64L	796124	13	564160	6458140	SNDS	6.4	16	50	380	50	1000	700	0.05
64L	796125	13	563290	6457580	SNDS	6.4	13	34	60	50	870	510	0.05
64L	796126	13	560800	6455440	SNDS	5.9	8	26	60	50	440	180	0.05
64L	796127	13	560770	6456810	SNDS	6.4	12	32	90	50	200	290	0.05
64L	796128	13	559540	6457910	SNDS	6.3	11	26	40	50	310	280	0.05
64L	796129	13	560000	6458740	SNDS	6.6	15	37	120	50	220	550	0.05
64L	796130	13	559920	6453020	SNDS	6.3	11	37	60	50	710	690	0.05
64L	796131	13	559440	6443780	SNDS	6.9	24	69	150	50	25	480	0.05
64L	796132	13	561060	6443930	SNDS	6.5	23	58	190	50	400	600	0.05
64L	796133	13	561860	6443880	ATWL	6.5	20	56	210	50	800	370	0.05
64L	796134	13	562680	6445040	SNDS	6.5	17	48	100	50	800	550	0.05
64L	796135	13	562550	6446140	SNDS	5.7	7	20	260	50	600	500	0.05
64L	796137	13	565150	6444760	ATWL	5.8	10	34	80	50	1410	550	0.05
64L	796138	13	566000	6444670	WLST	6.4	22	62	310	50	780	320	0.05
64L	796139	13	566110	6443500	WLST	6.2	11	39	40	50	570	140	0.05
64L	796140	13	573350	6445080	WLST	6.5	18	34	20	50	880	550	0.05
64L	796142	13	577620	6445560		5.6	186	79	2630	50	2010	77700	0.05
64L	796143	13	579020	6452150		7.2	76	50	2410	50	2700	9700	100.00
64L	796145	13	576840	6452100		7.1	115	107	2940	50	3390	14500	440.00
64L	796146	13	576310	6453660		6.8	20	50	440	50	500	800	4.10
64L	796147	13	575000	6452380	ATWL	6.2	7	20	420	50	600	1500	0.60
64L	796148	13	573760	6451960	SNDS	6.0	7	5	260	50	400	1100	1.20
64L	796149	13	572960	6451450	SNDS	6.7	15	34	180	50	530	460	0.12
64L	796150	13	572900	6450280	ATWL	7.0	35	51	180	50	840	500	0.24
64L	796151	13	573420	6449150	WLST	6.9	41	79	90	50	25	1830	1.10
64L	796152	13	571520	6448140	WLST	6.7	27	51	20	50	25	730	0.50
64L	796153	13	570140	6447540	WLST	6.2	11	39	50	50	530	550	0.50
64L	796154	13	569450	6447750	ATWL	6.7	22	51	90	50	310	460	0.63
64L	796155	13	568510	6447740	ATWL	6.7	21	250	400	50	500	400	0.05
64L	796156	13	568730	6448140	ATWL	6.5	20	45	130	50	970	460	0.37
64L	796157	13	569080	6449380	SNDS	6.5	16	45	130	50	530	600	0.05
64L	796158	13	570330	6448600	ATWL	6.6	21	5	380	50	600	600	0.68
64L	796159	13	571180	6448600	ATWL	6.5	20	56	60	50	1190	460	1.20
64L	796160	13	571100	6449100	ATWL	5.4	6	24	5	50	210	840	0.62
64L	796162	13	571170	6449960	ATWL	6.9	30	5	340	50	400	700	0.70
64L	796163	13	567200	6451750	SNDS	6.7	19	70	170	50	25	510	0.05
64L	796165	13	567650	6451260	SNDS	6.6	15	54	100	50	25	330	0.05
64L	796166	13	568570	6452550	SNDS	6.8	17	54	120	50	25	510	0.05
64L	796167	13	568810	6452070	SNDS	6.6	13	43	40	50	25	460	0.05

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
SURFACE LAKE WATER GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	COORDINATES NORTH	CATCH BASIN ROCK TYPE	PH	COND µMHOS CM	F PPB	CL PPB	PO4 PPB	NO3 PPB	SO4 PPB	U PPB
64L	796168	13	570110	6451270	SNDS	6.6	12	43	70	50	25	280	0.05
64L	796169	13	569800	6452540	SNDS	6.7	10	43	70	50	25	560	0.05
64L	796170	13	570700	6452700	SNDS	6.6	11	32	80	50	25	490	0.05
64L	796171	13	571240	6452240	SNDS	6.9	20	27	80	50	25	650	0.05
64L	796172	13	572420	6453180	SNDS	6.8	10	32	80	50	25	600	0.05
64L	796173	13	571280	6453270	SNDS	6.6	11	32	80	50	25	600	0.05
64L	796174	13	570530	6455280	SNDS	6.7	10	43	60	50	25	650	0.05
64L	796175	13	571480	6454810	SNDS	6.4	8	32	50	50	25	330	0.05
64L	796176	13	570700	6455670	SNDS	6.0	9	45	40	50	25	25	0.05
64L	796177	13	570170	6455060	SNDS	6.5	10	32	80	50	25	510	0.05
64L	796178	13	569760	6455230	SNDS	5.8	8	38	50	50	25	370	0.05
64L	796179	13	569100	6454630	SNDS	6.3	10	41	70	50	25	460	0.05
64L	796180	13	567730	6454420	SNDS	5.9	11	43	40	50	25	650	0.05
74I	796002	13	553300	6462150	SNDS	6.6	19	50	600	1100	25	800	0.05
74I	796003	13	554460	6463820	SNDS	6.5	17	50	500	400	25	800	0.05
74I	796004	13	555370	6465180	SNDS	6.3	11	53	170	50	1290	530	0.05
74I	796005	13	555870	6466200	SNDS	6.3	11	53	140	50	1290	490	0.05
74I	796006	13	555480	6464100	SNDS	6.2	10	53	120	50	1370	580	0.05
74I	796007	13	555000	6463300	SNDS	6.2	10	50	120	50	800	500	0.05
74I	796008	13	555570	6462500	SNDS	5.8	8	47	90	50	650	420	0.05
74I	796009	13	557020	6462330	SNDS	6.4	13	60	80	50	800	500	0.05
74I	796010	13	557950	6462950	SNDS	6.4	9	40	80	50	510	620	0.05
74I	796011	13	557390	6465190	SNDS	6.4	12	66	50	50	25	350	0.05
74I	796012	13	557610	6466550	SNDS	6.2	10	51	50	50	940	420	0.05
74I	796013	13	557560	6468230	SNDS	5.9	6	27	80	50	290	1180	0.05
74I	796014	13	558290	6469440	SNDS	5.4	5	27	50	50	360	740	0.05
74I	796015	13	557930	6470240	SNDS	6.0	5	29	80	50	430	560	0.05
74I	796016	13	557560	6469710	SNDS	6.4	8	40	180	50	25	560	0.05
74I	796017	13	557090	6469240	SNDS	6.2	10	40	110	50	790	490	0.05
74I	796019	13	556490	6468320	SNDS	6.4	12	50	80	50	1300	500	0.05
74I	796020	13	554320	6465360	SNDS	6.6	12	60	110	50	720	620	0.05
74I	796022	13	552880	6463850	SNDS	7.1	14	64	90	50	670	570	0.05
74I	796023	13	552630	6466770	SNDS	5.8	6	36	140	50	270	710	0.05
74I	796024	13	552930	6468400	SNDS	6.0	8	30	80	50	700	500	0.05
74I	796025	13	553290	6468060	SNDS	5.3	6	29	110	50	270	430	0.05
74I	796026	13	555400	6467820	SNDS	6.8	14	64	330	50	560	570	0.05
74I	796027	13	555730	6468340	SNDS	6.6	13	61	90	50	600	570	0.05
74I	796028	13	556440	6469530	SNDS	6.6	13	58	170	50	530	430	0.05
74I	796029	13	555300	6469450	SNDS	5.9	6	38	200	50	270	500	0.05
74I	796030	13	554750	6470430	SNDS	6.5	11	45	70	50	670	290	0.05
74I	796032	13	554120	6469910	SNDS	6.6	12	39	80	50	180	370	0.05
74I	796033	13	552060	6470150	SNDS	5.7	6	28	40	50	360	650	0.05
74I	796034	13	550330	6470010	SNDS	5.7	7	22	70	50	1290	370	0.05
74I	796035	13	549180	6468580	SNDS	6.4	11	50	70	50	800	510	0.05
74I	796036	13	547450	6468850	SNDS	6.6	19	80	80	50	500	500	0.05
74I	796037	13	548050	6470710	SNDS	6.4	12	44	70	50	630	420	0.05
74I	796038	13	547150	6470090	SNDS	6.5	16	59	80	50	270	420	0.05
74I	796039	13	545000	6469960	SNDS	6.6	24	128	30	50	1380	600	0.05
74I	796040	13	544220	6469200	SNDS	6.3	24	80	80	50	3800	600	0.05
74I	796043	13	544250	6467100	SNDS	6.2	12	50	50	50	1420	570	0.05

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
SURFACE LAKE WATER GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	COORDINATES NORTH	CATCH BASIN ROCK TYPE	PH	COND µMHOS CM	F PPB	CL PPB	PO4 PPB	NO3 PPB	SO4 PPB	U PPB
74I	796044	13	545050	6467140	SNDS	6.4	9	75	50	50	640	710	0.05
74I	796045	13	545480	6463490	SNDS	6.9	18	70	100	50	600	600	0.05
74I	796046	13	544600	6462170	SNDS	5.9	6	25	30	50	290	640	0.05
74I	796047	13	546400	6462420	SNDS	7.0	18	94	50	50	430	570	0.05
74I	796048	13	547500	6461240	SNDS	6.6	12	62	13	50	860	570	0.05
74I	796049	13	548190	6461490	SNDS	6.6	13	50	80	50	570	640	0.05
74I	796050	13	547720	6462490	SNDS	6.6	12	50	50	50	570	640	0.05
74I	796051	13	552010	6461000	SNDS	6.7	13	50	70	50	25	390	0.05
74I	796052	13	551330	6460700	SNDS	6.8	14	50	70	50	720	500	0.05
74I	796053	13	550410	6463460	SNDS	6.2	9	37	50	50	50	430	0.05
74I	796055	13	549880	6462910	SNDS	6.3	11	50	80	50	300	600	0.05
74I	796056	13	549570	6463700	SNDS	6.4	12	50	40	50	1000	600	0.05
74I	796057	13	548830	6463990	SNDS	6.6	13	50	70	50	570	710	0.05
74I	796058	13	548670	6460200	SNDS	6.5	12	37	50	50	570	570	0.05
74I	796059	13	546700	6460450	SNDS	6.0	7	44	40	50	640	500	0.05
74I	796060	13	545400	6458750	SNDS	6.2	10	50	50	50	1000	710	0.05
74I	796062	13	546110	6458430	SNDS	6.6	12	50	50	50	290	500	0.05
74I	796063	13	546650	6458240	SNDS	6.6	11	49	50	50	590	310	0.05
74I	796064	13	545830	6457830	SNDS	6.6	12	47	50	50	240	460	0.05
74I	796065	13	544640	6456320	SNDS	6.4	13	56	50	50	1420	510	0.05
74I	796066	13	544500	6455380	SNDS	6.4	11	49	50	50	690	460	0.05
74I	796068	13	545520	6455820	SNDS	6.6	12	37	50	50	390	510	0.05
74I	796069	13	545240	6453900	SNDS	6.7	16	49	60	50	590	360	0.05
74I	796070	13	544370	6452850	SNDS	6.8	16	74	50	50	690	360	0.05
74I	796071	13	547100	6453970	SNDS	6.2	17	49	60	50	25	510	0.05
74I	796072	13	547440	6455500	SNDS	6.9	16	47	60	50	290	460	0.05
74I	796073	13	549740	6452990	SNDS	6.0	6	25	60	50	390	560	0.05
74I	796074	13	549710	6454440	SNDS	5.3	6	31	50	50	340	1020	0.05
74I	796075	13	548990	6455000	SNDS	6.4	14	56	50	50	690	460	0.05
74I	796076	13	549100	6456120	SNDS	6.6	14	56	30	50	640	460	0.05
74I	796077	13	549500	6456830	SNDS	6.5	14	49	50	50	490	460	0.05
74I	796078	13	549910	6456890	SNDS	6.6	14	49	30	50	440	510	0.05
74I	796079	13	548880	6457890	SNDS	6.2	8	31	20	50	290	410	0.05
74I	796080	13	548890	6458920	SNDS	5.2	6	3	5	50	740	560	0.05
74I	796082	13	549880	6458840	SNDS	5.6	7	24	50	50	760	560	0.05
74I	796083	13	550540	6459000	SNDS	6.5	13	53	50	50	520	460	0.05
74I	796084	13	550150	6459370	SNDS	6.3	9	35	20	50	710	360	0.05
74I	796085	13	550400	6459760	SNDS	6.6	14	53	50	50	380	460	0.05
74I	796086	13	551110	6457560	SNDS	6.1	10	35	20	50	1290	310	0.05
74I	796087	13	551520	6457130	SNDS	6.5	12	47	40	50	570	360	0.05
74I	796088	13	553300	6458900	SNDS	6.2	10	41	90	50	670	460	0.05
74I	796089	13	555140	6460720	SNDS	5.7	8	35	50	50	950	310	0.05
74I	796090	13	556040	6460040	SNDS	6.3	12	45	40	50	570	390	0.05
74I	796091	13	555730	6459200	SNDS	6.2	9	30	50	50	25	440	0.05
74I	796092	13	556000	6456820	SNDS	6.3	10	38	70	50	180	210	0.05
74I	796093	13	556050	6456580	SNDS	6.8	17	40	120	50	90	740	0.05
74I	796094	13	554580	6455890	SNDS	6.6	9	34	80	50	280	280	0.05
74I	796095	13	558320	6457000	SNDS	6.6	12	32	10	50	350	390	0.05
74I	796096	13	557720	6456570	SNDS	6.5	11	45	50	50	700	180	0.05
74I	796098	13	558340	6456280	SNDS	6.3	9	33	50	50	220	320	0.05

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
SURFACE LAKE WATER GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	COORDINATES NORTH	CATCH BASIN ROCK TYPE	PH	COND µMHOS CM	F PPB	CL PPB	PO4 PPB	NO3 PPB	SO4 PPB	U PPB
74I	796099	13	557800	6455570	SNDS	6.2	9	30	80	50	590	380	0.05
74I	796100	13	557320	6455000	SNDS	6.3	10	30	40	50	320	290	0.05
74I	796102	13	558280	6454780	SNDS	6.1	7	24	70	50	360	620	0.05
74I	796103	13	557660	6453840	SNDS	5.7	6	30	80	50	440	1090	0.05
74I	796104	13	557240	6453260	SNDS	5.9	7	30	110	50	1410	290	0.05
74I	796105	13	556740	6452550	SNDS	5.6	6	21	70	50	550	950	0.05
74I	796106	13	558300	6452000	SNDS	6.4	18	47	110	50	730	380	0.05
74I	796107	13	556910	6450960	SNDS	6.0	8	35	100	50	1090	480	0.05
74I	796108	13	556440	6451100	SNDS	6.5	13	47	100	50	820	570	0.05
74I	796109	13	557000	6451800	SNDS	6.6	12	33	80	50	500	520	0.05
74I	796110	13	556360	6452010	SNDS	5.5	13	24	100	50	620	570	0.05
74I	796111	13	556590	6453510	SNDS	6.3	6	50	40	50	550	480	0.05
74I	796113	13	555230	6453180	SNDS	5.5	6	45	60	50	180	900	0.05
74I	796114	13	554660	6453570	SNDS	6.2	8	30	100	50	270	480	0.05
74I	796115	13	554340	6453070	SNDS	5.9	10	30	70	50	460	760	0.05
74I	796116	13	552730	6452510	SNDS	6.2	8	30	100	50	680	520	0.05
74I	796117	13	551820	6452050	SNDS	6.0	9	17	90	50	25	25	0.05
74I	796118	13	551750	6453320	SNDS	6.8	18	34	140	50	25	400	0.05
74I	796119	13	551070	6452840	SNDS	6.5	18	40	170	50	25	810	0.05
74I	796120	13	550490	6452250	SNDS	6.4	18	40	130	50	25	510	0.05
74I	796122	13	549700	6451550	SNDS	6.5	10	17	150	50	25	220	0.05
74I	796123	13	548780	6452290	SNDS	6.4	12	34	80	50	25	460	0.05
74I	796124	13	547240	6452370	SNDS	6.7	16	46	170	50	25	260	0.05
74I	796125	13	546360	6452580	SNDS	6.4	16	37	180	50	25	410	0.05
74I	796126	13	545820	6450920	SNDS	6.2	13	32	110	50	25	560	0.05
74I	796127	13	546790	6448860	SNDS	6.1	8	20	240	50	25	500	0.05
74I	796128	13	547400	6448360	SNDS	5.5	6	11	90	50	25	1010	0.05
74I	796129	13	549290	6447990	SNDS	6.1	11	34	110	50	25	310	0.05
74I	796130	13	550370	6448450	SNDS	6.3	10	20	180	50	25	400	0.05
74I	796131	13	551840	6450510	SNDS	6.0	10	23	100	50	25	590	0.05
74I	796132	13	545470	6446600	SNDS	6.1	8	23	70	50	25	290	0.05
74I	796133	13	544070	6446070	SNDS	6.1	9	21	60	50	25	360	0.05
74I	796134	13	545170	6445470	SNDS	6.0	9	23	90	50	25	310	0.05
74I	796137	13	546990	6442640	SNDS	6.4	12	24	140	50	25	570	0.05
74I	796138	13	548470	6442890	SNDS	6.4	12	24	100	50	25	620	0.05
74I	796139	13	549270	6445170	SNDS	6.5	10	43	80	50	25	710	0.05
74I	796140	13	548060	6444430	SNDS	6.0	12	30	150	50	25	480	0.05
74I	796142	13	546600	6444280	SNDS	6.1	19	34	110	50	610	620	0.05
74I	796143	13	547640	6445930	SNDS	6.8	13	30	100	50	660	620	0.05
74I	796145	13	547920	6446930	SNDS	5.9	7	24	100	50	520	380	0.05
74I	796146	13	550500	6447170	SNDS	6.1	7	24	100	50	830	380	0.05
74I	796147	13	551560	6446450	SNDS	6.3	11	30	90	50	390	570	0.05
74I	796148	13	551640	6442900	SNDS	5.7	5	12	20	50	240	670	0.05
74I	796149	13	553520	6444340	SNDS	5.8	6	24	50	50	480	570	0.05
74I	796150	13	554800	6444310	SNDS	6.5	12	49	130	50	390	710	0.05
74I	796151	13	555590	6443360	SNDS	6.0	9	24	70	50	260	520	0.05
74I	796152	13	558000	6445400	SNDS	6.4	22	87	120	50	1490	1040	0.05
74I	796153	13	556010	6446400	SNDS	5.9	8	27	70	50	700	670	0.05
74I	796154	13	557190	6448170	SNDS	6.5	14	40	140	50	800	500	0.05
74I	796155	13	554460	6447800	SNDS	6.6	13	40	80	50	700	400	0.05

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
SURFACE LAKE WATER GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	COORDINATES NORTH	CATCH BASIN ROCK TYPE	PH	COND uMHOS CM	F PPB	CL PPB	PO4 PPB	NO3 PPB	SO4 PPB	U PPB
74I	796156	13	554810	6449100	SNDS	6.4	12	34	90	50	610	570	0.05
74I	796157	13	554540	6449880	SNDS	6.0	13	33	80	50	1780	520	0.05
74I	796158	13	552240	6448190	SNDS	6.2	9	22	100	50	470	470	0.05
74I	796159	13	552340	6449430	SNDS	6.3	10	24	100	50	800	510	0.05
74I	796160	13	552970	6449300	SNDS	5.8	7	22	100	50	720	700	0.05
74I	796162	13	553240	6450670	SNDS	6.2	10	28	130	50	520	540	0.05
74I	796163	13	553790	6451360	SNDS	6.1	9	30	100	50	700	470	0.05
74I	796165	13	553400	6451740	SNDS	5.9	8	24	90	50	490	420	0.05
74I	796166	13	554250	6451850	SNDS	5.7	8	22	90	50	610	600	0.05
64L	771223	13	573529	6442536		6.9		58					
64L	771225	13	568760	6444655	WLST	6.9		68					
64L	771226	13	565171	6443420	ATWL	6.8		62					
64L	771227	13	563291	6444314	ATWL	6.9		58					
64L	771229	13	560247	6444435	SNDS	7.1		62					
64L	771230	13	560247	6444435	SNDS	7.1		62					
64L	771231	13	572628	6444180	WLST	6.6		70					
64L	771232	13	560888	6448509	SNDS	6.7		46					
64L	771233	13	563501	6450330	SNDS	6.5		54					
64L	771234	13	566316	6450471	SNDS	6.7		68					
64L	771235	13	569030	6450845	SNDS	6.7		58					
64L	771236	13	571277	6451035	SNDS	6.7		54					
64L	771237	13	573143	6451222	SNDS	7.0		48					
64L	771238	13	577079	6453343	WLST	6.6		56					
64L	771239	13	579538	6457718	WLST	5.0		32					
64L	771242	13	573113	6457944	SNDS	5.1		30					
64L	771243	13	572040	6459075	SNDS	5.6		34					
64L	771244	13	568656	6457565	SNDS	5.7		54					
64L	771245	13	568293	6458307	SNDS	5.9		36					
64L	771246	13	566362	6458201	SNDS	6.5		46					
64L	771247	13	565413	6459481	SNDS	6.7		68					
64L	771248	13	565413	6459481	SNDS	6.7		54					
64L	771249	13	564062	6459065	SNDS	6.5		52					
64L	771250	13	568849	6461717	SNDS	6.5		54					
64L	771251	13	564393	6461071	SNDS	6.7		54					
64L	771252	13	566149	6461840	SNDS	6.8		50					
64L	771254	13	566924	6463615	SNDS	6.7		52					
64L	771255	13	568304	6464909	SNDS	6.8		56					
64L	771256	13	568646	6466241	SNDS	6.8		60					
64L	771257	13	571308	6464616	SNDS	6.6		46					
64L	771258	13	571866	6465215	SNDS	6.6		52					
64L	771259	13	572846	6465691	SNDS	6.8		60					
64L	771260	13	571318	6468757	SNDS	6.6		42					
64L	771262	13	571343	6470526	SNDS	6.1		36					
64L	773060	13	569396	6468568	SNDS	6.6		22					
64L	773062	13	566251	6467914	SNDS	6.9		36					
64L	773063	13	565555	6466758	SNDS	6.6		48					
64L	773064	13	566677	6465693	SNDS	6.6		40					
64L	773065	13	566677	6465693	SNDS	6.7		46					
64L	773066	13	564644	6464852	SNDS	6.6		48					
64L	773067	13	561870	6462128	SNDS	6.5		48					

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
SURFACE LAKE WATER GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	NORTH	CATCH BASIN ROCK TYPE	PH	COND µMHOS CM	F PPB	CL PPB	PO4 PPB	NO3 PPB	SO4 PPB	U PPB
64L	773068	13	559702	6458605	SNDS	6.5		30					
64L	773069	13	560585	6457903	SNDS	6.4		36					
64L	773070	13	564499	6457106	SNDS	6.3		38					
64L	773071	13	559123	6457337	SNDS	6.2		26					
64L	773072	13	561422	6456296	SNDS	6.1		22					
64L	773074	13	567686	6455413	SNDS	7.0		30					
64L	773075	13	572062	6455207	SNDS	6.7		26					
64L	773076	13	573298	6456217	SNDS	5.8		22					
64L	773077	13	575131	6455617	SNDS	5.9		26					
64L	773078	13	578843	6456749	ATWL	4.9		20					
64L	773079	13	577898	6455128	WLST	5.7		30					
64L	773080	13	574041	6453477	SNDS	5.7		20					
64L	773082	13	570620	6452638	SNDS	7.3		26					
64L	773083	13	568285	6453151	SNDS	7.0		46					
64L	773084	13	566561	6452878	SNDS	6.6		38					
64L	773085	13	560796	6453423	SNDS	5.8		22					
64L	773086	13	559946	6454063	SNDS	5.4		20					
64L	773088	13	558809	6453970	SNDS	6.1		22					
64L	773089	13	559583	6451331	SNDS	6.2		30					
64L	773090	13	558809	6453970	SNDS	6.4		22					
64L	773091	13	559080	6449136	SNDS	6.3		52					
64L	773092	13	559390	6444984	SNDS	5.6		20					
64L	773093	13	559359	6443711	SNDS	6.5		54					
64L	773179	13	574185	6468410	SNDS	5.7		20					
64L	773180	13	576049	6467676	SNDS	6.2		28					
64L	773182	13	575709	6465791	SNDS	7.0		36					
64L	773183	13	575625	6464103	SNDS	6.7		34					
64L	773184	13	574458	6463481	SNDS	6.7		46					
64L	773185	13	572896	6463117	SNDS	6.5		30					
64L	773186	13	572896	6463117	SNDS	6.5		34					
64L	773187	13	571559	6461893	SNDS	6.4		38					
64L	773188	13	574229	6461745	SNDS	6.4		30					
64L	773189	13	575735	6462070	SNDS	6.3		34					
64L	773190	13	566632	6446665	ATWL	6.8		38					
64L	773191	13	577697	6461471	SNDS	6.3		30					
64L	773192	13	576865	6459427	SNDS	6.2		28					
64L	773193	13	574868	6451221		7.6		110					
64L	773194	13	574591	6449375		7.1		48					
64L	773195	13	572273	6449468	ATWL	6.9		30					
64L	773196	13	569660	6449147	ATWL	6.8		42					
64L	773197	13	564760	6448182	SNDS	6.3		30					
64L	773198	13	563582	6447973	SNDS	6.3		30					
64L	773199	13	563743	6446412	SNDS	6.1		36					
64L	773202	13	568998	6446681	WLST	6.1		38					
64L	773203	13	570591	6447326	WLST	6.1		26					
64L	773204	13	573530	6445366	WLST	6.7		54					
64L	773205	13	575060	6445258		5.1		51					
64L	773206	13	575772	6443782	WLST	5.8		26					
64L	773294	13	581922	6470371	MDJT	6.4		40					
64L	773295	13	577686	6470301	SNDS	6.7		60					

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
SURFACE LAKE WATER GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	NORTH	CATCH BASIN ROCK TYPE	PH	COND µMHOS CM	F PPB	CL PPB	PO4 PPB	NO3 PPB	SO4 PPB	U PPB
64L	773296	13	578261	6469215	ATMD	6.6		34					
64L	773297	13	580109	6468613	ATMD	6.3		20					
64L	773298	13	580349	6465731	SNDS	6.2		24					
64L	773299	13	578876	6465865	ATMD	5.9		20					
64L	773300	13	578330	6464554	SNDS	6.2		36					
64L	773302	13	579858	6464536	SNDS	6.7		28					
64L	773303	13	583323	6462398	WLST	6.3		26					
64L	773304	13	583346	6461489	WLST	6.1		28					
64L	773305	13	581554	6459929	WLST	6.0		28					
64L	773306	13	581205	6460391	WLST	5.4		20					
64L	773307	13	581205	6460391	WLST	5.3		20					
64L	773308	13	580314	6459178	WLST	5.9		30					
64L	773309	13	579118	6450496	WLST	6.1		48					
64L	773311	13	579833	6448905	WLST	6.1		48					
64L	773312	13	577707	6446961	WLST	5.9		50					
64L	773313	13	579355	6444968	WLST	6.0		34					
64L	761099	13	583350	6462600	WLST			75					
64L	761110	13	581560	6459830	WLST			78					
64L	761111	13	580170	6458870	WLST			77					
64L	761112	13	575530	6451460				96					
64L	761113	13	575730	6451460				96					
64L	761340	13	570000	6465500	SNDS			49					
64L	761341	13	575100	6463510	SNDS			52					
64L	761342	13	575430	6465600	SNDS			59					
64L	761343	13	578530	6466530	MDJT			50					
64L	761344	13	575800	6468920	SNDS			48					
64L	761345	13	577100	6469830	SNDS			49					
64L	761346	13	578270	6469320	ATMD			51					
64L	761349	13	568230	6469680	SNDS			51					
64L	761350	13	566370	6468000	SNDS			50					
64L	761351	13	562220	6467400	SNDS			49					
64L	761352	13	565000	6465000	SNDS			53					
64L	761353	13	567060	6465960	SNDS			51					
64L	761354	13	566450	6461830	SNDS			53					
64L	761355	13	559800	6463780	SNDS			45					
64L	761356	13	559000	6461730	SNDS			50					
64L	761357	13	560000	6458720	SNDS			50					
64L	761364	13	559430	6447420	SNDS			50					
64L	761375	13	559270	6446300	SNDS			57					
64L	761402	13	565600	6459500	SNDS			52					
64L	761403	13	566500	6458200	SNDS			48					
64L	761404	13	568430	6458180	SNDS			40					
64L	761405	13	570650	6461750	SNDS			46					
64L	761406	13	572230	6459250	SNDS			43					
64L	761408	13	571280	6453250	SNDS			44					
64L	761410	13	567600	6455250	SNDS			48					
64L	761411	13	565590	6451530	SNDS			50					
64L	761412	13	566830	6449300	SNDS			51					
64L	761413	13	565700	6447020	ATWL			54					
64L	761414	13	563200	6444360	ATWL			54					

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
SURFACE LAKE WATER GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	COORDINATES NORTH	CATCH BASIN ROCK TYPE	PH	COND µMHOS CM	F PPB	CL PPB	PO4 PPB	NO3 PPB	SO4 PPB	U PPB
64L	761415	13	559430	6443750	SNDS			52					
74I	761175	13	555000	6463600	SNDS			61					
74I	761176	13	555480	6464140	SNDS			65					
74I	761177	13	556000	6465220	SNDS			64					
74I	761178	13	556550	6465780	SNDS			66					
74I	761179	13	555700	6466220	SNDS			65					
74I	761180	13	555400	6465000	SNDS			73					
74I	761181	13	554860	6465250	SNDS			68					
74I	761182	13	554800	6464800	SNDS			68					
74I	761183	13	554450	6463800	SNDS			69					
74I	761184	13	553830	6462760	SNDS			69					
74I	761185	13	553300	6462150	SNDS			69					
74I	761186	13	553580	6462050	SNDS			70					
74I	761187	13	550900	6463900	SNDS			74					
74I	761188	13	552000	6465520	SNDS			74					
74I	761189	13	551500	6466510	SNDS			74					
74I	761190	13	550600	6466800	SNDS			73					
74I	761191	13	549800	6468100	SNDS			74					
74I	761192	13	548400	6467140	SNDS			74					
74I	761193	13	548330	6465350	SNDS			76					
74I	761194	13	547660	6463800	SNDS			75					
74I	761195	13	546850	6465530	SNDS			72					
74I	761196	13	546000	6466200	SNDS			73					
74I	761197	13	546170	6467800	SNDS			74					
74I	761298	13	548000	6470300	SNDS			61					
74I	761358	13	557000	6464000	SNDS			55					
74I	761359	13	556180	6461300	SNDS			54					
74I	761360	13	552330	6462000	SNDS			55					
74I	761361	13	552600	6460720	SNDS			51					
74I	761362	13	553900	6458230	SNDS			51					
74I	761363	13	551700	6457320	SNDS			50					
74I	761365	13	548680	6460190	SNDS			49					
74I	761366	13	546300	6456950	SNDS			49					
74I	761369	13	549430	6450200	SNDS			50					
74I	761370	13	551250	6454300	SNDS			50					
74I	761371	13	553700	6454400	SNDS			52					
74I	761372	13	556630	6453270	SNDS			51					
74I	761376	13	557350	6446240	SNDS			52					
74I	761377	13	557870	6445740	SNDS			54					
74I	761378	13	557300	6444880	SNDS			55					
74I	761380	13	557450	6443200	SNDS			55					
74I	761398	13	544300	6448600	SNDS			44					
74I	761399	13	544400	6451350	SNDS			44					
74I	761423	13	553900	6442600	SNDS			42					
74I	761424	13	550680	6447230	SNDS			40					
74I	761425	13	554900	6449240	SNDS			40					
74I	761426	13	556730	6449340	SNDS			46					

Appendix III

Lake Sediment Geochemical Data

An explanation of the coding used on the lake sediment geochemical data listings is given below:

MAP SHEET - National Topographic System (N.T.S.), lettered quadrangle (1:250,000 designation i.e. 64L or 74I).

SAMPLE NUMBER - Six digit sample number (as shown on the Sample Location Map, Figure).

UTM COORDINATES - Universal Transverse Mercator (U.T.M.) Coordinate System.

(a) ZONE - Zone

(b) EAST - Easting (metres)

(c) NORTH - Northing (metres

CATCH BASIN ROCK TYPE - Catchment basin rock type indicates a lake entirely within a given bedrock lithology, bedrock unit (group of bedrock lithologies) or contact zone with drainage into the lake also predominantly from within the designated geologic environment.

SNDS - Athabasca Group (sandstone)

MDJT - Mudjatik Lithostructural Domain

ATMD - Contact zone Athabasca - Mudjatik

WLST - Wollaston Lithostructural Domain

ATWL - Contact zone Athabasca - Wollaston

Samples with a blank in this field are considered to have "abnormal" chemical characteristics.

LAKE WATER DEPTH M - Lake water depth in metres

SED COMP - Sediment composition. The four columns are used to describe the bulk mechanical composition (field observation) of the sediment collected.

The three size fractions are divided as follows:

column 1	>0.125 mm	Sand
2	<0.125 mm	Fines, Silt and Clay
3		Organics

The proportion of each size fraction present is:

blank	Absent	
1	Minor	<33%
2	Medium	33-67%
3	Major	>67%

The fourth column is used to record the presence of an organic gel or gyttja:-

blank	Absent
1	Present

SED COLOUR - Sediment colour. Up to two of the colours may be checked (1 in appropriate column).

column 1	Tan
2	Yellow
3	Green

4 Grey

5 Brown

6 Black

			D.L./~½D.L.*
U PPM	-	Uranium (ppm)	0.2/0.1
ZN PPM	-	Zinc (ppm)	2/1
CU PPM	-	Copper (ppm)	2/1
PB PPM	-	Lead (ppm)	2/1
NI PPM	-	Nickel (ppm)	2/1
CO PPM	-	Cobalt (ppm)	2/1
AG PPM	-	Silver (ppm)	0.2/0.1
MN PPM	-	Manganese (ppm)	5/2
AS PPM	-	Arsenic (ppm)	1.0/0.5
MO PPM	-	Molybdenum (ppm)	2/1
FE PCT	-	Iron (percent)	0.02/0.01
LOI PCT	-	Loss-on-ignition (percent)	1.0/0.5

*Detection limit/Value recorded recorded equals approximately ½ detection limit value.

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
LAKE SEDIMENT GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	COORDINATES NORTH	CATCH BASIN ROCK TYPE	LAKE WATER DEPTH M	SED COMP	SED COLOUR	U PPM	ZN PPM	CU PPM	PB PPM	NI PPM	CO PPM	AG PPM	MN PPM	AS PPM	MO PPM	FE PCT	LOI PCT
64L	796002	13	560620	6466890	SNDS	1	0131	1 1	2.2	25	8	1	9	4	0.1	45	0.5	1	0.25	32.8
64L	796003	13	561900	6467610	SNDS	2	0131	1 1	2.0	38	10	1	12	5	0.1	60	0.5	1	0.60	34.0
64L	796004	13	561210	6468080	SNDS	2	0131	1 1	2.0	42	10	1	14	6	0.1	55	0.5	1	0.80	38.2
64L	796005	13	560800	6467840	SNDS	2	0131	1 1	3.0	70	10	1	13	6	0.1	90	0.5	1	0.60	38.0
64L	796006	13	560080	6467790	SNDS	3	0131	1 1	1.7	18	9	1	11	3	0.1	30	0.5	1	0.10	41.8
64L	796007	13	560960	6468950	SNDS	3	0131	1 1	1.3	19	10	1	10	2	0.1	40	0.5	1	0.15	48.0
64L	796008	13	562760	6469090	SNDS	3	0131	1 1	1.5	39	19	2	9	3	0.1	40	0.5	1	0.10	84.0
64L	796009	13	562290	6469920	SNDS	2	0131	1 1	1.9	62	14	1	18	8	0.1	110	0.5	1	1.15	34.2
64L	796010	13	562950	6470180	SNDS	2	0131	1 1	3.0	118	20	1	23	10	0.1	180	0.5	1	2.00	36.8
64L	796011	13	565930	6470860	SNDS	3														
64L	796012	13	565300	6469200	SNDS	4	0131	1 1	3.2	180	21	3	13	6	0.1	60	0.5	1	0.45	35.8
64L	796013	13	566360	6469040	SNDS	1	0131	1 1	2.1	28	9	1	10	4	0.1	45	0.5	1	0.50	34.0
64L	796014	13	566580	6469850	SNDS	2	0131	1 1	0.8	29	6	1	6	2	0.1	30	0.5	1	0.10	51.0
64L	796015	13	567320	6469500	SNDS	6	0131	1 1	0.9	62	11	1	4	5	0.1	190	0.5	7	4.90	55.2
64L	796016	13	568120	6469500	SNDS	5	0131	1 1	1.2	58	9	1	7	6	0.1	225	0.5	3	2.70	32.2
64L	796017	13	567940	6470350	SNDS	5	0131	1 1	2.8	120	14	1	11	15	0.1	195	5.0	5	10.40	47.6
64L	796019	13	571350	6470540	SNDS	2	0131	1 1	0.9	56	7	1	5	3	0.1	65	0.5	4	0.50	59.8
64L	796020	13	572200	6470370	SNDS	2	0131	1 1	1.5	68	7	1	6	8	0.1	80	5.5	5	5.00	37.4
64L	796022	13	574980	6470270	SNDS	2	0131	1 1	2.6	46	19	2	12	3	0.1	60	0.5	1	0.40	52.4
64L	796023	13	575860	6469620	SNDS	2														
64L	796024	13	576320	6469060	SNDS	10	0131	1 1	0.6	87	10	1	4	1	0.1	55	0.5	1	0.45	73.2
64L	796025	13	576720	6468830	SNDS	11	0131	1 1	1.2	56	12	1	7	4	0.1	60	3.5	1	0.45	61.6
64L	796026	13	577070	6469840	SNDS	11	0131	1 1	2.6	38	10	1	7	7	0.1	140	3.0	1	1.00	24.0
64L	796027	13	577740	6470430	SNDS	7	0131	1 1	6.2	74	19	1	17	12	0.1	680	0.5	7	14.60	47.6
64L	796028	13	581150	6469640	MDJT	5	0131	1 1	8.4	52	12	1	11	4	0.1	75	0.5	1	0.80	54.6
64L	796029	13	579980	6468650	ATMD	7	0131	1 1	2.4	86	12	2	10	4	0.1	70	0.5	1	0.40	64.6
64L	796030	13	577720	6468250	ATMD	4	0131	1 1	1.6	39	12	1	8	3	0.1	70	0.5	1	0.30	35.8
64L	796032	13	576900	6468010	ATMD	2	0131	1 1	1.3	24	5	1	4	3	0.1	50	1.0	1	1.15	34.6
64L	796033	13	575470	6467200	SNDS	5	0131	1 1	1.0	36	8	1	5	3	0.1	60	0.5	1	1.15	32.0
64L	796034	13	574640	6467760	SNDS	5	0131	1 1	1.2	44	10	1	5	4	0.1	200	1.5	2	3.15	36.2
64L	796035	13	574140	6468420	SNDS	6	0131	1 1	1.1	84	22	1	14	2	0.1	50	0.5	1	0.20	80.4
64L	796036	13	573240	6467750	SNDS	3	0131	1 1	1.1	17	6	1	4	2	0.1	55	0.5	1	0.25	27.6
64L	796037	13	569840	6468430	SNDS	6	0131	1 1	1.1	54	8	1	7	5	0.1	225	0.5	2	1.15	35.4
64L	796038	13	569320	6468680	SNDS	9	0131	1 1	0.9	68	16	1	11	3	0.1	45	0.5	1	0.90	70.4
64L	796039	13	568340	6468740	SNDS	3	0131	1 1	1.0	14	6	1	5	3	0.1	40	0.5	2	0.40	24.2
64L	796040	13	567200	6467840	SNDS	2	0131	1 1	1.2	32	6	1	6	4	0.1	130	0.5	3	1.00	27.8
64L	796042	13	566820	6467280	SNDS	10	0131	1 1	1.7	58	11	1	9	5	0.1	290	0.5	3	1.60	36.6
64L	796043	13	565240	6467900	SNDS	5	0131	1 1	1.3	42	7	1	6	3	0.1	150	0.5	2	0.60	41.4
64L	796044	13	564860	6467150	SNDS	4	0131	1 1	0.8	46	7	1	6	4	0.1	120	0.5	1	0.90	56.6
64L	796045	13	561020	6466560	SNDS	3	0131	1 1	0.7	130	15	4	7	1	0.1	50	0.5	1	0.10	88.0
64L	796046	13	560520	6465870	SNDS	1	0131	1 1	1.8	42	8	3	11	4	0.1	50	0.5	1	0.20	41.2
64L	796047	13	560910	6464900	SNDS	2	0131	1 1	2.4	36	10	1	4	14	0.1	475	170.0	5	26.50	46.8
64L	796048	13	561620	6465350	SNDS	2	0131	1 1	4.2	42	14	1	13	8	0.1	125	7.5	2	3.10	47.2
64L	796049	13	562160	6466260	SNDS	1	0131	1 1	3.4	26	9	1	12	4	0.1	40	2.0	2	1.00	40.4
64L	796050	13	562620	6465930	SNDS	3	0131	1 1	1.0	52	8	1	7	5	0.1	55	0.5	1	1.85	47.0
64L	796051	13	562980	6466170	SNDS	4	0131	1 1	1.6	26	6	1	6	3	0.1	70	0.5	1	0.80	30.4
64L	796052	13	563460	6466570	SNDS	6	0131	1 1	2.2	40	9	1	8	5	0.1	130	0.5	1	1.50	32.0
64L	796053	13	563740	6466220	SNDS	2	0131	1 1	2.0	70	9	1	10	9	0.1	140	2.0	2	5.55	34.6
64L	796055	13	564600	6466370	SNDS	4	0131	1 1	0.8	98	9	1	6	5	0.1	75	0.5	1	0.80	67.4

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
LAKE SEDIMENT GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	NORTH	CATCH BASIN ROCK TYPE	LAKE WATER DEPTH M	SED COMP	SED COLOUR	U PPM	ZN PPM	CU PPM	PB PPM	NI PPM	CO PPM	AG PPM	MN PPM	AS PPM	MO PPM	FE PCT	LOI PCT
64L	796056	13	570000	6466800	SNDS	3	0131	1 1	1.3	26	4	1	6	4	0.1	90	0.5	1	0.65	22.2
64L	796057	13	573200	6466870	SNDS	3	0131	1 1	1.3	33	7	1	7	3	0.1	130	0.5	1	0.45	43.0
64L	796058	13	573880	6466700	SNDS	4	0131	1 1	2.3	51	7	1	8	4	0.1	160	0.5	4	0.40	40.0
64L	796059	13	574510	6466270	SNDS	5	0131	1 1	1.3	34	9	1	8	4	0.1	165	0.5	3	0.70	39.0
64L	796060	13	576190	6466290	SNDS	4	0131	1 1	2.5	74	11	1	10	9	0.1	295	2.0	2	4.50	44.4
64L	796062	13	577110	6467570	ATMD	2	0131	1 1	2.6	32	5	1	7	3	0.1	80	0.5	1	0.90	33.0
64L	796063	13	577440	6467880	ATMD	4	0131	1 1	4.1	48	11	1	10	4	0.1	60	0.5	3	1.30	35.4
64L	796064	13	579750	6468100	ATMD	3	0131	1 1	2.9	50	6	1	8	4	0.1	60	0.5	1	1.25	60.8
64L	796065	13	580740	6466840	ATMD	3	0131	1 1	6.1	52	7	1	6	8	0.1	100	1.0	1	10.40	46.4
64L	796066	13	580270	6467130	ATMD	4	0131	1 1	8.1	20	8	1	9	1	0.1	35	0.5	1	0.30	32.2
64L	796068	13	579560	6466800	MDJT	3	0131	1 1	5.4	54	7	1	4	15	0.1	160	6.0	1	23.50	48.8
64L	796069	13	580440	6465920	SNDS	7	0131	1 1	0.5	38	5	1	3	2	0.1	65	0.5	1	0.50	53.8
64L	796070	13	579920	6465290	SNDS	2	0131	1 1	1.5	18	3	1	9	2	0.1	20	0.5	1	0.15	27.2
64L	796071	13	578260	6463040	SNDS	3	0131	1 1	0.2	25	6	1	3	1	0.1	90	0.5	1	0.80	91.8
64L	796072	13	577560	6462730	SNDS	1	0131	1 1	0.7	49	6	1	6	3	0.1	30	0.5	1	0.50	63.8
64L	796073	13	577420	6464030	SNDS	2	0131	1 1	0.7	32	7	1	3	2	0.1	55	0.5	1	0.10	66.2
64L	796074	13	576920	6464290	SNDS	4	0131	1 1	1.6	69	10	1	7	4	0.1	75	0.5	1	0.55	64.2
64L	796075	13	576440	6463920	SNDS	3	0131	1 1	2.6	45	8	1	8	6	0.1	175	0.5	2	4.40	38.0
64L	796076	13	574970	6463640	SNDS	6	0131	1 1	0.8	30	9	1	7	4	0.1	130	0.5	1	0.95	31.2
64L	796077	13	574280	6465050	SNDS	2	1121	1 1	1.7	42	6	1	8	4	0.1	260	0.5	1	0.70	37.0
64L	796078	13	573230	6464970	SNDS	4	0131	1 1	1.0	44	7	1	6	6	0.1	340	0.5	1	2.50	30.6
64L	796079	13	573230	6464260	SNDS	10	0131	1 1	0.9	70	17	2	11	4	0.1	45	0.5	1	0.40	77.0
64L	796080	13	572760	6463700	SNDS	3	0131	1 1	1.4	35	7	1	7	6	0.1	270	0.5	1	1.25	33.2
64L	796082	13	572420	6464120	SNDS	4	0131	1 1	2.1	76	13	1	6	7	0.1	200	0.5	1	5.65	64.0
64L	796083	13	572010	6463470	SNDS	2	0131	1 1	2.0	71	9	1	7	10	0.1	490	1.0	1	4.10	40.8
64L	796084	13	571520	6462750	SNDS	3	0131	1 1	3.3	88	14	1	13	12	0.1	290	2.0	1	5.00	43.0
64L	796085	13	568520	6462280	SNDS	2	0131	1 1	1.2	46	20	1	13	2	0.1	35	0.5	1	0.20	82.2
64L	796086	13	563490	6463340	SNDS	5	0131	1 1	0.6	56	9	1	7	2	0.1	90	0.5	1	0.45	62.0
64L	796087	13	559010	6459030	SNDS	3	0131	1 1	2.1	76	8	1	12	12	0.1	210	5.0	1	12.60	33.2
64L	796088	13	559500	6459700	SNDS	3	0131	1 1	4.2	64	14	1	14	13	0.1	340	16.0	7	17.40	41.8
64L	796089	13	560780	6460780	SNDS	2	0131	1 1	4.4	86	12	1	12	13	0.1	440	11.0	5	18.20	35.2
64L	796090	13	561020	6461890	SNDS	7	0131	1 1	5.3	82	16	1	15	11	0.1	340	7.5	4	5.40	27.4
64L	796091	13	561310	6463260	SNDS	17	0131	1 1	3.1	63	13	1	9	6	0.1	510	6.0	3	2.20	52.4
64L	796092	13	562600	6463280	SNDS	2	0131	1 1	1.2	32	5	1	5	2	0.1	110	0.5	2	0.30	42.8
64L	796093	13	563770	6461900	SNDS	5	0131	1 1	1.0	50	8	1	6	4	0.1	60	0.5	1	0.55	55.6
64L	796094	13	564010	6461410	SNDS	2	0131	1 1	1.9	50	10	1	9	4	0.1	80	0.5	1	0.30	61.0
64L	796095	13	566660	6459530	SNDS	1	0131	1 1	1.0	26	6	1	5	2	0.1	140	0.5	1	0.50	31.4
64L	796096	13	567560	6460470	SNDS	3	0131	1 1	1.2	32	7	1	6	4	0.1	145	0.5	1	0.95	25.6
64L	796098	13	569040	6459120	SNDS	1	0131	1 1	1.4	44	6	1	10	5	0.1	65	0.5	1	0.75	34.6
64L	796099	13	569550	6459250	SNDS	1	0131	1 1	0.8	24	7	2	7	2	0.1	40	0.5	1	0.40	58.2
64L	796100	13	569800	6460720	SNDS	5	0131	1 1	2.6	77	16	1	14	12	0.1	210	0.5	2	2.90	43.2
64L	796102	13	569520	6461140	SNDS	3	0131	1 1	2.7	97	18	1	16	15	0.1	280	1.5	3	4.00	47.2
64L	796103	13	570650	6461760	SNDS	3	0131	1 1	3.6	100	18	1	17	16	0.1	365	1.5	3	4.65	48.4
64L	796104	13	571770	6459990	SNDS	1	0131	1 1	1.9	26	11	1	10	3	0.1	75	0.5	1	1.20	51.2
64L	796105	13	573620	6461820	SNDS	5	0131	1 1	1.5	31	7	1	7	4	0.1	60	0.5	1	0.80	75.0
64L	796106	13	574020	6461140	SNDS	3	0131	1 1	1.0	50	16	1	9	2	0.1	50	0.5	1	0.10	70.0
64L	796107	13	575260	6460910	SNDS	5	0131	1 1	1.3	24	5	1	7	3	0.1	65	0.5	1	0.50	22.4
64L	796108	13	576610	6460430	SNDS	6	0131	1 1	1.8	28	8	1	7	5	0.1	65	0.5	1	0.55	26.8
64L	796109	13	577480	6459710	SNDS	3	0131	1 1	9.0	36	14	1	29	11	0.1	40	0.5	5	1.40	38.2
64L	796110	13	578730	6456820	ATWL	1	0131	1 1	0.5	30	4	1	2	2	0.1	95	0.5	1	0.40	93.2

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
LAKE SEDIMENT GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	NORTH	CATCH BASIN ROCK TYPE	LAKE WATER DEPTH M	SED COMP	SED COLOUR	U PPM	ZN PPM	CU PPM	PB PPM	NI PPM	CO PPM	AG PPM	MN PPM	AS PPM	MO PPM	FE PCT	LOI PCT
64L	796111	13	575180	6456430	SNDS	3	0131	1 1	1.6	26	10	1	16	4	0.1	55	0.5	1	0.20	46.6
64L	796113	13	572870	6456890	SNDS	1	0131	1 1	1.4	104	7	1	14	10	0.1	140	5.5	3	5.45	38.8
64L	796114	13	572280	6457240	SNDS	1	0131	1 1	0.8	44	7	1	13	2	0.1	40	0.5	2	0.75	49.0
64L	796115	13	571870	6458030	SNDS	1	0131	1 1	1.4	17	7	1	10	1	0.1	20	0.5	1	0.25	53.0
64L	796116	13	570650	6457340	SNDS	3	0131	1 1	2.3	39	15	1	14	2	0.1	30	0.5	1	0.30	55.2
64L	796117	13	570250	6456900	SNDS	1	0131	1 1	1.5	18	10	1	10	2	0.1	35	0.5	1	0.20	58.8
64L	796118	13	568720	6457560	SNDS	1	0131	1 1	2.0	64	12	1	8	4	0.1	80	0.5	1	0.75	50.2
64L	796119	13	568430	6458360	SNDS	2	0131	1 1	2.1	62	8	1	9	6	0.1	150	0.5	1	1.20	30.6
64L	796120	13	566470	6458380	SNDS	1														
64L	796122	13	565100	6455910	SNDS	2	0131	1 1	0.7	56	9	1	8	6	0.1	110	0.5	1	0.70	64.2
64L	796123	13	564500	6457360	SNDS	8	0131	1 1	2.2	60	9	1	7	12	0.1	330	2.0	1	9.70	33.0
64L	796124	13	564160	6458140	SNDS	2	0131	1 1	1.8	58	8	1	6	9	0.1	250	0.5	4	6.20	36.8
64L	796125	13	563290	6457580	SNDS	2	0131	1 1	0.8	60	8	1	7	8	0.1	70	0.5	1	7.20	43.6
64L	796126	13	560800	6455440	SNDS	1	0131	1 1	0.9	32	5	1	10	4	0.1	120	0.5	1	0.80	43.6
64L	796127	13	560770	6456810	SNDS	5	0131	1 1	0.6	32	5	1	5	3	0.1	235	0.5	1	0.80	31.2
64L	796128	13	559540	6457910	SNDS	2	0131	1 1	1.0	38	3	1	4	4	0.1	60	0.5	1	1.95	44.4
64L	796129	13	560000	6458740	SNDS	10	0131	1 1	2.6	98	10	1	11	17	0.1	445	14.0	3	18.50	40.6
64L	796130	13	559920	6453020	SNDS	3	0131	1 1	2.0	76	8	1	13	6	0.1	60	0.5	2	0.75	44.4
64L	796131	13	559440	6443780	SNDS	7	0131	1 1	1.1	24	5	1	3	2	0.1	335	0.5	4	0.95	39.6
64L	796132	13	561060	6443930	SNDS	1	0131	1 1	1.0	18	2	1	3	2	0.1	260	0.5	1	0.70	46.0
64L	796133	13	561860	6443880	ATHL	1	0131	1 1	10.0	26	5	1	11	4	0.1	80	0.5	1	0.50	30.0
64L	796134	13	562680	6445040	SNDS	3	0131	1 1	2.6	25	4	1	6	3	0.1	95	0.5	1	0.80	31.0
64L	796135	13	562550	6446140	SNDS	4	0131	1 1	1.8	52	8	1	9	4	0.1	70	0.5	1	0.20	55.6
64L	796137	13	565150	6444760	ATHL	2	0131	1 1	0.9	86	6	1	6	4	0.1	110	0.5	1	1.00	64.8
64L	796138	13	566000	6444670	WLST	3	0131	1 1	21.0	39	10	1	18	6	0.1	270	0.5	1	2.55	47.6
64L	796139	13	566110	6443500	WLST	3	0131	1 1	1.0	56	5	1	7	5	0.1	120	0.5	1	2.20	45.4
64L	796140	13	573350	6445080	WLST	2	0131	1 1	41.1	27	17	1	6	3	0.1	70	0.5	2	0.80	36.8
64L	796142	13	577620	6445560																
64L	796143	13	579020	6452150		2	0131	1 1	62.7	33	16	1	13	6	0.1	90	0.5	1	0.70	19.0
64L	796145	13	576840	6452100		2	0131	1 1	605.0	26	32	30	34	8	0.1	120	3.0	6	1.25	12.4
64L	796146	13	576310	6453660		3	0131	1 1	7.8	54	10	1	12	5	0.1	200	0.5	1	0.80	42.2
64L	796147	13	575000	6452380	ATHL	9	0131	1 1	2.7	48	10	2	9	4	0.1	70	0.5	1	0.45	64.4
64L	796148	13	573760	6451960	SNDS	10	0131	1 1	1.5	60	8	1	7	4	0.1	60	0.5	1	0.70	53.8
64L	796149	13	572960	6451450	SNDS	10	0131	1 1	1.7	52	8	1	6	4	0.1	130	0.5	2	1.80	56.4
64L	796150	13	572900	6450280	ATHL	5	0131	1 1	91.2	45	11	1	8	4	0.1	60	0.5	3	1.30	55.2
64L	796151	13	573420	6449150	WLST	2	1121	1 1	15.2	30	19	1	11	4	0.1	100	0.5	1	0.65	37.8
64L	796152	13	571520	6448140	WLST	2	0131	1 1	18.8	52	10	1	8	3	0.1	110	0.5	1	0.60	68.0
64L	796153	13	570140	6447540	WLST	2	0131	1 1	16.7	83	12	1	7	7	0.1	190	0.5	2	5.70	54.0
64L	796154	13	569450	6447750	ATHL	7	0131	1 1	29.5	52	11	1	10	5	0.1	200	0.5	1	2.85	34.0
64L	796155	13	568510	6447740	ATHL	3	0131	1 1	42.7	67	12	1	10	12	0.1	225	44.0	4	15.20	52.6
64L	796156	13	568730	6448140	ATHL	2	0131	1 1	22.1	44	7	1	8	4	0.1	130	2.0	1	2.20	49.0
64L	796157	13	569080	6449380	SNDS	3	0131	1 1	5.5	20	4	1	4	3	0.1	70	2.0	1	1.20	15.8
64L	796158	13	570330	6448600	ATHL	4	0131	1 1	85.8	24	8	1	7	3	0.1	80	0.5	1	0.75	35.0
64L	796159	13	571180	6448600	ATHL	3	0131	1 1	174.0	26	6	1	6	5	0.1	90	0.5	1	1.25	44.0
64L	796160	13	571100	6449100	ATHL	6	0131	1 1	2.0	55	18	1	14	2	0.1	90	0.5	1	0.20	75.2
64L	796162	13	571170	6449960	ATHL	2	0131	1 1	33.9	18	8	1	7	4	0.1	45	0.5	1	0.40	39.2
64L	796163	13	567200	6451750	SNDS	1	0131	1 1	1.1	27	4	1	4	3	0.1	190	0.5	1	0.60	36.2
64L	796165	13	567650	6451260	SNDS	2														
64L	796166	13	568570	6452550	SNDS	12	0131	1 1	1.5	39	7	1	6	4	0.1	145	0.5	3	2.00	37.8
64L	796167	13	568810	6452070	SNDS	2	0131	1 1	0.4	32	4	1	5	2	0.1	90	0.5	2	0.25	53.0

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
LAKE SEDIMENT GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	NORTH	CATCH BASIN ROCK TYPE	LAKE WATER DEPTH M	SED COMP	SED COLOUR	U PPM	ZN PPM	CU PPM	PB PPM	NI PPM	CO PPM	AG PPM	MN PPM	AS PPM	MO PPM	FE PCT	LOI PCT
64L	796168	13	570110	6451270	SNDS	4	0131	1 1	1.4	34	5	1	5	2	0.1	50	0.5	1	0.30	60.6
64L	796169	13	569800	6452540	SNDS	17	0131	1 1	2.1	34	6	1	6	3	0.1	90	0.5	1	0.60	41.6
64L	796170	13	570700	6452700	SNDS	5	0131	1 1	1.3	60	8	1	6	3	0.1	80	0.5	2	1.50	56.0
64L	796171	13	571240	6452240	SNDS	6	0131	1 1	1.9	45	7	1	6	3	0.1	65	0.5	1	0.75	38.8
64L	796172	13	572420	6453180	SNDS	9	0131	1 1	2.0	34	5	1	6	2	0.1	45	0.5	1	0.30	27.8
64L	796173	13	571280	6453270	SNDS	3														
64L	796174	13	570530	6455280	SNDS	15	0131	1 1	1.9	50	8	1	7	4	0.1	100	1.0	1	0.85	42.6
64L	796175	13	571480	6454810	SNDS	3	0131	1 1	1.2	98	9	1	7	4	0.1	45	0.5	1	0.75	64.8
64L	796176	13	570700	6455670	SNDS	2	0131	1 1	0.3	54	5	1	4	5	0.1	60	0.5	1	1.25	52.0
64L	796177	13	570170	6455060	SNDS	8	0131	1 1	1.4	49	7	1	7	5	0.1	110	0.5	1	1.30	38.0
64L	796178	13	569760	6455230	SNDS	3	0131	1 1	1.6	40	10	1	8	5	0.1	75	0.5	1	0.35	48.0
64L	796179	13	569100	6454630	SNDS	4	0131	1 1	2.1	96	16	2	12	4	0.1	80	0.5	1	0.40	60.4
64L	796180	13	567730	6454420	SNDS	1	0131	1 1	1.0	36	9	1	9	4	0.1	80	0.5	1	0.35	56.6
74I	796002	13	553300	6462150	SNDS	7	0131	1 1	6.3	52	12	1	10	7	0.1	155	1.5	4	2.50	45.8
74I	796003	13	554460	6463820	SNDS	3	0131	1 1	8.6	88	15	1	10	8	0.1	200	3.0	5	5.20	43.6
74I	796004	13	555370	6465180	SNDS	3	0131	1 1	2.8	78	14	1	10	5	0.1	120	0.5	3	1.10	65.4
74I	796005	13	555870	6466200	SNDS	5	0131	1 1	1.8	56	10	1	8	4	0.1	115	0.5	2	1.45	59.4
74I	796006	13	555480	6464100	SNDS	3	0131	1 1	2.0	69	11	1	9	5	0.1	120	0.5	1	1.70	63.8
74I	796007	13	555000	6463300	SNDS	2	0131	1 1	2.2	81	11	1	9	6	0.1	130	0.5	1	1.50	65.0
74I	796008	13	555570	6462500	SNDS	3	0131	1 1	1.1	68	9	1	10	3	0.1	100	0.5	1	0.90	56.6
74I	796009	13	557020	6462330	SNDS	2	0131	1 1	2.0	96	9	1	7	9	0.1	200	0.5	1	7.40	43.0
74I	796010	13	557950	6462950	SNDS	4	0131	1 1	0.7	64	10	1	7	6	0.1	100	0.5	1	1.70	65.0
74I	796011	13	557390	6465190	SNDS	2	0131	1 1	2.0	77	10	1	10	9	0.1	230	0.5	3	4.85	33.4
74I	796012	13	557610	6466550	SNDS	2	0131	1 1	1.3	80	12	1	11	7	0.1	110	0.5	1	1.45	53.2
74I	796013	13	557560	6468230	SNDS	5	0131	1 1	4.0	76	18	1	12	6	0.1	80	0.5	1	0.60	34.2
74I	796014	13	558290	6469440	SNDS	4	0131	1 1	1.3	56	15	1	10	4	0.1	90	0.5	1	1.45	61.4
74I	796015	13	557930	6470240	SNDS	7	0131	1 1	1.6	62	12	1	7	2	0.1	40	0.5	1	0.20	68.8
74I	796016	13	557560	6469710	SNDS	6	0131	1 1	1.6	46	11	1	8	3	0.1	40	0.5	1	0.50	62.4
74I	796017	13	557090	6469240	SNDS	1	0131	1 1	1.8	46	4	1	5	3	0.1	40	3.5	1	1.30	33.2
74I	796019	13	556490	6468320	SNDS	3	0131	1 1	1.4	34	5	1	4	2	0.1	40	3.5	1	1.00	38.4
74I	796020	13	554320	6465360	SNDS	2	0131	1 1	1.8	80	7	1	5	6	0.1	225	1.5	4	3.90	53.6
74I	796022	13	552880	6463850	SNDS	1	0131	1 1	0.7	36	4	4	4	3	0.1	220	0.5	1	0.60	41.4
74I	796023	13	552630	6466770	SNDS	3	0131	1 1	1.6	52	10	1	11	2	0.1	100	0.5	1	0.80	53.6
74I	796024	13	552930	6468400	SNDS	2	0131	1 1	0.7	52	9	2	7	4	0.1	70	0.5	1	0.40	57.4
74I	796025	13	553290	6468060	SNDS	5	0131	1 1	1.4	74	12	6	8	1	0.1	40	0.5	1	0.20	37.2
74I	796026	13	555400	6467820	SNDS	6	0131	1 1	2.2	46	10	1	7	4	0.1	130	2.0	5	3.20	40.6
74I	796027	13	555730	6468340	SNDS	3														
74I	796028	13	556440	6469530	SNDS	4	0131	1 1	2.3	28	6	2	5	2	0.1	80	2.0	2	1.55	16.6
74I	796029	13	555300	6469450	SNDS	7	0131	1 1	2.0	26	11	1	8	2	0.1	90	0.5	1	0.65	26.8
74I	796030	13	554750	6470430	SNDS	2	0131	1 1	0.8	21	6	2	6	3	0.1	45	0.5	1	0.25	39.8
74I	796032	13	554120	6469910	SNDS	6	0131	1 1	3.0	40	9	1	8	5	0.1	60	0.5	1	0.45	46.2
74I	796033	13	552060	6470150	SNDS	3	0131	1 1	1.6	75	19	1	15	3	0.2	55	0.5	1	0.45	67.0
74I	796034	13	550330	6470010	SNDS	3	0131	1 1	1.8	120	10	3	8	4	0.1	40	0.5	1	0.40	47.0
74I	796035	13	549180	6468580	SNDS	3	1121	1	0.7	33	1	2	2	1	0.1	30	0.5	1	0.35	16.4
74I	796036	13	547450	6468850	SNDS	2	0131	1 1	1.3	51	11	1	10	5	0.1	100	0.5	1	4.10	40.0
74I	796037	13	548050	6470710	SNDS	2	0131	1 1	1.9	50	11	1	11	4	0.1	70	0.5	1	0.85	41.0
74I	796038	13	547150	6470090	SNDS	1	0131	1 1	1.9	24	5	2	6	2	0.1	30	0.5	1	0.20	33.0
74I	796039	13	545000	6469960	SNDS	1	1121	1 1	0.8	44	7	2	7	5	0.1	150	0.5	1	0.90	51.2
74I	796040	13	544220	6469200	SNDS	2	0131	1 1	0.8	24	5	1	6	3	0.1	195	0.5	1	0.70	29.6
74I	796043	13	544250	6467100	SNDS	2	0131	1 1	0.4	56	8	1	8	6	0.2	75	0.5	1	0.85	56.6

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
LAKE SEDIMENT GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	NORTH	CATCH BASIN ROCK TYPE	LAKE WATER DEPTH M	SED COMP	SED COLOUR	U PPM	ZN PPM	CU PPM	PB PPM	NI PPM	CO PPM	AG PPM	MN PPM	AS PPM	MO PPM	FE PCT	LOI PCT
74I	796044	13	545050	6467140	SNDS	3	0131	1 1	0.9	56	12	2	7	3	0.1	60	0.5	1	0.25	77.6
74I	796045	13	545480	6463490	SNDS	16	0131	1 1	2.5	44	8	1	6	4	0.2	230	0.5	1	1.40	26.6
74I	796046	13	544600	6462170	SNDS	3	0131	1 1	1.6	70	12	5	9	2	0.1	55	0.5	1	0.20	66.6
74I	796047	13	546400	6462420	SNDS	18	0131	1 1	1.7	38	7	1	5	3	0.1	200	0.5	1	0.60	30.6
74I	796048	13	547500	6461240	SNDS	3	0131	1 1	1.5	62	13	1	9	5	0.1	70	0.5	1	1.05	65.4
74I	796049	13	548190	6461490	SNDS	3														
74I	796050	13	547720	6462490	SNDS	17	0131	1 1	2.7	66	13	2	9	4	0.1	145	0.5	1	0.90	42.8
74I	796051	13	552010	6461000	SNDS	4	0131	1 1	3.7	66	14	1	10	8	0.1	230	33.0	6	21.00	54.6
74I	796052	13	551330	6460700	SNDS	2	0131	1 1	2.4	62	8	1	8	6	0.1	140	5.5	4	1.90	47.0
74I	796053	13	550410	6463460	SNDS	2	0131	1 1	0.7	60	5	1	4	4	0.1	85	0.5	1	0.50	52.0
74I	796055	13	549880	6462910	SNDS	2	0131	1 1	1.3	58	9	1	5	4	0.1	45	0.5	1	0.90	56.8
74I	796056	13	549570	6463700	SNDS	2	0131	1 1	1.4	88	9	2	6	4	0.1	130	0.5	1	2.20	62.0
74I	796057	13	548830	6463990	SNDS	2	0131	1 1	1.4	84	13	2	7	3	0.1	160	0.5	1	1.60	59.0
74I	796058	13	548670	6460200	SNDS	10	0131	1 1	1.5	56	12	1	9	3	0.1	90	0.5	1	0.60	47.2
74I	796059	13	546700	6460450	SNDS	4	0131	1 1	1.4	98	20	2	14	9	0.1	80	0.5	1	1.00	72.6
74I	796060	13	545400	6458750	SNDS	2	0131	1 1	2.4	20	7	2	12	2	0.1	20	0.5	1	0.20	28.4
74I	796062	13	546110	6458430	SNDS	5	0131	1 1	2.0	24	5	1	8	3	0.1	50	0.5	1	0.55	22.6
74I	796063	13	546650	6458240	SNDS	1	0131	1 1	0.7	34	4	1	6	3	0.1	30	0.5	1	0.35	28.6
74I	796064	13	545830	6457830	SNDS	3	0131	1 1	1.8	44	8	2	11	4	0.1	65	0.5	1	0.85	29.2
74I	796065	13	544640	6456320	SNDS	1	0131	1 1	1.5	44	6	1	9	4	0.1	45	0.5	1	0.40	39.4
74I	796066	13	544500	6455380	SNDS	2	0131	1 1	1.7	56	7	1	8	5	0.1	90	0.5	1	2.40	37.6
74I	796068	13	545520	6455820	SNDS	6	0131	1 1	1.9	51	7	2	5	5	0.1	110	0.5	1	0.60	40.6
74I	796069	13	545240	6453900	SNDS	6	0131	1 1	1.7	25	5	1	5	3	0.1	50	0.5	1	0.60	26.2
74I	796070	13	544370	6452850	SNDS	3	0131	1 1	1.2	22	4	2	2	3	0.1	50	0.5	1	0.65	22.6
74I	796071	13	547100	6453970	SNDS	9	0131	1 1	1.4	52	7	2	5	3	0.1	80	0.5	2	1.60	52.6
74I	796072	13	547440	6455500	SNDS	1	0131	1 1	3.4	18	3	1	11	1	0.1	20	0.5	1	0.15	37.8
74I	796073	13	549740	6452990	SNDS	9	0131	1 1	0.8	68	16	2	12	4	0.1	70	0.5	1	0.65	70.6
74I	796074	13	549710	6454440	SNDS	2	0131	1 1	1.3	84	18	2	11	3	0.1	65	0.5	1	0.30	83.4
74I	796075	13	548990	6455000	SNDS	1	0131	1 1	1.3	19	5	3	6	2	0.1	70	0.5	1	0.45	37.8
74I	796076	13	549100	6456120	SNDS	1	0131	1 1	1.9	6	4	2	6	1	0.1	30	0.5	1	0.30	26.2
74I	796077	13	549500	6456830	SNDS	1	0131	1 1	2.2	8	4	4	7	2	0.1	45	0.5	1	0.40	30.6
74I	796078	13	549910	6456890	SNDS	1	0131	1 1	2.6	13	5	1	8	2	0.1	70	0.5	1	0.40	33.2
74I	796079	13	548880	6457890	SNDS	5	0131	1 1	1.3	33	10	2	7	1	0.1	40	0.5	1	0.20	40.6
74I	796080	13	548890	6458920	SNDS	2	0131	1 1	1.5	89	23	3	11	2	0.1	75	0.5	1	0.25	66.2
74I	796082	13	549880	6458840	SNDS	1	0131	1 1	1.3	78	13	2	9	1	0.1	60	0.5	1	0.30	70.0
74I	796083	13	550540	6459000	SNDS	1	0131	1 1	3.5	59	8	1	10	3	0.1	70	2.5	11	5.20	35.4
74I	796084	13	550150	6459370	SNDS	1	0131	1 1	0.6	40	6	1	4	2	0.1	50	0.5	1	0.20	54.8
74I	796085	13	550400	6459760	SNDS	1	0131	1 1	2.6	19	4	2	8	1	0.1	30	0.5	1	0.20	30.6
74I	796086	13	551110	6457560	SNDS	1	0131	1 1	0.6	45	7	6	6	2	0.1	40	0.5	1	0.35	55.6
74I	796087	13	551520	6457130	SNDS	1	0131	1 1	1.6	24	4	16	7	2	0.1	60	0.5	1	0.65	33.4
74I	796088	13	553300	6458900	SNDS	1	0131	1 1	1.6	28	6	2	6	3	0.1	40	0.5	1	0.80	36.0
74I	796089	13	555140	6460720	SNDS	2	0131	1 1	0.5	60	10	1	7	3	0.1	60	0.5	1	0.20	77.4
74I	796090	13	556040	6460040	SNDS	1	0131	1 1	1.4	45	5	1	9	4	0.1	85	0.5	1	0.80	34.6
74I	796091	13	555730	6459200	SNDS	1	0131	1 1	1.0	33	5	3	9	3	0.1	50	0.5	1	0.60	35.6
74I	796092	13	556000	6456820	SNDS	5	0131	1 1	0.6	42	3	1	4	2	0.1	60	0.5	1	0.35	20.8
74I	796093	13	556050	6456580	SNDS	6	0131	1 1	3.1	70	13	1	24	13	0.1	310	11.0	4	17.50	46.6
74I	796094	13	554580	6455890	SNDS	4	0131	1 1	0.9	54	6	2	10	5	0.1	105	0.5	1	2.00	40.4
74I	796095	13	558320	6457000	SNDS	6	0131	1 1	1.8	74	9	1	5	4	0.1	125	1.0	1	7.75	56.4
74I	796096	13	557720	6456570	SNDS	2	0131	1 1	0.7	30	3	1	12	3	0.1	60	0.5	1	0.25	37.8
74I	796098	13	558340	6456280	SNDS	2	0131	1 1	1.2	76	6	1	9	7	0.1	70	2.0	1	1.35	52.4

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
LAKE SEDIMENT GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	NORTH	CATCH BASIN ROCK TYPE	LAKE WATER DEPTH M	SED COMP	SED COLOUR	U PPM	ZN PPM	CU PPM	PB PPM	NI PPM	CO PPM	AG PPM	MN PPM	AS PPM	MO PPM	FE PCT	LOI PCT
74I	796099	13	557800	6455570	SNDS	1	0131	1 1	0.9	32	4	1	7	3	0.1	40	0.5	1	0.60	55.8
74I	796100	13	557320	6455000	SNDS	2	0131	1 1	1.0	32	3	2	7	3	0.1	45	2.0	1	1.10	43.6
74I	796102	13	558280	6454780	SNDS	6	0131	1 1	1.0	82	11	1	8	2	0.1	60	0.5	1	0.30	59.6
74I	796103	13	557660	6453840	SNDS	4	0131	1 1	1.5	76	9	5	7	3	0.1	45	0.5	1	0.40	45.6
74I	796104	13	557240	6453260	SNDS	3	0131	1 1	0.6	49	6	2	5	3	0.1	80	0.5	1	0.40	75.6
74I	796105	13	556740	6452550	SNDS	3	0131	1 1	1.4	62	9	3	6	2	0.1	40	0.5	1	0.20	52.4
74I	796106	13	558300	6452000	SNDS	3	0131	1 1	1.8	80	8	1	9.	7	0.1	240	11.0	3	16.00	37.6
74I	796107	13	556910	6450960	SNDS	4	0131	1 1	0.8	64	7	2	6	2	0.1	100	0.5	1	0.40	57.6
74I	796108	13	556440	6451100	SNDS	4	0131	1 1	1.7	82	9	1	11	5	0.1	280	2.0	1	2.50	53.4
74I	796109	13	557000	6451800	SNDS	3	0131	1 1	1.3	42	5	1	8	4	0.1	195	0.5	1	1.40	41.2
74I	796110	13	556360	6452010	SNDS	5	0131	1 1	1.3	52	8	2	5	2	0.1	35	0.5	1	0.15	62.4
74I	796111	13	556590	6453510	SNDS	3	0131	1 1	1.1	34	5	1	6	3	0.1	35	0.5	1	0.30	56.6
74I	796113	13	555230	6453180	SNDS	9	0131	1 1	1.8	78	12	2	9	3	0.1	55	0.5	1	0.40	59.8
74I	796114	13	554660	6453570	SNDS	6	0131	1 1	1.9	80	9	1	15	11	0.1	90	3.0	1	3.00	51.0
74I	796115	13	554340	6453070	SNDS	5	0131	1 1	3.4	72	10	1	15	11	0.1	75	2.0	1	2.30	56.6
74I	796116	13	552730	6452510	SNDS	2	0131	1 1	1.9	30	6	1	7	3	0.1	100	0.5	1	1.00	55.6
74I	796117	13	551820	6452050	SNDS	3	0131	1 1	1.7	71	8	1	6	6	0.1	110	1.0	1	7.95	40.4
74I	796118	13	551750	6453320	SNDS	4	0131	11	2.7	60	8	1	10	7	0.1	115	6.5	9	14.50	58.2
74I	796119	13	551070	6452840	SNDS	4	0131	1 1	2.3	28	5	1	12	5	0.1	70	9.5	6	2.35	42.4
74I	796120	13	550490	6452250	SNDS	2	0131	1 1	1.1	16	1	1	3	3	0.1	35	1.5	1	0.70	16.2
74I	796122	13	549700	6451550	SNDS	3	0131	11	1.7	72	9	1	5	3	0.1	120	2.0	15	24.00	53.8
74I	796123	13	548780	6452290	SNDS	4	0131	1 1	1.5	72	6	1	7	5	0.1	160	0.5	2	0.85	40.8
74I	796124	13	547240	6452370	SNDS	4														
74I	796125	13	546360	6452580	SNDS	9	0131	1 1	2.8	97	11	1	9	13	0.1	2650	5.5	7	18.00	34.4
74I	796126	13	545820	6450920	SNDS	2	1121	1 1	1.1	27	2	1	2	2	0.1	150	0.5	1	1.10	13.0
74I	796127	13	546790	6448860	SNDS	4	0131	1 1	1.6	42	9	2	8	2	0.1	80	0.5	1	0.30	56.0
74I	796128	13	547400	6448360	SNDS	5	0131	1 1	1.2	90	15	4	10	2	0.1	45	0.5	1	0.40	70.6
74I	796129	13	549290	6447990	SNDS	2	0131	1 1	0.9	33	3	1	4	4	0.1	60	1.5	1	1.60	22.0
74I	796130	13	550370	6448450	SNDS	3	0131	1 1	0.9	58	5	1	6	3	0.1	70	0.5	1	3.15	37.4
74I	796131	13	551840	6450510	SNDS	4	0131	1 1	0.8	72	6	3	6	3	0.1	55	0.5	1	0.55	55.0
74I	796132	13	545470	6446600	SNDS	2	0131	1 1	1.9	58	6	1	7	2	0.1	70	1.5	1	4.60	30.4
74I	796133	13	544070	6446070	SNDS	3	0131	1 1	1.9	94	10	1	8	6	0.1	310	3.0	5	13.50	46.8
74I	796134	13	545170	6445470	SNDS	2	0131	1 1	1.9	44	8	3	6	2	0.1	90	0.5	1	0.80	54.0
74I	796137	13	546990	6442640	SNDS	5	0131	1 1	2.6	36	8	2	7	3	0.1	125	2.5	2	2.00	10.6
74I	796138	13	548470	6442890	SNDS	4	0131	1 1	1.6	50	8	1	11	4	0.1	100	0.5	1	2.30	34.4
74I	796139	13	549270	6445170	SNDS	3	0131	1 1	1.5	46	5	1	10	5	0.1	130	3.0	1	2.55	28.2
74I	796140	13	548060	6444430	SNDS	4	0131	1 1	1.3	62	6	1	5	3	0.1	180	1.5	4	5.20	39.6
74I	796142	13	546600	6444280	SNDS	5	0131	1 1	1.8	91	9	1	9	6	0.1	210	1.5	4	9.05	44.2
74I	796143	13	547640	6445930	SNDS	2	0131	1 1	1.7	86	7	1	6	5	0.1	240	3.5	4	8.20	38.8
74I	796145	13	547920	6446930	SNDS	2	1121	1 1	1.5	12	3	1	4	3	0.1	20	1.5	1	0.65	12.0
74I	796146	13	550500	6447170	SNDS	3	0131	1 1	1.0	72	7	1	5	2	0.1	85	0.5	1	1.60	61.0
74I	796147	13	551560	6446450	SNDS	4	0131	1 1	1.0	83	8	1	8	5	0.1	255	0.5	1	3.00	40.6
74I	796148	13	551640	6442900	SNDS	2														
74I	796149	13	553520	6444340	SNDS	3	0131	1 1	3.4	34	11	1	15	3	0.1	30	0.5	1	0.10	59.0
74I	796150	13	554800	6444310	SNDS	5														
74I	796151	13	555590	6443360	SNDS	4	0131	1 1	1.0	48	11	3	8	2	0.1	70	0.5	1	0.15	64.2
74I	796152	13	558000	6445400	SNDS	1	0131	1 1	0.7	36	5	2	4	2	0.1	115	0.5	1	0.25	51.4
74I	796153	13	556010	6446400	SNDS	2	0131	1 1	2.0	67	10	3	10	3	0.1	60	0.5	1	0.30	65.2
74I	796154	13	557190	6448170	SNDS	5	0131	1 1	1.2	22	4	1	5	2	0.1	280	0.5	1	0.60	17.2
74I	796155	13	554460	6447800	SNDS	5	0131	1 1	1.5	62	8	1	11	4	0.1	270	2.5	1	2.55	39.0

NEA-IAEA ATHABASCA BASIN - HOLLASTON LAKE TEST AREA
LAKE SEDIMENT GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	NORTH	CATCH BASIN ROCK TYPE	LAKE WATER DEPTH M	SED COMP	SED COLOUR	U PPM	ZN PPM	CU PPM	PB PPM	NI PPM	CO PPM	AG PPM	MN PPM	AS PPM	MO PPM	FE PCT	LOI PCT
74I	796156	13	554810	6449100	SNDS	8	0131	1 1	1.8	76	10	1	9	5	0.1	320	3.5	4	6.10	40.2
74I	796157	13	554540	6449880	SNDS	2	0131	1 1	0.6	32	4	1	4	2	0.1	95	0.5	1	0.50	28.4
74I	796158	13	552240	6448190	SNDS	3	0131	1 1	0.6	53	5	2	5	4	0.1	140	0.5	1	1.00	40.4
74I	796159	13	552340	6449430	SNDS	1	0131	1 1	0.6	29	4	1	4	2	0.1	45	0.5	1	0.30	38.2
74I	796160	13	552970	6449300	SNDS	4	0131	1 1	0.6	94	10	1	4	2	0.1	100	0.5	1	6.00	67.8
74I	796162	13	553240	6450670	SNDS	4	0131	1 1	0.8	47	6	1	5	3	0.1	120	0.5	1	1.40	43.4
74I	796163	13	553790	6451360	SNDS	2	0131	1 1	1.3	34	5	1	6	3	0.1	50	0.5	1	0.85	40.8
74I	796165	13	553400	6451740	SNDS	3	0131	1 1	2.3	95	11	1	7	7	0.1	170	0.5	3	9.10	50.8
74I	796166	13	554250	6451850	SNDS	3	0131	1 1	2.4	76	7	1	8	5	0.1	100	0.5	1	1.80	42.8
64L	771223	13	573529	6442536		5		1 1	20.2	91	16	1	14	11	0.1	560	0.5	4	9.45	36.0
64L	771225	13	568760	6444655	HLST	3		1 1	12.0	58	9	2	17	15	0.1	145	0.5	1	1.20	36.8
64L	771226	13	565171	6443420	ATHL	3		1 1	6.3	36	5	1	16	4	0.1	185	0.5	1	1.40	26.2
64L	771227	13	563291	6444314	ATHL	11		11	8.8	62	10	1	13	8	0.1	890	0.5	1	4.55	14.4
64L	771229	13	560247	6444435	SNDS	5		11	1.5	46	5	3	6	2	0.1	190	0.5	1	1.00	41.0
64L	771230	13	560247	6444435	SNDS	5		11	1.4	44	6	2	5	3	0.1	180	0.5	1	0.90	40.2
64L	771231	13	572628	6444180	HLST	3		1 1	33.0	73	40	1	14	11	0.1	190	0.5	1	2.70	40.6
64L	771232	13	560888	6448509	SNDS	1		1 1	2.4	82	7	1	8	6	0.1	965	1.0	1	3.40	38.4
64L	771233	13	563501	6450330	SNDS	1		1 1	1.4	24	1	1	4	4	0.1	530	2.5	1	3.00	9.8
64L	771234	13	566316	6450471	SNDS	3		1 1	0.9	36	2	2	1	4	0.1	670	3.0	9	10.00	7.6
64L	771235	13	569030	6450845	SNDS	5		1 1	1.6	54	7	1	4	2	0.1	115	0.5	5	6.35	40.8
64L	771236	13	571277	6451035	SNDS	5		1 1	3.0	53	6	1	6	8	0.1	780	1.5	1	7.00	31.6
64L	771237	13	573143	6451222	SNDS	10		1 1	3.3	76	8	2	9	4	0.2	135	0.5	1	1.10	35.6
64L	771238	13	577079	6453343	HLST	3		1 1	42.8	72	16	1	20	7	0.1	170	0.5	2	0.80	51.6
64L	771239	13	579538	6457718	HLST	1		1	0.5	36	6	3	4	2	0.1	90	0.5	1	0.15	91.0
64L	771242	13	573113	6457944	SNDS	2		1	0.9	32	7	2	11	2	0.1	50	0.5	1	0.50	76.6
64L	771243	13	572040	6459075	SNDS	3		1 1	1.6	107	10	1	9	3	0.2	50	0.5	1	0.25	61.8
64L	771244	13	568656	6457565	SNDS	2		1	1.7	34	7	1	9	3	0.1	50	0.5	1	0.30	38.2
64L	771245	13	568293	6458307	SNDS	3		1 1	2.5	65	8	1	11	6	0.1	160	0.5	1	1.20	30.6
64L	771246	13	566362	6458201	SNDS	4		1 1	2.0	58	6	1	8	8	0.1	200	4.0	1	5.70	27.8
64L	771247	13	565413	6459481	SNDS	4		11	1.6	51	8	1	7	5	0.1	385	0.5	1	1.40	24.4
64L	771248	13	565413	6459481	SNDS	4		11	1.6	41	7	1	6	4	0.1	360	0.5	2	1.30	13.6
64L	771249	13	564062	6459065	SNDS	2		11	1.1	45	5	1	7	4	0.1	130	0.5	1	1.85	29.8
64L	771250	13	568849	6461717	SNDS	3		1 1	4.6	70	12	1	17	5	0.1	160	0.5	2	3.60	36.2
64L	771251	13	564393	6461071	SNDS	6		11	2.0	70	9	2	9	4	0.2	200	0.5	1	1.60	40.2
64L	771252	13	566149	6461840	SNDS	11		1 1	2.8	95	13	4	11	7	0.1	330	0.5	4	5.10	30.4
64L	771254	13	566924	6463615	SNDS	2		1 1	1.4	46	5	1	5	4	0.1	140	0.5	1	2.05	20.6
64L	771255	13	568304	6464909	SNDS	4		1 1	1.3	36	4	2	5	3	0.1	150	0.5	1	0.70	20.0
64L	771256	13	568646	6466241	SNDS	11		1 1	2.1	78	10	2	7	6	0.1	510	0.5	2	1.70	29.0
64L	771257	13	571308	6464616	SNDS	2		1 1	1.3	28	5	3	7	3	0.1	160	0.5	1	0.60	27.8
64L	771258	13	571866	6465215	SNDS	2		1 1	1.4	32	5	1	6	4	0.1	160	0.5	1	0.60	30.0
64L	771259	13	572846	6465691	SNDS	3		1 1	1.6	37	5	1	4	5	0.1	440	0.5	1	1.20	24.8
64L	771260	13	571318	6468757	SNDS	2		11	1.5	32	3	2	6	3	0.1	60	0.5	1	0.55	24.6
64L	771262	13	571343	6470526	SNDS	3		1 1	1.2	70	8	3	5	4	0.1	90	0.5	4	0.65	61.8
64L	773060	13	569396	6468568	SNDS	9		1	0.9	73	14	2	10	3	0.1	60	0.5	1	0.20	75.4
64L	773062	13	566251	6467914	SNDS	8		1	3.8	56	10	1	9	7	0.1	250	1.0	1	2.20	23.6
64L	773063	13	565555	6466758	SNDS	4		1	1.5	47	6	5	4	2	0.1	90	0.5	1	0.30	50.2
64L	773064	13	566677	6465693	SNDS	10		1 1	2.5	52	10	2	9	5	0.1	310	0.5	1	0.80	25.8
64L	773065	13	566677	6465693	SNDS	10		1 1	2.4	49	10	3	7	3	0.1	370	1.0	1	0.90	23.6
64L	773066	13	564644	6464852	SNDS	9		1	2.2	32	7	2	6	4	0.1	245	0.5	1	0.85	19.4
64L	773067	13	561870	6462128	SNDS	8		1	2.4	96	12	1	7	8	0.1	190	0.5	1	4.00	46.2

NEA-IAEA ATHABASCA BASIN - WOLLASTON LAKE TEST AREA
LAKE SEDIMENT GEOCHEMICAL DATA

MAP SHEET	SAMPLE NUMBER	UTM ZONE	COORDINATES EAST	NORTH	CATCH BASIN ROCK TYPE	LAKE WATER DEPTH M	SED COMP	SED COLOUR	U PPM	ZN PPM	CU PPM	PB PPM	NI PPM	CO PPM	AG PPM	MN PPM	AS PPM	MO PPM	FE PCT	LOI PCT
64L	773068	13	559702	6458605	SNDS	2		1	1.4	32	1	1	2	4	0.1	320	12.0	1	4.90	2.8
64L	773069	13	560585	6457903	SNDS	2		1	1.9	28	3	1	4	5	0.1	280	1.5	1	2.60	20.2
64L	773070	13	564499	6457106	SNDS	7		1 1	2.7	69	8	1	8	8	0.1	330	2.0	2	11.50	45.8
64L	773071	13	559123	6457337	SNDS	2		11	1.1	46	4	1	5	3	0.1	70	0.5	1	1.60	30.6
64L	773072	13	561422	6456296	SNDS	2		1 1	1.3	37	6	2	12	5	0.1	90	0.5	1	0.30	41.6
64L	773074	13	567686	6455413	SNDS	3		1 1	3.5	22	9	3	8	3	0.1	110	0.5	1	0.70	2.2
64L	773075	13	572062	6455207	SNDS	5		1 1	2.3	44	10	3	11	2	0.1	45	0.5	1	0.30	39.2
64L	773076	13	573258	6456217	SNDS	2		1	2.0	144	9	1	21	11	0.1	160	5.0	1	0.30	39.6
64L	773077	13	575131	6455617	SNDS	1		1	1.1	12	1	2	5	1	0.1	25	0.5	1	0.30	5.4
64L	773078	13	578843	6456749	ATHL	2		1	0.5	32	4	1	3	1	0.1	120	0.5	1	0.60	92.4
64L	773079	13	577898	6455128	WLST	2		1 1	3.9	58	8	2	8	4	0.1	95	0.5	1	0.50	42.8
64L	773080	13	574041	6453477	SNDS	2		1	1.7	24	6	3	8	2	0.1	45	0.5	1	0.30	27.2
64L	773082	13	570620	6452638	SNDS	2		11	1.1	62	8	1	5	3	0.1	70	0.5	1	0.70	66.6
64L	773083	13	568285	6453151	SNDS	12		1 1	1.7	42	7	1	6	3	0.1	160	0.5	1	0.45	28.8
64L	773084	13	566561	6452878	SNDS	2		1 1	1.1	79	10	3	8	5	0.1	110	0.5	2	0.30	57.2
64L	773085	13	560796	6453423	SNDS	3		1	2.0	36	13	5	13	3	0.1	60	0.5	1	0.10	67.0
64L	773086	13	559946	6454063	SNDS	1		1	0.1	20	8	1	4	2	0.1	60	0.5	1	0.10	92.4
64L	773088	13	558809	6453970	SNDS	2		1	1.1	68	8	1	18	11	0.1	50	3.0	1	1.40	67.2
64L	773089	13	559583	6451331	SNDS	3		1 1	1.7	82	10	1	8	5	0.1	190	1.5	3	5.70	53.2
64L	773090	13	558809	6453970	SNDS	2		1	1.3	24	5	1	13	3	0.1	50	0.5	1	0.20	47.2
64L	773091	13	559080	6449136	SNDS	4		1 1	1.2	37	6	1	5	3	0.1	380	0.5	1	0.90	34.8
64L	773092	13	559390	6444984	SNDS	2		1	2.0	152	18	4	12	3	0.1	50	0.5	1	0.30	61.8
64L	773093	13	559359	6443711	SNDS	9		11	1.3	32	6	1	4	2	0.1	340	0.5	3	0.80	41.0
64L	773179	13	574185	6468410	SNDS	7		1	0.9	82	24	3	16	4	0.1	50	0.5	1	0.15	81.0
64L	773180	13	576049	6467676	SNDS	5		1 1	1.7	21	5	1	6	1	0.1	30	0.5	1	0.20	28.2
64L	773182	13	575709	6465791	SNDS	4		1	1.4	48	9	1	9	4	0.1	170	0.5	2	1.65	30.4
64L	773183	13	575625	6464103	SNDS	2		1	1.3	22	4	1	4	2	0.1	70	0.5	1	1.00	9.4
64L	773184	13	574458	6463481	SNDS	5		1	1.3	34	10	1	9	4	0.1	30	1.0	4	0.60	31.0
64L	773185	13	572896	6463117	SNDS	5		1	1.4	42	10	1	9	4	0.1	170	1.0	2	1.90	27.6
64L	773186	13	572896	6463117	SNDS	5		1	1.7	42	10	1	8	4	0.1	180	1.0	2	1.90	27.8
64L	773187	13	571559	6461893	SNDS	7		1	2.4	86	15	1	14	9	0.1	295	2.0	5	6.00	38.8
64L	773188	13	574229	6461745	SNDS	5		1	1.2	38	8	1	7	4	0.1	40	0.5	2	0.65	25.0
64L	773189	13	575735	6462070	SNDS	6		1	0.8	84	9	1	7	14	0.1	410	0.5	3	3.60	40.0
64L	773190	13	566632	6446665	ATHL	4		1 1	56.3	60	14	2	11	3	0.1	140	0.5	4	1.50	62.8
64L	773191	13	577697	6461471	SNDS	2		1 1	0.6	36	4	1	6	2	0.1	25	0.5	2	0.30	36.2
64L	773192	13	576865	6459427	SNDS	5		1	1.5	52	8	1	7	2	0.1	40	0.5	1	0.20	35.2
64L	773193	13	574868	6451221		2		1	226.0	25	11	7	15	4	0.1	100	0.5	4	1.20	16.0
64L	773194	13	574591	6449375		3		1	39.7	42	29	1	20	6	0.1	70	0.5	3	0.85	34.6
64L	773195	13	572273	6449468	ATHL	5		1	108.0	50	27	3	13	5	0.1	160	0.5	1	1.45	33.0
64L	773196	13	569660	6449147	ATHL	2		1	19.3	28	5	1	9	3	0.1	30	0.5	2	0.45	32.8
64L	773197	13	564760	6448182	SNDS	3		1	0.6	36	5	1	7	3	0.1	120	0.5	1	0.75	45.6
64L	773198	13	563582	6447973	SNDS	2		1	1.5	37	4	1	5	6	0.1	1000	6.5	1	6.85	14.8
64L	773199	13	563743	6446412	SNDS	2		1	0.9	32	4	1	7	1	0.1	90	0.5	1	1.10	40.4
64L	773202	13	568998	6446681	WLST	3		1	4.2	54	5	1	9	4	0.1	165	0.5	1	1.60	57.6
64L	773203	13	570591	6447326	WLST	5		1 1	6.1	60	8	2	7	5	0.1	310	0.5	1	2.20	62.8
64L	773204	13	573530	6445366	WLST	2		1 1	228.0	34	21	1	13	3	0.1	40	0.5	4	1.60	29.2
64L	773205	13	575060	6445258		2		1	11.3	28	15	2	19	5	0.1	70	0.5	3	0.50	27.8
64L	773206	13	575772	6443782	WLST	2		1	1.7	72	6	1	8	6	0.1	320	0.5	1	2.25	60.8
64L	773294	13	581922	6470371	MDJT	3		1	8.0	38	8	1	13	3	0.1	125	0.5	1	0.95	25.8
64L	773295	13	577686	6470301	SNDS	8		1 1	5.3	61	16	1	14	4	0.1	620	3.0	5	16.00	45.2

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64L	773296	13	578261	6469215	ATMD	5		1	14.7	40	10	1	12	4	0.1	100	0.5	1	0.80	32.6
64L	773297	13	580109	6468613	ATMD	6		1	2.1	84	12	1	12	6	0.1	90	0.5	1	0.40	68.8
64L	773298	13	580349	6465731	SNDS	4		1	0.7	34	5	1	6	3	0.1	70	0.5	1	0.20	52.6
64L	773299	13	578876	6465865	ATMD	7		1	1.6	54	10	1	12	4	0.1	80	0.5	1	0.60	42.6
64L	773300	13	578330	6464554	SNDS	2		1	2.8	34	5	2	8	3	0.1	215	0.5	1	0.95	22.6
64L	773302	13	579858	6464536	SNDS	2		1	0.1	42	3	1	5	3	0.1	90	0.5	1	0.40	90.4
64L	773303	13	583323	6462398	WLST	2		1	4.3	86	11	1	10	5	0.1	295	0.5	1	2.60	55.0
64L	773304	13	583346	6461489	WLST	2		1	28.0	94	28	2	16	8	0.1	435	0.5	1	1.20	57.6
64L	773305	13	581554	6459929	WLST	2		1	10.9	87	12	1	14	4	0.1	250	0.5	1	3.25	43.4
64L	773306	13	581205	6460391	WLST	2		1	7.0	109	12	1	18	4	0.1	125	0.5	1	0.60	58.8
64L	773307	13	581205	6460391	WLST	2		1	7.7	123	14	1	21	6	0.1	150	0.5	1	0.70	58.8
64L	773308	13	580314	6459178	WLST	2		1	7.5	63	7	1	9	3	0.1	160	0.5	1	1.40	21.4
64L	773309	13	579118	6458496	WLST	2		1	8.3	60	25	2	28	10	0.1	210	0.5	1	0.90	30.8
64L	773311	13	579833	6458905	WLST	2		1	4.1	40	12	1	14	8	0.1	195	0.5	1	1.25	29.0
64L	773312	13	577707	6446961	WLST	6		1 1	5.9	44	10	1	12	7	0.1	355	0.5	1	1.70	9.8
64L	773313	13	579355	6444968	WLST	2		1	5.7	53	17	5	16	7	0.1	290	0.5	1	1.00	45.4
64L	761099	13	583350	6462600	WLST				4.9	60	12	2	10	5	0.1	245	1.5	1	2.00	55.8
64L	761110	13	581560	6459830	WLST				13.1	94	14	1	16	7	0.1	335	0.5	1	3.65	39.4
64L	761111	13	580170	6458870	WLST				8.7	80	10	1	11	5	0.1	210	0.5	1	2.40	29.2
64L	761112	13	575530	6451460						66	52	1	21	8	0.1	205	0.5	4	4.90	49.4
64L	761113	13	575730	6451460						68	53	1	22	8	0.1	215	0.5	2	5.40	48.4
64L	761340	13	570000	6465500	SNDS				1.5	92	12	6	6	5	0.1	580	0.5	1	5.15	40.4
64L	761341	13	575100	6463510	SNDS				1.2	32	7	6	5	4	0.1	180	0.5	1	1.50	37.6
64L	761342	13	575430	6465600	SNDS				1.6	46	6	3	6	4	0.1	345	0.5	1	1.70	35.8
64L	761343	13	578530	6466530	MDJT				0.7	58	6	1	5	3	0.1	160	0.5	1	2.10	64.8
64L	761344	13	575800	6468920	SNDS					32	4	7	4	2	0.1	65	0.5	1	0.35	28.4
64L	761345	13	577100	6469830	SNDS					28	8	9	6	6	0.1	210	0.5	1	0.70	29.2
64L	761346	13	578270	6469320	ATMD				19.6	49	16	5	12	6	0.1	135	1.5	3	3.45	42.6
64L	761349	13	568230	6469680	SNDS				1.5	54	9	4	6	2	0.1	255	0.5	2	3.20	43.8
64L	761350	13	566370	6468000	SNDS				2.1	44	7	5	6	3	0.1	260	1.5	1	1.75	33.6
64L	761351	13	562220	6467400	SNDS				2.4	38	12	3	14	5	0.1	80	0.5	1	0.30	20.2
64L	761352	13	565000	6465000	SNDS				2.2	38	9	2	8	4	0.1	385	1.5	2	1.70	26.8
64L	761353	13	567060	6465960	SNDS				2.8	100	14	12	10	7	0.1	1900	2.5	4	8.10	36.4
64L	761354	13	566450	6461830	SNDS				2.6	102	13	1	10	6	0.1	640	1.5	4	12.50	35.6
64L	761355	13	559800	6463780	SNDS				2.9	28	9	1	11	5	0.1	40	0.5	1	0.30	37.4
64L	761356	13	559000	6461730	SNDS				5.2	75	16	1	15	10	0.1	590	27.0	7	17.00	55.0
64L	761357	13	560000	6458720	SNDS				2.7	104	10	1	12	11	0.1	715	80.0	17	23.50	37.0
64L	761364	13	559430	6447420	SNDS				1.7	14	3	1	4	3	0.1	150	2.0	1	0.80	8.6
64L	761375	13	559270	6446300	SNDS				1.5	28	5	6	8	3	0.1	135	0.5	1	1.00	32.0
64L	761402	13	565600	6459500	SNDS				1.5	38	8	5	6	4	0.1	570	0.5	1	1.30	31.6
64L	761403	13	566500	6458200	SNDS				1.6	39	4	3	6	4	0.1	170	2.0	1	2.80	21.0
64L	761404	13	568430	6458180	SNDS				2.0	56	7	1	9	5	0.1	140	0.5	1	1.00	34.0
64L	761405	13	570650	6461750	SNDS				2.6	92	16	2	15	12	0.1	415	2.5	2	5.45	53.8
64L	761406	13	572230	6459250	SNDS				1.5	68	11	5	10	3	0.1	60	0.5	1	0.35	65.2
64L	761408	13	571280	6453250	SNDS				0.8	36	6	14	5	1	0.2	120	0.5	1	0.85	46.4
64L	761410	13	567600	6455250	SNDS				1.4	60	7	2	7	3	0.1	390	0.5	2	2.60	33.2
64L	761411	13	565590	6451530	SNDS				1.7	54	7	5	7	5	0.1	250	2.0	4	2.70	38.6
64L	761412	13	566830	6449300	SNDS				1.8	34	4	1	4	5	0.1	435	1.0	1	4.70	15.4
64L	761413	13	565700	6447020	ATWL				10.1	46	8	2	9	4	0.1	330	2.5	3	3.90	36.6
64L	761414	13	563200	6444360	ATWL				7.6	64	10	13	12	4	0.1	435	2.0	2	3.10	34.4

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64L	761415	13	559430	6443750	SNDS				1.5	26	5	7	4	2	0.1	695	0.5	3	0.95	47.0
74I	761175	13	555000	6463600	SNDS				2.1	72	10	1	9	5	0.1	150	0.5	1	1.50	64.0
74I	761176	13	555480	6464140	SNDS				2.2	104	12	1	9	5	0.1	150	0.5	2	1.80	56.6
74I	761177	13	556000	6465220	SNDS				2.2	72	12	1	9	4	0.1	130	0.5	2	1.30	62.8
74I	761178	13	556550	6465780	SNDS				2.0	76	11	1	9	3	0.1	130	0.5	1	1.20	54.2
74I	761179	13	555700	6466220	SNDS				2.2	64	12	4	8	4	0.1	165	0.5	1	1.30	57.4
74I	761180	13	555400	6465000	SNDS				2.4	88	15	1	10	5	0.1	125	0.5	3	1.00	65.2
74I	761181	13	554860	6465250	SNDS				2.5	56	9	1	7	4	0.1	170	0.5	1	1.10	61.0
74I	761182	13	554800	6464800	SNDS				4.9	80	8	1	7	4	0.1	160	1.5	2	2.30	47.2
74I	761183	13	554450	6463800	SNDS				8.4	100	10	1	10	3	0.1	220	7.0	7	2.35	50.0
74I	761184	13	553830	6462760	SNDS				5.1	58	8	2	9	4	0.1	165	2.0	4	2.00	46.4
74I	761185	13	553300	6462150	SNDS				5.2	50	8	5	10	4	0.1	160	1.5	3	2.00	50.4
74I	761186	13	553580	6462050	SNDS				6.9	58	7	2	10	5	0.1	250	3.0	5	2.60	46.2
74I	761187	13	550900	6463900	SNDS				1.4	60	4	2	5	2	0.1	90	0.5	3	1.20	50.0
74I	761188	13	552000	6465520	SNDS				1.2	42	5	2	5	2	0.1	100	0.5	2	1.40	50.8
74I	761189	13	551500	6466510	SNDS				1.4	40	3	1	5	2	0.1	65	0.5	1	0.60	43.0
74I	761190	13	550600	6466800	SNDS				1.4	16	2	1	3	1	0.1	110	0.5	1	0.45	14.6
74I	761191	13	549800	6468100	SNDS				1.1	18	2	1	4	1	0.1	150	0.5	1	0.50	13.8
74I	761192	13	548400	6467140	SNDS				1.1	20	3	1	3	2	0.1	230	2.5	1	1.40	11.8
74I	761193	13	548330	6465350	SNDS				1.1	19	2	1	3	1	0.1	275	0.5	1	0.65	12.4
74I	761194	13	547660	6463800	SNDS				1.4	26	4	4	4	1	0.1	185	0.5	1	0.60	27.8
74I	761195	13	546850	6465530	SNDS				1.9	39	7	4	6	1	0.1	250	1.5	1	1.10	32.4
74I	761196	13	546000	6466200	SNDS				1.8	50	6	5	8	2	0.1	240	1.5	1	0.85	35.0
74I	761197	13	546170	6467800	SNDS				0.9	24	4	3	4	2	0.1	155	0.5	1	0.50	36.0
74I	761298	13	548000	6470300	SNDS				1.9	51	9	2	11	5	0.1	165	0.5	1	1.00	57.0
74I	761358	13	557000	6464000	SNDS				1.7	62	12	3	12	6	0.1	165	0.5	1	1.30	46.2
74I	761359	13	556180	6461300	SNDS				1.3	80	12	1	11	7	0.1	230	0.5	1	4.55	45.0
74I	761360	13	552330	6462000	SNDS				3.1	50	9	2	15	6	0.1	55	5.0	5	1.60	41.4
74I	761361	13	552600	6460720	SNDS				2.2	82	11	1	9	4	0.1	90	0.5	1	1.00	59.2
74I	761362	13	553900	6458230	SNDS				0.7	18	5	4	7	1	0.1	80	0.5	1	0.60	33.6
74I	761363	13	551700	6457320	SNDS				1.7	62	9	4	8	5	0.1	20	1.0	1	2.60	62.0
74I	761365	13	548680	6460190	SNDS				1.2	36	10	7	8	4	0.1	110	0.5	1	0.45	52.0
74I	761366	13	546300	6456950	SNDS				1.1	42	5	3	4	2	0.1	100	0.5	1	0.40	26.2
74I	761369	13	549430	6450200	SNDS				2.4	104	12	1	10	8	0.1	460	5.5	3	16.00	46.6
74I	761370	13	551250	6454300	SNDS				2.5	200	18	4	13	3	0.1	100	0.5	1	0.70	55.4
74I	761371	13	553700	6454400	SNDS				3.9	58	9	1	23	6	0.1	335	36.0	8	15.50	30.2
74I	761372	13	556630	6453270	SNDS				0.8	49	6	7	7	3	0.1	60	0.5	1	0.35	60.4
74I	761376	13	557350	6446240	SNDS				1.6	40	8	2	8	3	0.1	380	1.0	1	2.05	28.2
74I	761377	13	557870	6445740	SNDS				1.8	42	8	2	8	3	0.1	525	0.5	1	2.10	35.6
74I	761378	13	557300	6444880	SNDS				1.4	44	6	1	6	2	0.1	580	0.5	1	1.90	43.4
74I	761380	13	557450	6443200	SNDS				1.7	28	5	1	6	3	0.1	410	0.5	1	1.75	17.8
74I	761398	13	544300	6448600	SNDS				1.6	30	3	2	3	2	0.1	290	0.5	1	0.30	6.0
74I	761399	13	544400	6451350	SNDS				1.6	29	5	3	4	2	0.1	210	1.5	1	0.90	16.0
74I	761423	13	553900	6442600	SNDS				3.2	90	14	1	12	6	0.1	360	1.5	2	6.25	51.0
74I	761424	13	550680	6447230	SNDS				0.9	60	8	3	5	5	0.1	110	0.5	1	1.90	57.0
74I	761425	13	554900	6449240	SNDS				1.6	76	10	4	9	6	0.1	390	3.5	2	6.50	46.6
74I	761426	13	556730	6449340	SNDS				2.3	80	7	1	11	4	0.1	650	37.0	1	1.50	9.2