amec

14 May 2008

Reference: 2AM-JER0410

ORIGINAL

Nunavut Water Board
1 Water Street
Box 119
Gjoa Haven, NU
X0B 1J0
Attention: Licensing Administrator

Dear Ms. Beaulieu

Re: 2007 Aquatic Effects Monitoring Report – Water Quality Addendum

On behalf of Tahera Diamond Corporation (Tahera), AMEC Earth & Environmental is pleased to provide the attached water quality assessment addendum report to the 2007 Aquatic Effects Monitoring report which will be submitted under separate cover. Tahera will provide printed copies shortly.

I trust you will find all in order. Please call the undersigned or Mr. Greg Missal should you have any questions.

Yours truly,

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c: G. Missal, M. Johnson, A. Coster: Tahera

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TAHERA
DIAMOND CORPORATION

2007 Aquatic Effects Monitoring Report

Water Quality Assessment Addendum

Jericho Diamond Mine, Nunavut

Submitted to:

Tahera Diamond Corporation

Toronto, Ontario

Submitted by:

AMEC Earth & Environmental

A Division of AMEC Americas Ltd.

Burnaby, BC

May 2008

VE51295.3100

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1.0 Introduction

1.1 Background

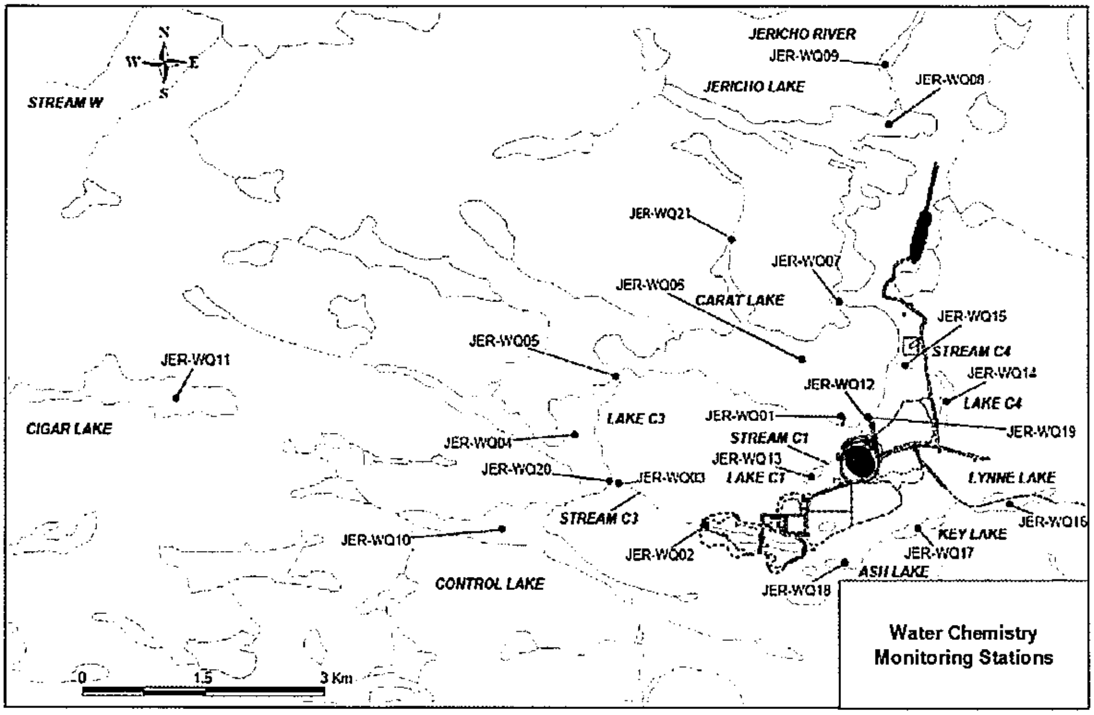
Tahera Diamond Corporation (Tahera) was issued a water license **NWB1JER0410** 22 December 2004 (subsequently changed to **2AMJER0410**) by Nunavut Water Board (NWB) for the Jericho Diamond Mine (Jericho). An annual aquatic effects monitoring report is provided pursuant to Water License Part K and Schedules K and L.

This water quality addendum provides an update assessment of water quality and effects from Jericho for 2007. Potential effects on water quality from mining the Jericho deposit were assessed as part of the Jericho Project Final Environmental Impact Statement to Nunavut Impact Review Board (NIRB) January 2003 (Tahera 2003) and elaborated upon for the water license application in 2004 (Tahera 2004). This update assesses water quality effects noted from monitoring of water chemistry prior to mining through 2007 in the context of predicted effects.

This addendum report should be read with the 2007 Aquatic Effects Monitoring report submitted under separate cover.

1.2 Monitoring Station Locations

The surveillance network program (SNP) established for Jericho includes a relatively large number of sites located upstream, the mine discharge point, downstream near the mine discharge point, and downstream at various distances from the mine discharge point. As well, two lakes and a stream that may be influenced by mine operations, one control lake in a separate drainage, and one stream not influenced by mine operations are included in the network. The latter stream was added by Jericho in 2007. Figure 1-1 provides a map of the SNP station locations.



Source: Mainstream Aquatics

Figure 1-1: SNP Station Locations

2.0 Discharge Limits and Environmental Guidelines

Table 2-1 compares mine effluent discharge limits, site specific water quality objectives, federal (CCME 2002) environmental quality guidelines for protection of freshwater aquatic life, and Canadian drinking water guidelines. Most mine water quality objectives default to CCME, with the few exceptions noted. Objectives and guidelines are guides to acceptable quality whereas discharge limits are legally binding standards the mine must meet.

Table 2-1: Water Quality Parameters Relevant to Jericho Operations

General Parameters		Discharge Limits		Site Specific Water Quality Objectives	Canadian Environmental Quality Guidelines	
		Average	Maximum		Freshwater Aquatic Life	Drinking water
pH	pH	6 - 8.8	6 - 8.8		6.5 - 9	
Total Dissolved Solids	mg/L	2000	4000	400		
Total Suspended Solids	mg/L	15	25			
Chloride (Cl)	mg/L	500	1000	150		
Ammonia as N	mg/L	6	12	0.59		
Nitrate (as N)	mg/L	28	56	13	13	
Nitrite (as N)	mg/L	2.5	5	0.25	0.06	
Total Phosphate as P	mg/L	0.2	0.4			
Aluminum (Al)-Total	mg/L	1.5	3	0.16	0.005 - 0.1	
Antimony (Sb)-Total	mg/L					0.006
Arsenic (As)-Total	mg/L	0.05	0.1	0.005	0.005	0.01
Barium (Ba)-Total	mg/L					1
Boron (B)-Total	mg/L					5
Cadmium (Cd)-Total	mg/L	0.0012	0.0024	0.00017	0.000017	0.005
Chromium (Cr)-Total	mg/L	0.087	0.17	0.0089	0.001	0.05
Copper (Cu)-Total	mg/L	0.02	0.04	0.004	0.002 - 0.004	
Iron (Fe)-Total	mg/L				0.3	
Lead (Pb)-Total	mg/L	0.01	0.02	0.001	0.001 - 0.007	0.01
Mercury (Hg)-Total	mg/L				0.000026	0.001
Molybdenum (Mo)-Total	mg/L	0.73	1.5	0.073	0.073	
Nickel (Ni)-Total	mg/L	0.05	0.1	0.025	0.025 - 0.15	
Selenium (Se)-Total	mg/L				0.001	0.01
Silver (Ag)-Total	mg/L				0.0001	
Uranium (U)-Total	mg/L	0.5	1	0.02		0.02
Zinc (Zn)-Total	mg/L	0.25	0.5	0.03	0.03	
Aluminum (Al)-Dissolved	mg/L	1	2			

Discharge limits were based on an analysis of the receiving environment assimilation capacity and the probable minimum concentrations the mine could achieve in effluent discharge. The assimilation capacity assessment was based on dynamic modelling of the first lake reached by the stream into which effluent was to be discharged (Lake

C3)[1]. Predicted effluent discharge concentrations were calculated using scaled up laboratory test results by SRK (Tahera 2004); a summary of predictions provided in the water license application is attached to this report as Appendix A.

[1] For additional information, see Water License Application, Appendix V (Tahera 2004).

3.0 Water Chemistry Assessment

3.1 Program Scope

The water chemistry assessment presented in this report is based on the parameters regulated by the Jericho water license, listed in Table 2-1, with the exceptions of fecal coleforms, oil and grease, and biochemical oxygen demand. The limits for these parameters are listed in Table 3-1. They are not discussed further in this report because discharge limits were never approached and these parameters were not measured in the receiving environment, other than the freshwater intake for the mine.

Table 3-1: Water License Limits Not Listed in Table 2-1

Parameter	Maximum	Average
Fecal coleform	20 CFU/100 mL	10 CFU/100 mL
Oil and grease	5 mg/L	3 mg/L
BOD_5	25 mg/L	15 mg/L

This section treats both spatial (between station) and temporal (over the time span of available water chemistry data) distribution of data. Data are summarized in tables and graphs, as appropriate to the parameters being discussed. For spatial variation, stations are grouped in logical units as follows (Table 3-2):

Table 3-2: Station Groupings for Spatial Variation Comparisons

Location	Station	Monitoring Purpose
Cigar Lake	JER-WQ11	Separate drainage basin control
Control Lake	JER-WQ10	Upstream drainage basin control
Lake C3 S basin	JER-WQ04	1st receiving lake, near field
Lake C3 Outlet	JER-WQ05	1st receiving lake, near field
Carat Lake Centre	JER-WQ06	2nd receiving lake, mid field
Carat Lake Water Intake	JER-WQ01	Freshwater supply
Carat Lake Outlet	JER-WQ07	2nd receiving lake, mid field
Jericho Lake	JER-WQ08	3rd receiving lake, far field
Jericho River	JER-WQ09	Downstream on IOL
PKCA West Dam	JER-WQ02	Mine effluent discharge
Stream C3 – mouth	JER-WQ03	Effluent discharge stream
Lake C1	JER-WQ13	Mine influenced, near field lake
Stream C1 – mouth	JER-WQ12	Mine influenced, near field stream
Lake C4	JER-WQ14	Mine influenced, mid field lake
Stream C4	JER-WQ15	Mine influenced, mid field stream
Stream C6 – control	JER-WQ21	Control stream outside mine influence
Ash Lake	JER-WQ16	Separate drainage, possible mine influence
Key Lake	JER-WQ17	
Lynne Lake	JER-WQ18	

Summary statistics for spatial variation are based on all data available. Table 3-3 lists the years of data available for each of the stations listed in Table 3-2; duplicate data, collected for QA purposes, were not analyzed.

Table 3-3: Years Water Chemistry Data Collected

Station	Data Period
JER-WQ11	1995 - 1999, 2005 - 2007
JER-WQ10	2005 - 2007
JER-WQ04	1999, 2005 - 2007
JER-WQ05	1995 - 1998, 2005 - 2007
JER-WQ06	1995 - 1998, 2005 - 2007
JER-WQ01	2005 - 2007
JER-WQ07	1995 - 1999, 2005 - 2007
JER-WQ08	1995 - 1999, 2005 - 2007
JER-WQ09	2005 - 2007
JER-WQ02	1999, 2005 - 2007
JER-WQ03	2005 - 2007
JER-WQ13	1995 - 1996, 2005 - 2007
JER-WQ12	2005 - 2007
JER-WQ14	2005 - 2007
JER-WQ15	2005 - 2007
JER-WQ21	2007
JER-WQ16	1996, 2005 - 2007
JER-WQ17	1996, 2005 - 2007
JER-WQ18	1996, 2005 - 2007

Water chemistry data spans from 1995 through 2007; all data were analyzed except in cases where historical detection limits were so high as to distort results. As well, because many parameter concentrations are very low, frequently patterns of temporal distribution are driven by changes in detection limits over time rather than changes in actual concentration at a particular station; where this was assessed to be the case it is noted.

Raw data used in this assessment are attached in Appendix B. All these data have been previously presented in reports to NIRB and NWB and are provided here for convenience of reference.

3.2 Field Methods

Water is collected using a Kemerer sampling bottle (similar to Van Dorn bottle) from approximately one metre below the water surface or lower ice surface in winter and early spring. Water samples are collected monthly during the summer (June through September), December and April (from under ice). Clean transfer methods are employed: a technician using latex gloves exclusively handles water sampling and a separate field crew operate the boat or snow machine and ice auger. Bottles prepared and supplied by the laboratory are filled, preservatives added as required and the water samples shipped immediately to the analysis laboratory per procedures detailed in the mine's General Monitoring and QA/QC Plans. A YSI model 556 multi-probe is used to measure temperature, pH, conductivity, dissolved oxygen (concentration and per cent saturation), and oxidation-reduction potential in the field per requirements of the mine's water license. Field measurements together with laboratory analyses are reported monthly to NWB and collated in an annual data report for the Board.

3.3 Total Dissolved Solids

3.3.1 Spatial Variation

Table 3-4 provides the spatial variation found for total dissolved solids. The discharge maximum for mine effluent is 4000 mg/L.

Table 3-4: Spatial Variation of Total Dissolved Solids

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	25	2	11	11	14	30	5.9	0.5	20%
Control Lake	JER-WQ10	13	<10	13	13	14	30	6.5	0.5	23%
Lake C3 S basin	JER-WQ04	17	<10	12	15	18	40	9.3	0.6	24%
Lake C3 Outlet	JER-WQ05	19	2	11	11	16	19	4.8	0.4	16%
Carat Lake Centre	JER-WQ06	23	4	10	11	14	17	4.1	0.4	13%
Carat Lake Water Intake	JER-WQ01	2	<10	10	10	13	15	7.1	0.7	50%
Carat Lake Outlet	JER-WQ07	23	<10	11	12	14	32	5.5	0.5	9%
Jericho Lake	JER-WQ08	25	<10	12	12	14	40	7.0	0.6	16%
Jericho River	JER-WQ09	13	<10	15	16	19	40	10.4	0.7	31%
PKCA West Dam	JER-WQ02	36	<10	116	124	200	231	70.3	0.6	6%
Stream C3 - mouth	JER-WQ03	10	<10	27	49	69	173	52.8	1.1	20%
Lake C1	JER-WQ13	19	<10	37	31	42	66	18.4	0.6	16%
Stream C1 - mouth	JER-WQ12	9	13	44	49	74	101	29.4	0.6	0%
Lake C4	JER-WQ14	10	<10	19	20	26	36	9.4	0.5	10%
Stream C4	JER-WQ15	9	<10	16	19	21	48	13.2	0.7	22%
Stream C6 - control	JER-WQ21	3	11	15	14	16	17	3.1	0.2	0%
Ash Lake	JER-WQ16	8	<10	13	14	16	22	5.6	0.4	13%
Key Lake	JER-WQ17	7	<10	11	11	14	16	3.7	0.3	14%
Lynne Lake	JER-WQ18	8	8	10.5	12	13	24	5.2	0.4	0%

3rd Qrt: third quartile SD: standard deviation CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

A number of measures of central tendency are listed in the table together with ranges. Variability in data is shown by the standard deviation and the coefficient of variation which provides a measure of variation corrected for the numerical values of the data and thus allows a comparison of the variability of numerically different data – the lower the coefficient of variation, the less variable the data. Evident from the table is that TDS values on average were highly variable and thus the predictive value of the means is generally low. Another source of unknowns are values less than detection (<MDL). For the statistical analyses in this report, less than detection values were set at one half the detection limit, but of course, the values could be anywhere from close to zero to just below detection. As well, with data that spanned the full range of collection time, detection limits often varied, up to more than an order of magnitude in

some cases, which introduced yet another uncertainty. Statistical summaries and trends therefore must be viewed as approximations, or best guesses. However, the analyses do provide some direction for environmental management and are still valuable.

Water in contact with processed kimberlite is relatively high (against regional water bodies) in total dissolved solids (TDS) (essentially major ions, principally chloride and sulphate). As expected the highest mean TDS is the mine discharge, followed by the discharge stream. Lake C1 and Stream C1 are also elevated above background. Although no mine discharge or direct runoff to these water bodies occurs, they are both close to mining activities and are influenced largely from airborne particulates from the mine. Lake C4 and Stream C4 also show influence from the mine, but to a lesser extent than C1 water bodies.

The mean effluent discharge TDS from the processed kimberlite containment area (PKCA) polishing pond is over 17 times less than the allowable maximum discharge and is therefore well below the discharge criterion. As well, based on receiving water body results downstream of Streams C3 and C1, TDS does not appear to be elevated significantly.

3.3.2 Temporal Variation

Temporal variation of TDS is shown for the stations analyzed on Figure 3-1. Evident from the figure is that there is a general trend of slightly increasing TDS regionally independent of the mine. The reason for this trend is not apparent from the data. Imposed on this regional trend is a more marked increase over time in TDS at JER-WQ2 (sampled for baseline as Long Lake). This more marked temporal increase is reflected to a lesser extent at JER-WQ3 at the mouth of Stream C3. Stream C3 base flows dilute the PKCA discharge to ½ to ⅓ the effluent concentration, depending on season. There is no apparent effect on TDS in Lake C3 (JER-WQ4) or downstream.

Likewise, TDS is also elevated after mine start up in Lake C1 (JER-WQ13) and Stream C1 (JER-WQ12) but is not apparent in Carat Lake at the closest station (JER-WQ1). Similarly, the increase in TDS after mine start up at Lake C4 (JER-WQ14) and Stream C4 (JER-WQ15) is not apparent in Carat Lake. The lakes measured in the Lynne Lake drainage system south of the mine were not affected by mine operation with respect to TDS.

Although elevated somewhat above background, current TDS levels are below those that are know to cause effects (approximately 400 mg/L [AMEC 2004; attached to this report as Appendix C]) and thus no management actions are required at this time.

3.4 Total Suspended Solids

Total suspended solids in discharge were well below discharge criteria, created no measurable increases in Stream C3 which receives effluent, and are therefore not discussed further in this report.

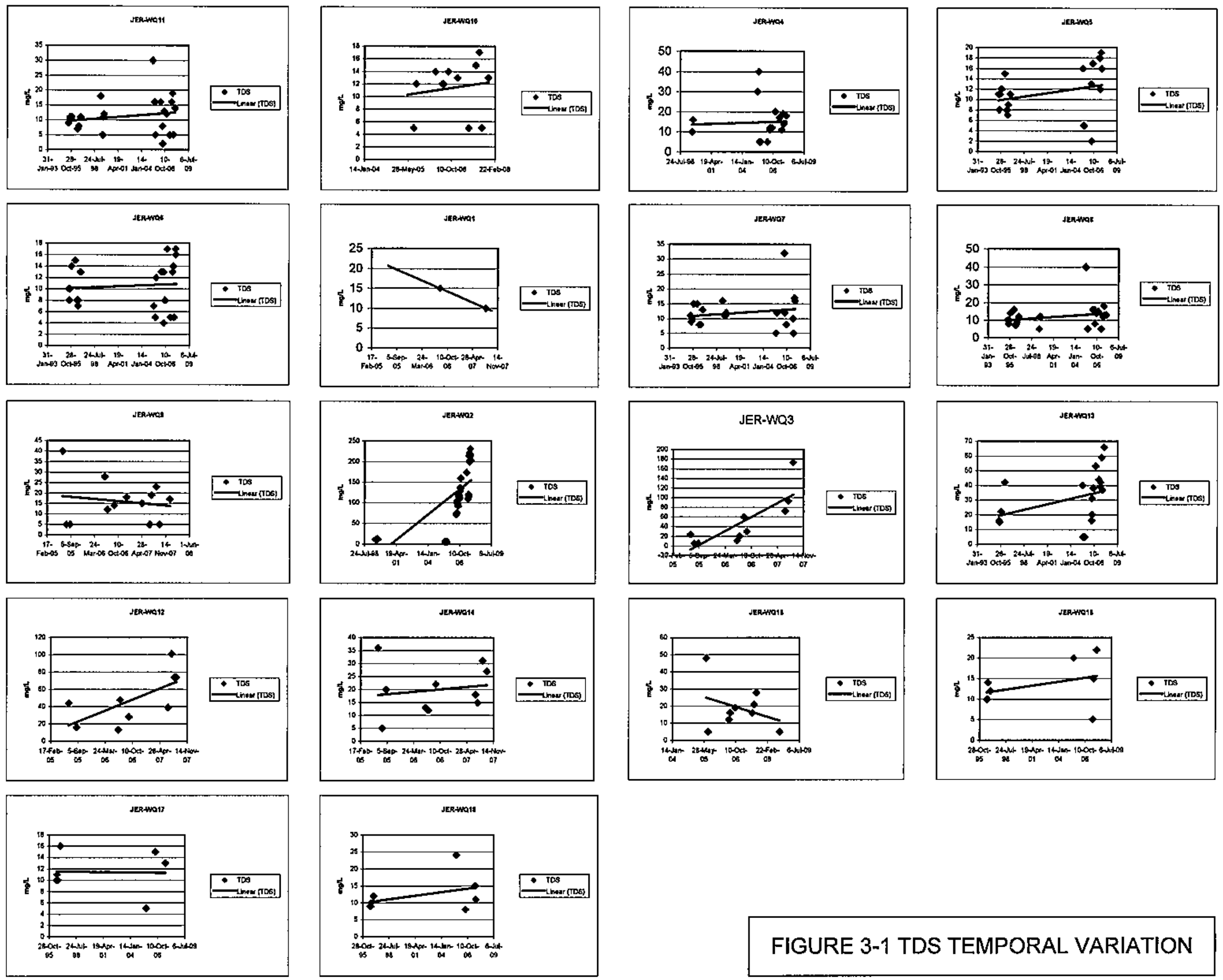


FIGURE 3-1 TDS TEMPORAL VARIATION

3.5 Ammonia

Ammonia is a by-product of blasting with nitrogen based explosives (ammonium nitrate in the case of Jericho) and would therefore be expected to be elevated in any mine water receiving runoff or seepage from ore and waste. Ammonia is also toxic to aquatic organisms at relatively low concentrations and is therefore a parameter of management concern at most mines.

3.5.1 Spatial Variation

The average concentration of ammonia at SNP stations is listed in Table 3-5. The allowable discharge maximum for mine effluent is 12 mg/L. Third quartile and maximum concentrations listed are a measure of the influence of mining operations for stations downstream of effluent discharge.

Table 3-5: Spatial Variation of Ammonia

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	26	<0.005	0.007	0.013	0.014	0.05	0.015	1.181	54%
Control Lake	JER-WQ10	14	<0.005	0.011	0.020	0.025	0.05	0.017	0.866	29%
Lake C3 S basin	JER-WQ04	17	<0.005	0.019	0.021	0.043	0.05	0.019	0.893	53%
Lake C3 Outlet	JER-WQ05	20	<0.005	0.010	0.015	0.014	0.05	0.016	1.028	40%
Carat Lake Centre	JER-WQ06	24	<0.005	0.013	0.029	0.031	0.24	0.048	1.662	25%
Carat Lake Water Intake	JER-WQ01	3	<0.005	0.015	0.014	0.018	0.02	0.006	0.439	0%
Carat Lake Outlet	JER-WQ07	24	<0.005	0.010	0.014	0.017	0.05	0.015	1.073	42%
Jericho Lake	JER-WQ08	26	<0.005	0.012	0.016	0.020	0.05	0.015	0.959	38%
Jericho River	JER-WQ09	14	<0.005	0.010	0.020	0.031	0.05	0.018	0.919	36%
PKCA West Dam	JER-WQ02	37	<0.005	0.116	0.204	0.240	1.460	0.294	1.444	16%
Stream C3 - mouth	JER-WQ03	11	<0.005	0.010	0.020	0.035	0.050	0.020	1.003	55%
Lake C1	JER-WQ13	21	<0.005	0.020	0.029	0.043	0.088	0.020	0.699	24%
Stream C1 - mouth	JER-WQ12	10	<0.005	0.010	0.018	0.020	0.050	0.018	0.995	40%
Lake C4	JER-WQ14	11	0.009	0.012	0.024	0.045	0.050	0.019	0.779	27%
Stream C4	JER-WQ15	9	<0.005	0.022	0.028	0.050	0.050	0.018	0.661	44%
Stream C6 - control	JER-WQ21	3	0.01	0.012	0.015	0.017	0.021	0.006	0.385	0%
Ash Lake	JER-WQ16	8	0.0025	0.015	0.019	0.026	0.050	0.015	0.779	25%
Key Lake	JER-WQ17	7	0.0025	0.020	0.022	0.028	0.050	0.016	0.738	29%
Lynne Lake	JER-WQ18	8	0.0067	0.015	0.018	0.019	0.050	0.014	0.765	13%

Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

Ammonia data are highly variable as shown by the coefficient of variation; standard deviations are often near or greater than the means; the number of data less than detection was also quite variable with no particular pattern. The highest mean concentration of ammonia was the PKCA polishing pond where discharge takes place. All other stations were much lower and this is likely due to the unstable nature of ammonia which oxidizes readily to nitrate and thus is not a particularly good indicator of the spatial influence of mine discharge.

The mean concentration of ammonia in PKCA discharge in 2006 and 2007 was 50 times lower than the maximum allowable concentration indicating there is no issue with ammonia in PKCA supernatant water at this time.

3.5.2 Temporal Variation

Temporal variation comparisons are provided in Figure 3-2. Trends for all but JER-WQ1 and JER-WQ2 are largely driven by detection limits. In 2005 the laboratory provided a detection limit of 0.10 mg/L for ammonia which was much higher than the 0.005 mg/L detection limit of earlier and later samples. Thus, with ammonia concentrations typically much below 0.10, trends are masked. Variability in ammonia concentrations increased markedly at JER-WQ2 once discharge commenced. Variability was also increased at JER-WQ3. All together the data do not provide useful indications of trends in ammonia concentration.

3.6 Nitrate

Nitrate is also a by product of blasting and, while soluble and therefore mobile, is a better indication of spatial extent of mine influence than ammonia. Nitrate is utilized by plants and therefore is not conservative but, as phosphate is limiting in the freshwater aquatic environment at Jericho, nitrate is likely not fully utilized by plants.

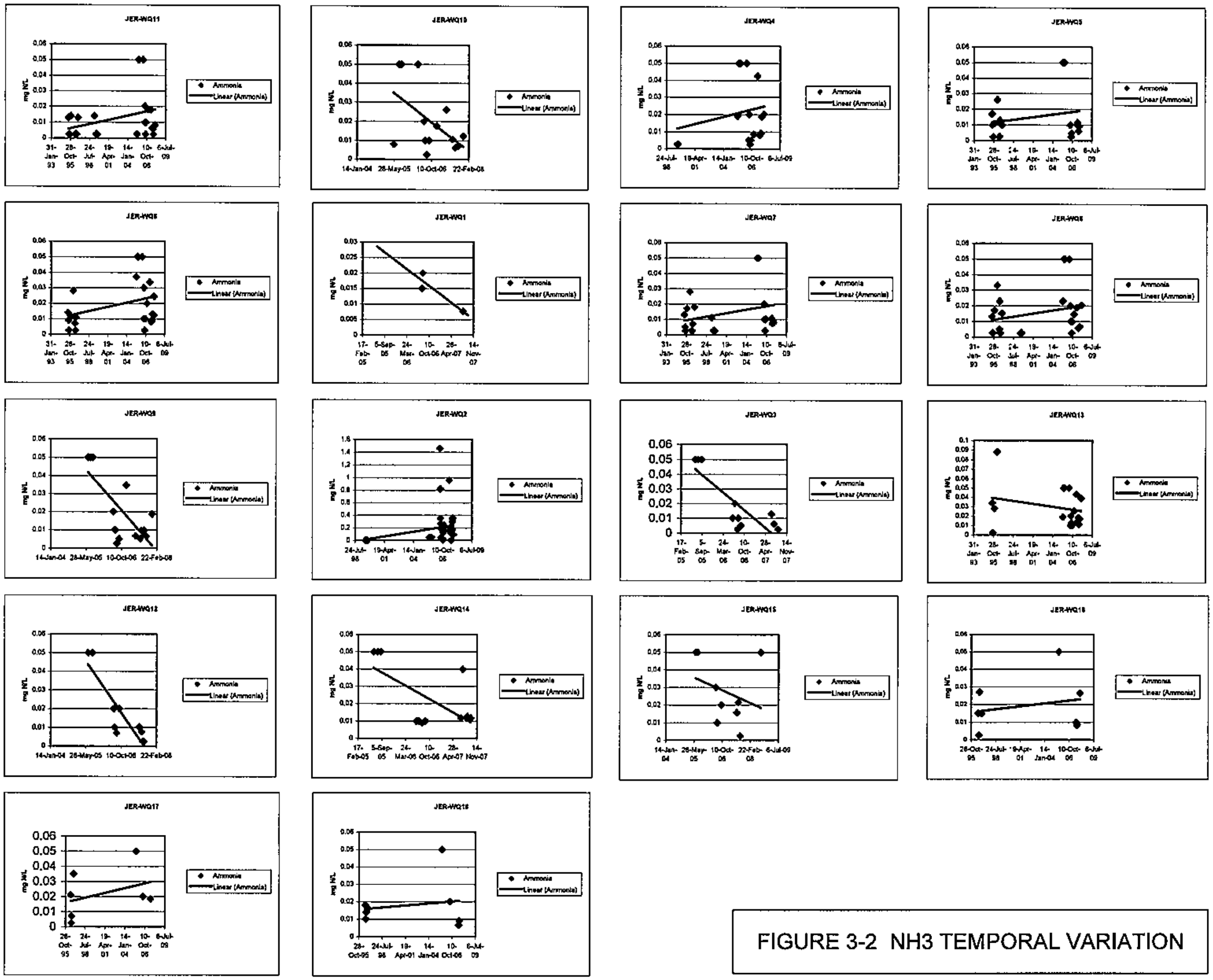


FIGURE 3-2 NH3 TEMPORAL VARIATION

3.6.1 Spatial Variation

Table 3-6 list spatial variation found at SNP stations.

Table 3-6: Spatial Variation of Nitrate

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	27	<0.005	0.003	0.011	0.018	0.060	0.013	1.246	74%
Control Lake	JER-WQ10	13	<0.005	0.025	0.019	0.025	0.026	0.009	0.468	62%
Lake C3 S basin	JER-WQ04	17	<0.005	0.025	0.082	0.067	0.313	0.103	1.263	47%
Lake C3 Outlet	JER-WQ05	21	<0.005	0.025	0.055	0.054	0.280	0.079	1.439	38%
Carat Lake Centre	JER-WQ06	25	<0.002	0.025	0.027	0.039	0.092	0.025	0.928	40%
Carat Lake Water Intake	JER-WQ01	2	<0.05	0.053	0.053	0.066	0.080	0.039	0.741	0%
Carat Lake Outlet	JER-WQ07	25	<0.005	0.024	0.118	0.025	2.500	0.496	4.195	40%
Jericho Lake	JER-WQ08	27	<0.005	0.007	0.011	0.021	0.042	0.011	0.968	63%
Jericho River	JER-WQ09	13	0.0106	0.025	0.036	0.033	0.153	0.037	1.021	38%
PKCA West Dam	JER-WQ02	36	<0.005	7.65	8.31	15.60	17.80	5.97	0.72	8%
Stream C3 - mouth	JER-WQ03	10	<0.05	1.43	3.04	4.44	12.70	4.07	1.34	30%
Lake C1	JER-WQ13	20	<0.005	0.450	0.753	1.233	2.590	0.828	1.100	10%
Stream C1 - mouth	JER-WQ12	9	<0.05	1.220	1.488	2.320	3.970	1.281	0.861	11%
Lake C4	JER-WQ14	10	<0.005				<0.05			80%
Stream C4	JER-WQ15	9	0.0109	0.060	0.054	0.080	0.118	0.035	0.650	33%
Stream C6 - control	JER-WQ21	3	0.01	0.012	0.037	0.051	0.090	0.046	1.260	0%
Ash Lake	JER-WQ16	8	<0.005	0.029	0.037	0.068	0.077	0.031	0.827	25%
Key Lake	JER-WQ17	7	<0.005	0.007	0.024	0.034	0.080	0.032	1.337	29%
Lynne Lake	JER-WQ18	8	<0.005				0.025			75%

Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

As indicated by the coefficient of variation, nitrate concentrations were highly variable over the measurement period with the standard deviation often being greater than the mean; in the case of Carat Lake outlet over four times the mean. This indicates a low confidence in the mean and median estimates. However, the difference between PKCA discharge and background is great enough that the variability in the data does not mask the effects of the PKCA discharge at near field stations. The PKCA mean discharge was still over six times lower than the allowable maximum discharge. Nitrate is not particularly toxic and therefore the relatively high guideline concentration for freshwater aquatic life protection of 13 mg/L. Thus the PKCA mean nitrate discharge concentration was a little more than half the receiving environment guide.

Stream C3 at its mouth had the highest mean nitrate concentration after the PKCA discharge, which would be expected given the difference above background of the PKCA nitrate concentration. Nitrate was somewhat elevated in Lake C3 and Carat

Lake (Carat Lake outlet had one anomalous nitrate reading of 2.5 mg/L in August 1998, or well above the lake average concentration, which distorted the mean, whereas the median concentration was about at background). From Carat Lake downstream, nitrate concentrations dropped back to near background.

Lake C1 and Stream C1 show the influence of proximity to the mine with somewhat elevated concentrations of nitrate. Since there is no direct drainage from the mine site to these water bodies the most likely source was airborne dust from blasting, waste rock and stockpiled ore. However, nitrate concentrations were about 1/10th the guideline concentration and of no concern. Lake C4 nitrate concentrations were always below detection. Stream C4 has slightly elevated mean concentration of nitrate which showed some possible influence from mining activities. Visible dust does not carry that far away from the open pit, thus the source may have been fine suspended particulates carrying nitrogen from blasting. Ash, Key and Lynne lakes which could also be expected to be influenced by nitrate carried by wind from the mine site were near, or at, background concentrations indicating little or no influence from the mine blasting activities based on mean readings but do show effects at 3rd quartile and maximum readings.

3.6.2 Temporal Variation of Nitrate

Figure 3-3 shows temporal variation of nitrate. Nitrate change with time at control sites (JER-WQ11 and JER-WQ10) appears to be random and not likely meaningful. Nitrate shows influence of the mine at near and mid field sites which is illustrated by the increase at JER-WQ2 (formerly Long Lake) once deposition of fine PK commenced in 2006 being mirrored at Stream C3 mouth (JER-WQ3), Lake C3 (JER-WQ4 and JER-WQ5), Carat Lake (JER-WQ6 and JER-WQ7) and Jericho Lake (JER-WQ8). The increase at Jericho Lake is less clear as there are as many low readings as high readings; in fact the mean concentration is at background.

Likewise, Lake C1 (JER-WQ13) and Stream C1 (JER-WQ12) also show the influence of the mine on the nitrate concentration trend, likely, as previously commented, due to wind-blown dust. It appears Lake C4 was not influenced by the mine as nitrate concentrations have dropped over time whereas they have increased at Stream C4. As the major source of water for Stream C4 is Lake C4, it is unclear as to what has caused the increase in nitrate at this station.

Some increase is also shown Ash, Key and Lynne lakes, again likely due to wind-blown dust.

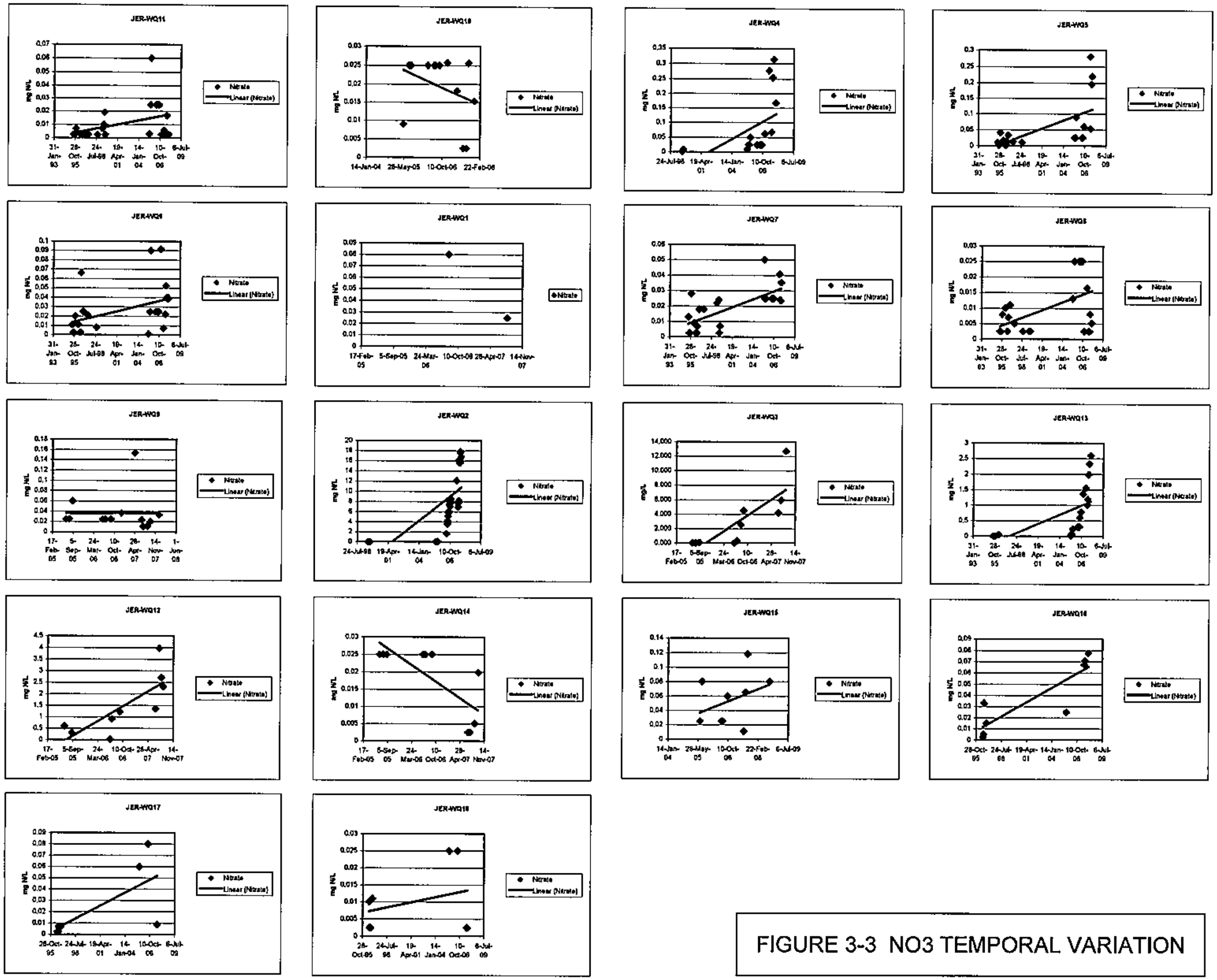


FIGURE 3-3 NO3 TEMPORAL VARIATION

While nitrate is showing an upward trend in water bodies near the mine, concentrations are very much below guidelines, no increase in algal growth is apparent, and therefore the increase in nitrate does not require corrective action at this time. However, the increase does demonstrate that careful management of explosives to limit fugitive loss of ammonium nitrate to the greatest extent possible is prudent. Once the mine resumes operation, explosives, waste rock and ore handling will be examined to determine whether any practical changes to reduce loss of ammonium nitrate or blasting residues is possible.

3.7 Nitrite

While nitrite is regulated by Jericho's water license, discharge concentrations are much below the allowable maximum (mean 0.69 mg/L vs. a maximum discharge limit of 5 mg/L). Further, nitrite is relatively short-lived in aerobic waters, oxidizing readily to nitrate, and is therefore a poor indicator of spatial or temporal influence of the mine.

3.8 Total Aluminum and Dissolved Aluminum

Mine discharge is regulated on both total and dissolved aluminum with maxima of 3 and 2 mg/L, respectively. A site-specific receiving environment objective for total aluminum of 0.16 mg/L was proposed based on the recognition that concentrations above the CCME guideline of 0.10 mg/L for pH $\geq$ 6.5 were exceeded naturally by area water bodies.

3.8.1 Spatial Variation of Aluminum

3.8.1.1 Total Aluminum

Table 3-7 lists the spatial variation of total aluminum.

Table 3-7: Spatial Variation of Total Aluminum

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	28	0.0055	0.0143	0.0157	0.0186	0.0380	0.0078	0.4962	4%
Control Lake	JER-WQ10	14	0.0113	0.0184	0.0195	0.0218	0.0331	0.0063	0.3246	0%
Lake C3 S basin	JER-WQ04	18	0.0092	0.02185	0.0241	0.0270	0.0494	0.0106	0.4410	0%
Lake C3 Outlet	JER-WQ05	22	0.0092	0.03	0.0318	0.0388	0.0620	0.0146	0.4582	0%
Carat Lake Centre	JER-WQ06	26	0.0104	0.021	0.0230	0.0270	0.0580	0.0108	0.4685	0%
Carat Lake Water Intake	JER-WQ01	15	0.0135				0.0600			0%
Carat Lake Outlet	JER-WQ07	26	0.01	0.026	0.0409	0.0325	0.3800	0.0700	1.7104	4%
Jericho Lake	JER-WQ08	28	0.0086	0.01995	0.0198	0.0260	0.0360	0.0076	0.3828	4%
Jericho River	JER-WQ09	14	0.0108	0.0204	0.0190	0.0217	0.0280	0.0060	0.3127	0%
PKCA West Dam	JER-WQ02	37	0.0065	0.0203	0.0339	0.0270	0.3280	0.0534	1.5731	0%
Stream C3 - mouth	JER-WQ03	11	0.0136	0.031	0.0292	0.0355	0.0543	0.0117	0.4016	0%
Lake C1	JER-WQ13	21	0.007	0.0293	0.0339	0.0414	0.0949	0.0202	0.5946	0%
Stream C1 - mouth	JER-WQ12	10	0.0154	0.04	0.0414	0.0569	0.0770	0.0208	0.5019	0%
Lake C4	JER-WQ14	11	0.017	0.0324	0.0329	0.0394	0.0500	0.0104	0.3154	0%

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Stream C4	JER-WQ15	9	0.0176	0.0344	0.0358	0.0389	0.0590	0.0125	0.3494	0%
Stream C6 - control	JER-WQ21	3	0.01	0.04	0.0290	0.0365	0.0369	0.0129	0.4452	0%
Ash Lake	JER-WQ16	8	0.0138	0.027	0.0388	0.0385	0.1220	0.0348	0.8968	0%
Key Lake	JER-WQ17	7	0.0278	0.041	0.0493	0.0427	0.1240	0.0335	0.6799	0%
Lynne Lake	JER-WQ18	8	0.01	0.0333	0.0366	0.0400	0.0760	0.0192	0.5238	13%

Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

Table 3-7 illustrates that total aluminum in PKCA discharge is not different from background concentrations and also that the concentrations were highly variable over time (coefficient of variation 1.57; only exceeded by Carat Lake outlet for variability). The mean discharge concentration was approximately 100 times lower than the maximum allowable discharge. This was as much due to the low total suspended solids in the discharge which was accomplished by construction of a filter divider dyke between the slurry cell and the polishing cell of the PKCA and the relatively large polishing cell allowing ample time for fine solids that did pass through the divider dyke to settle out of the water column before reaching the west end of the polishing cell.

3.8.1.2 Dissolved Aluminum

Table 3-8 lists the spatial variation of dissolved aluminum. As expected the pattern for dissolved aluminum is similar to that for total aluminum.

Table 3-8: Spatial Variation of Dissolved Aluminum

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	28	<0.005	0.0080	0.0082	0.0103	0.0220	0.0042	0.5147	18%
Control Lake	JER-WQ10	14	<0.005	0.0136	0.0151	0.0190	0.0280	0.0061	0.4038	7%
Lake C3 S basin	JER-WQ04	18	<0.005	0.0173	0.0180	0.0238	0.0440	0.0094	0.5196	6%
Lake C3 Outlet	JER-WQ05	22	<0.005	0.0180	0.0190	0.0218	0.0520	0.0103	0.5405	5%
Carat Lake Centre	JER-WQ06	26	<0.005	0.0145	0.0160	0.0200	0.0420	0.0086	0.5358	8%
Carat Lake Water Intake	JER-WQ01	13	<0.005	0.0130	0.0129	0.0180	0.0193	0.0052	0.4011	15%
Carat Lake Outlet	JER-WQ07	26	<0.005	0.0170	0.0182	0.0216	0.0330	0.0069	0.3781	4%
Jericho Lake	JER-WQ08	27	<0.005	0.0140	0.0151	0.0175	0.0350	0.0068	0.4479	0%
Jericho River	JER-WQ09	14	<0.005	0.0108	0.0113	0.0128	0.0270	0.0060	0.5332	14%
PKCA West Dam	JER-WQ02	35	<0.005	0.0050	0.0081	0.0095	0.0710	0.0119	1.4668	20%
Stream C3 - mouth	JER-WQ03	10	0.0113	0.0231	0.0224	0.0260	0.0350	0.0077	0.3420	0%
Lake C1	JER-WQ13	21	<0.005	0.0200	0.0220	0.0260	0.0600	0.0156	0.7072	10%
Stream C1 - mouth	JER-WQ12	9	<0.005	0.0210	0.0216	0.0240	0.0490	0.0141	0.6520	11%
Lake C4	JER-WQ14	11	<0.005	0.0220	0.0227	0.0267	0.0410	0.0091	0.3993	0%
Stream C4	JER-WQ15	9	0.0100	0.0250	0.0251	0.0310	0.0430	0.0098	0.3917	0%
Stream C6 - control	JER-WQ21	3	<0.0004	0.0003	0.0045	0.0067	0.0130	0.0074	1.6359	67%
Ash Lake	JER-WQ16	7	0.0102	0.0220	0.0248	0.0260	0.0590	0.0165	0.6637	0%

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Key Lake	JER-WQ17	7	0.0128	0.0270	0.0331	0.0320	0.0860	0.0244	0.7371	0%
Lynne Lake	JER-WQ18	7	0.0125	0.0250	0.0302	0.0390	0.0570	0.0157	0.5189	0%

Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

3.8.2 Temporal Variation of Aluminum

No patterns were evident for aluminum, as expected, as concentrations are near background at all SNP stations.

3.9 Total Arsenic

3.9.1 Spatial Variation of Total Arsenic

Table 3-9 lists the spatial variation found for total arsenic.

Table 3-9: Spatial Variation of Total Arsenic

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	28	0.00005	0.00015	0.00015	0.00020	0.00030	0.00006	0.40053	32%
Control Lake	JER-WQ10	14	0.00010	0.00020	0.00020	0.00021	0.00030	0.00004	0.21209	29%
Lake C3 S basin	JER-WQ04	18	0.00010	0.00020	0.00020	0.00021	0.00030	0.00004	0.19684	33%
Lake C3 Outlet	JER-WQ05	22	0.00005	0.00020	0.00017	0.00020	0.00030	0.00006	0.35760	32%
Carat Lake Centre	JER-WQ06	26	0.00005	0.00018	0.00044	0.00020	0.00665	0.00128	2.89194	35%
Carat Lake Water Intake	JER-WQ01	15	0.00010	0.00010	0.00013	0.00017	0.00019	0.00004	0.28475	60%
Carat Lake Outlet	JER-WQ07	26	0.00005	0.00018	0.00016	0.00020	0.00030	0.00006	0.39918	38%
Jericho Lake	JER-WQ08	28	0.00005	0.00019	0.00017	0.00020	0.00030	0.00006	0.37292	32%
Jericho River	JER-WQ09	14	0.00010	0.00018	0.00017	0.00020	0.00024	0.00005	0.26750	43%
PKCA West Dam	JER-WQ02	37	0.00010	0.00042	0.00053	0.00051	0.00500	0.00078	1.47774	16%
Stream C3 - mouth	JER-WQ03	11	0.00010	0.00021	0.00028	0.00028	0.00070	0.00019	0.68516	27%
Lake C1	JER-WQ13	21	0.00005	0.00019	0.00018	0.00020	0.00040	0.00009	0.51299	48%
Stream C1 - mouth	JER-WQ12	10	0.00010	0.00020	0.00021	0.00028	0.00030	0.00007	0.32413	30%
Lake C4	JER-WQ14	11	0.00010	0.00020	0.00021	0.00023	0.00040	0.00008	0.38193	45%
Stream C4	JER-WQ15	9	0.00010	0.00016	0.00015	0.00020	0.00020	0.00005	0.30406	67%
Stream C6 - control	JER-WQ21	3	0.00012	0.00012	0.00013	0.00014	0.00015	0.00002	0.13323	0%
Ash Lake	JER-WQ16	8	0.00010	0.00018	0.00017	0.00019	0.00020	0.00003	0.19098	13%
Key Lake	JER-WQ17	7	0.00010	0.00020	0.00019	0.00021	0.00024	0.00004	0.22739	29%
Lynne Lake	JER-WQ18	8	0.00010	0.00020	0.00018	0.00020	0.00021	0.00004	0.19593	25%

Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

Arsenic concentrations in water were very low and there are no apparent differences among stations. The mean concentration in the PKCA discharge was only slightly higher than Carat Lake which was higher than the first receiving water body (Stream C3). Total arsenic mean concentration in the PKCA discharge was 189 times lower than the maximum allowable discharge concentration.

3.9.2 Temporal Variation of Total Arsenic

Most SNP sites showed no temporal variation in total arsenic or an apparent decrease caused by a lowering of the laboratory method detection limit in more recent analyses. The one exception in the data set was Lake C1 (JER-WQ13) which showed an increase (shown in Figure 3-4).

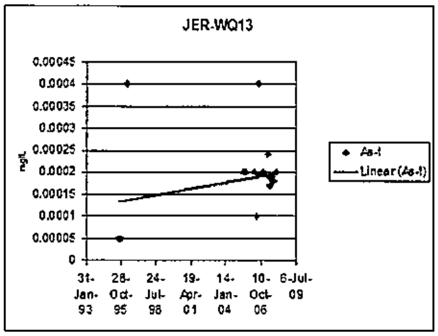


Figure 3-4: Temporal Variation of Total Arsenic in Lake C1

The high values shown are high detection limits. The increase is likely due to wind-blown dust from waste rock (there is essentially no arsenic in Jericho kimberlite). Concentrations shown are well below the CCME freshwater guideline of 0.005 mg/L and thus are of no concern.

Ash, Key and Lynne lakes, as well as Lake C4 showed a decreasing temporal trend in total arsenic for the aforementioned reason and thus arsenic in wind blown dust does not appear to be influencing those water bodies. Of the lakes mentioned, Lake C1 is the closest to the waste rock dump and open pit.

3.10 Total Cadmium

Cadmium was below detection in most samples and is not above crustal averages in the kimberlite or host rock.

3.11 Total Chromium

3.11.1 Spatial Variation

Table 3-10 lists the spatial variation of total chromium.

Table 3-10: Spatial Variation of Total Chromium

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	28	<0.0001				0.0075			75%
Control Lake	JER-WQ10	14	<0.0001	0.0003	0.0004	0.0005	0.0015	0.0004	0.9037	71%
Lake C3 S basin	JER-WQ04	18	<0.0001	0.0003	0.0004	0.0005	0.0017	0.0004	0.9195	78%

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Lake C3 Outlet	JER-WQ05	22	<0.0001	0.0003	0.0019	0.0018	0.0075	0.0029	1.5094	73%
Carat Lake Centre	JER-WQ06	26	<0.0001	0.0003	0.0017	0.0010	0.0075	0.0027	1.5782	73%
Carat Lake Water Intake	JER-WQ01	15	0.0001	0.0005	0.0009	0.0014	0.0043	0.0011	1.2269	60%
Carat Lake Outlet	JER-WQ07	26	<0.0001	0.0003	0.0018	0.0014	0.0075	0.0027	1.5170	69%
Jericho Lake	JER-WQ08	28	<0.0001				0.0075			79%
Jericho River	JER-WQ09	14	<0.0002	0.0003	0.0006	0.0005	0.0022	0.0006	1.0248	71%
PKCA West Dam	JER-WQ02	37	<0.0005	0.0003	0.0014	0.0010	0.0102	0.0025	1.7035	62%
Stream C3 - mouth	JER-WQ03	11	<0.0005	0.0005	0.0012	0.0011	0.0063	0.0018	1.5040	55%
Lake C1	JER-WQ13	21	<0.0005	0.0005	0.0019	0.0015	0.0075	0.0027	1.3949	71%
Stream C1 - mouth	JER-WQ12	10	<0.0005				0.0014			80%
Lake C4	JER-WQ14	11	<0.0005	0.0003	0.0006	0.0005	0.0024	0.0007	1.1412	73%
Stream C4	JER-WQ15	9	<0.0005				0.0008			89%
Stream C6 - control	JER-WQ21	3	<0.0005				<0.0005			100%
Ash Lake	JER-WQ16	8	0.00005				0.00045			75%
Key Lake	JER-WQ17	7	0.0001	0.0003	0.0004	0.0004	0.001	0.0003	0.8729	43%
Lynne Lake	JER-WQ18	8	0.0001	0.0003	0.0003	0.0003	0.0011	0.0003	0.9690	50%

Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

There is no spatial pattern apparent from the data; many chromium concentrations were at or below the method detection limited. The mean PKCA discharge concentration was 121 times below the maximum allowable discharge concentration. Coefficients of variation were also very high suggesting large variation in the data and uncertainty in the summary statistics.

3.12 Total Copper

3.12.1 Spatial Variation

Table 3-11 lists the spatial variation of total copper. Total copper exhibited no pattern of spatial variation. The PKCA mean discharge was not higher than background and 17 times lower than the maximum allowable discharge. In fact, mean concentration was well below the site specific receiving environment objective for total copper. As with chromium variability was very high.

Table 3-11: Spatial Variation of Total Copper

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	28	<0.001	0.0010	0.0016	0.0017	0.0050	0.0015	0.9313	32%
Control Lake	JER-WQ10	14	<0.001	0.0007	0.0008	0.0008	0.0020	0.0004	0.5394	43%
Lake C3 S basin	JER-WQ04	18	<0.001	0.0010	0.0014	0.0013	0.0044	0.0012	0.8349	22%
Lake C3 Outlet	JER-WQ05	22	<0.001	0.0010	0.0018	0.0016	0.0050	0.0018	0.9979	50%
Carat Lake Centre	JER-WQ06	26	<0.001	0.0010	0.0017	0.0015	0.0050	0.0017	0.9655	38%
Carat Lake Water Intake	JER-WQ01	15	<0.001	0.0012	0.0013	0.0015	0.0033	0.0009	0.7057	40%
Carat Lake Outlet	JER-WQ07	26	<0.001	0.0012	0.0020	0.0016	0.0076	0.0020	0.9662	35%

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Jericho Lake	JER-WQ08	28	<0.001	0.0010	0.0020	0.0016	0.0094	0.0022	1.1012	36%
Jericho River	JER-WQ09	14	<0.001	0.0008	0.0009	0.0013	0.0017	0.0004	0.4736	36%
PKCA West Dam	JER-WQ02	37	<0.001	0.0017	0.0019	0.0024	0.0057	0.0014	0.7072	16%
Stream C3 - mouth	JER-WQ03	11	<0.001	0.0010	0.0009	0.0011	0.0019	0.0004	0.4788	36%
Lake C1	JER-WQ13	21	<0.001	0.0018	0.0023	0.0024	0.0050	0.0014	0.6139	24%
Stream C1 - mouth	JER-WQ12	10	0.0012	0.0019	0.0020	0.0022	0.0031	0.0006	0.2876	0%
Lake C4	JER-WQ14	11	<0.001	0.0013	0.0015	0.0015	0.0053	0.0014	0.9184	36%
Stream C4	JER-WQ15	9	<0.001	0.0009	0.0010	0.0013	0.0017	0.0005	0.5106	44%
Stream C6 - control	JER-WQ21	3	0.0011	0.0014	0.0014	0.0015	0.0016	0.0002	0.1707	0%
Ash Lake	JER-WQ16	8	0.0011	0.0013	0.0014	0.0016	0.0023	0.0004	0.2955	0%
Key Lake	JER-WQ17	7	0.00138	0.0015	0.0017	0.0019	0.0027	0.0005	0.2886	0%
Lynne Lake	JER-WQ18	8	<0.001	0.0012	0.0012	0.0014	0.0022	0.0006	0.4743	25%

Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

3.12.2 Temporal Variation of Total Copper

Figure 3-5 shows temporal variation in total copper at SNP stations. As expected because of the lack of pattern in spatial variation, there are also no meaningful trends in temporal variation. Apparent trends are due as much to detection limit changes as to actual changes in copper concentrations. Variability in concentration increased at JER-WQ2 when discharge commenced and the apparent upward temporal trend is an artefact of the variation. As previously discussed concentrations at all stations are well within freshwater environmental guidelines.

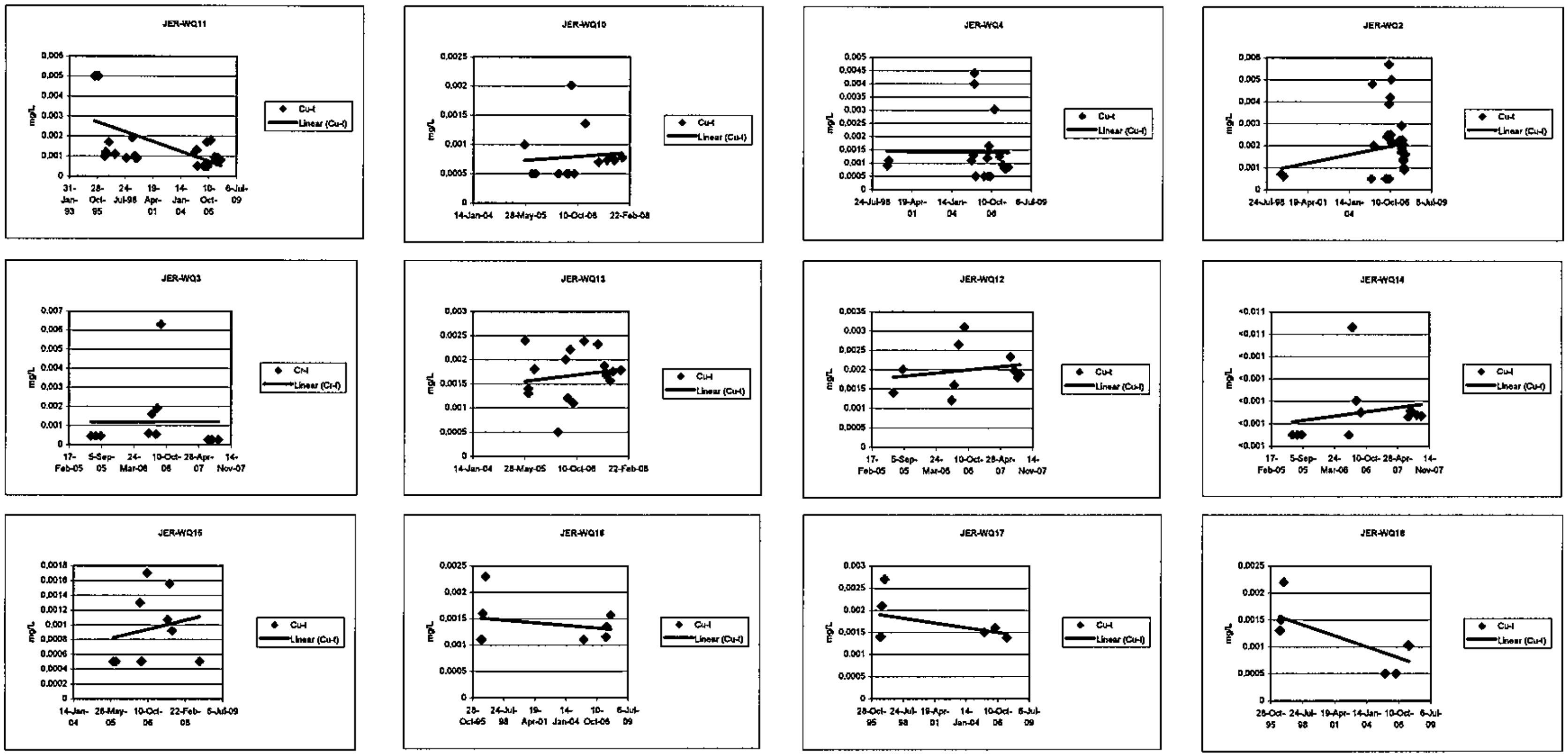


FIGURE 3-5 CU-t TEMPORAL VARIATION

3.13 Total Lead

Lead was near or below detection in SNP samples and is not above crustal averages in the deposit or host rock.

3.14 Total Molybdenum

Table 3-12 lists spatial variation of total molybdenum. Molybdenum was below detection on most samples except water bodies close to the mine.

Table 3-12: Spatial Variation of Total Molybdenum

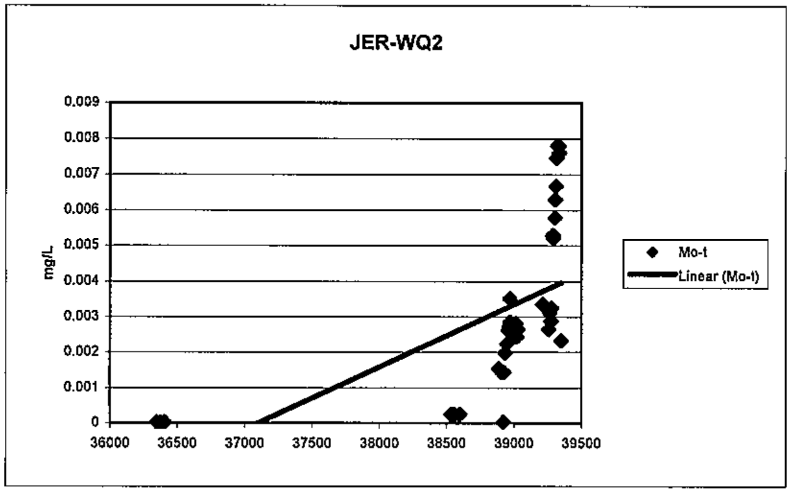
Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	28	<0.00005				<0.0005			93%
Control Lake	JER-WQ10	14	<0.00005				<0.0005			86%
Lake C3 S basin	JER-WQ04	18	<0.00005				<0.0005			94%
Lake C3 Outlet	JER-WQ05	22	<0.00005				<0.0005			95%
Carat Lake Centre	JER-WQ06	26	<0.00005				<0.0005			92%
Carat Lake Water Intake	JER-WQ01	15	<0.00005				<0.0005			87%
Carat Lake Outlet	JER-WQ07	26	<0.00005				<0.0005			96%
Jericho Lake	JER-WQ08	28	<0.00005				<0.0005			96%
Jericho River	JER-WQ09	14	<0.00005				<0.0005			93%
PKCA West Dam	JER-WQ02	37	<0.00005	0.00265	0.00309	0.00352	0.00781	0.00235	0.75906	19%
Stream C3 - mouth	JER-WQ03	11	<0.00005	0.00025	0.00041	0.00037	0.00167	0.00050	1.21600	45%
Lake C1	JER-WQ13	21	<0.00005	0.00012	0.00019	0.00025	<0.0005	0.00017	0.89538	52%
Stream C1 - mouth	JER-WQ12	10	<0.00005	<0.00005	0.00027	0.00036	0.000587	0.00017	0.61384	30%
Lake C4	JER-WQ14	11	<0.00005				<0.0005			91%
Stream C4	JER-WQ15	9	<0.00005				<0.00005			100%
Stream C6 - control	JER-WQ21	3	<0.00005				<0.00005			100%
Ash Lake	JER-WQ16	8	<0.00005				<0.00005			100%
Key Lake	JER-WQ17	7	<0.00005				<0.00005			100%
Lynne Lake	JER-WQ18	8	<0.00005				<0.00005			100%

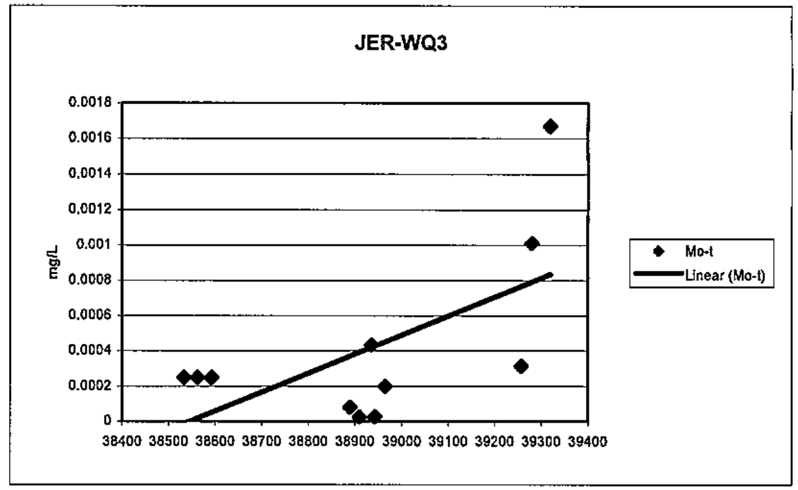
Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

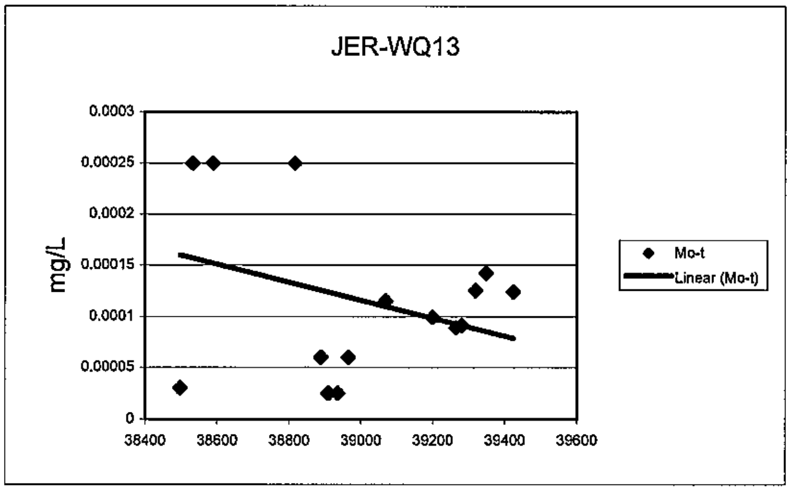
Total molybdenum was slightly elevated in PKCA discharge and in the downstream receiving water body but dropped below detection beyond that (in Lake C3). Total molybdenum was also slightly elevated in Lake C1 and in Stream C1 flowing from the lake, but less so in the latter water body. None of the observed concentrations are a concern and the PKCA mean discharge was 485 times lower than the maximum allowable discharge concentration. Variability in sample results was again high.

3.14.1 Temporal Variation of Total Molybdenum

Figure 3-6 shows temporal variation in total molybdenum for stations above detection.







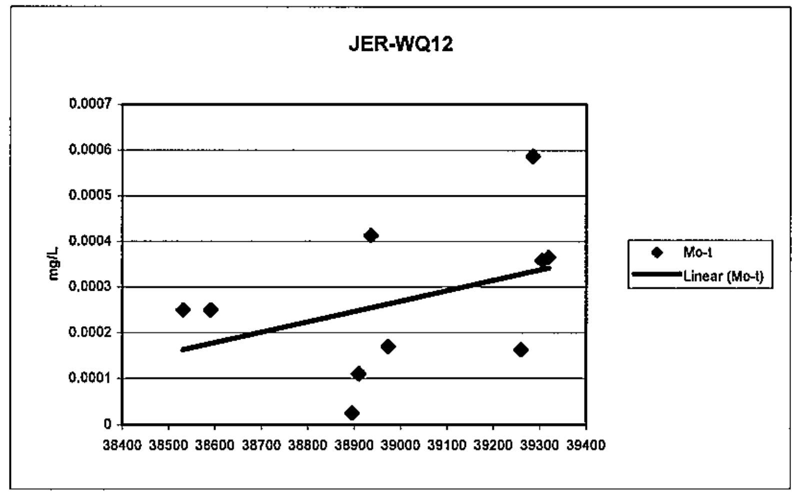


FIGURE 3-6 Mo-t TEMPORAL VARIATION

All stations show an increasing trend through time; the apparent decreasing trend of total molybdenum concentration for Lake C1 is due to higher detection limits used in the historic samples. No concerns with these concentrations are indicated as all are well below the freshwater guide of 0.073 mg/L for total molybdenum.

3.15 Total Nickel

3.15.1 Spatial Variation of Total Nickel

Table 3-13 lists spatial variation for total nickel.

Table 3-13: Spatial Variation of Total Nickel

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	28	0.0001	0.0003	0.0003	0.0003	0.0010	0.0002	0.5845	43%
Control Lake	JER-WQ10	14	0.0002	0.0003	0.0004	0.0004	0.0013	0.0003	0.7282	43%
Lake C3 S basin	JER-WQ04	18	0.0003	0.0003	0.0003	0.0003	0.0007	0.0001	0.3311	56%
Lake C3 Outlet	JER-WQ05	22	0.0002	0.0003	0.0003	0.0004	0.0005	0.0001	0.2837	55%
Carat Lake Centre	JER-WQ06	26	0.0001	0.0003	0.0004	0.0005	0.0008	0.0002	0.4407	54%
Carat Lake Water Intake	JER-WQ01	15	0.0002	0.0003	0.0003	0.0003	0.0007	0.0001	0.4183	47%
Carat Lake Outlet	JER-WQ07	26	0.0002	0.0004	0.0004	0.0005	0.0012	0.0002	0.4710	42%
Jericho Lake	JER-WQ08	28	0.0002	0.0003	0.0005	0.0004	0.0030	0.0006	1.1829	39%
Jericho River	JER-WQ09	14	0.0003	0.0003	0.0003	0.0003	0.0005	0.0001	0.3029	64%
PKCA West Dam	JER-WQ02	37	<0.0001	0.0021	0.0019	0.0025	0.0040	0.0011	0.5560	8%
Stream C3 - mouth	JER-WQ03	11	<0.0005	0.0006	0.0005	0.0007	0.0008	0.0002	0.3808	36%
Lake C1	JER-WQ13	21	0.0003	0.0006	0.0006	0.0009	0.0011	0.0003	0.4289	38%
Stream C1 - mouth	JER-WQ12	10	0.0003	0.0009	0.0009	0.0012	0.0016	0.0005	0.5086	20%
Lake C4	JER-WQ14	11	0.0003	0.0003	0.0004	0.0004	0.0008	0.0002	0.5321	64%
Stream C4	JER-WQ15	9	<0.0001	0.0003	0.0003	0.0003	0.0006	0.0001	0.4601	67%
Stream C6 - control	JER-WQ21	3	<0.0003				<0.0003			100%
Ash Lake	JER-WQ16	8	0.0002	0.0004	0.0004	0.0005	0.0006	0.0002	0.4096	25%
Key Lake	JER-WQ17	7	0.0003	0.0004	0.0004	0.0004	0.0005	0.0001	0.2339	29%
Lynne Lake	JER-WQ18	8	0.0003	0.0003	0.0004	0.0004	0.0006	0.0001	0.3442	25%

Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

The PKCA discharge (JER-WQ2) and Stream C1 (JER-WQ12) were above background; all other stations are at background concentrations for total nickel. Between one quarter and one half of samples were below detection including historical samples at JER-WQ2 (Long Lake). The mean discharge concentration at JER-WQ2 was 53 times less than the maximum allowable discharge concentration. All concentrations, including the PKCA discharge, were well below the freshwater guideline of 0.025 mg/L total nickel for soft waters.

3.15.2 Temporal Variation of Total Nickel

Figure 3-7 shows temporal variation of total nickel for water bodies at or near the mine site.

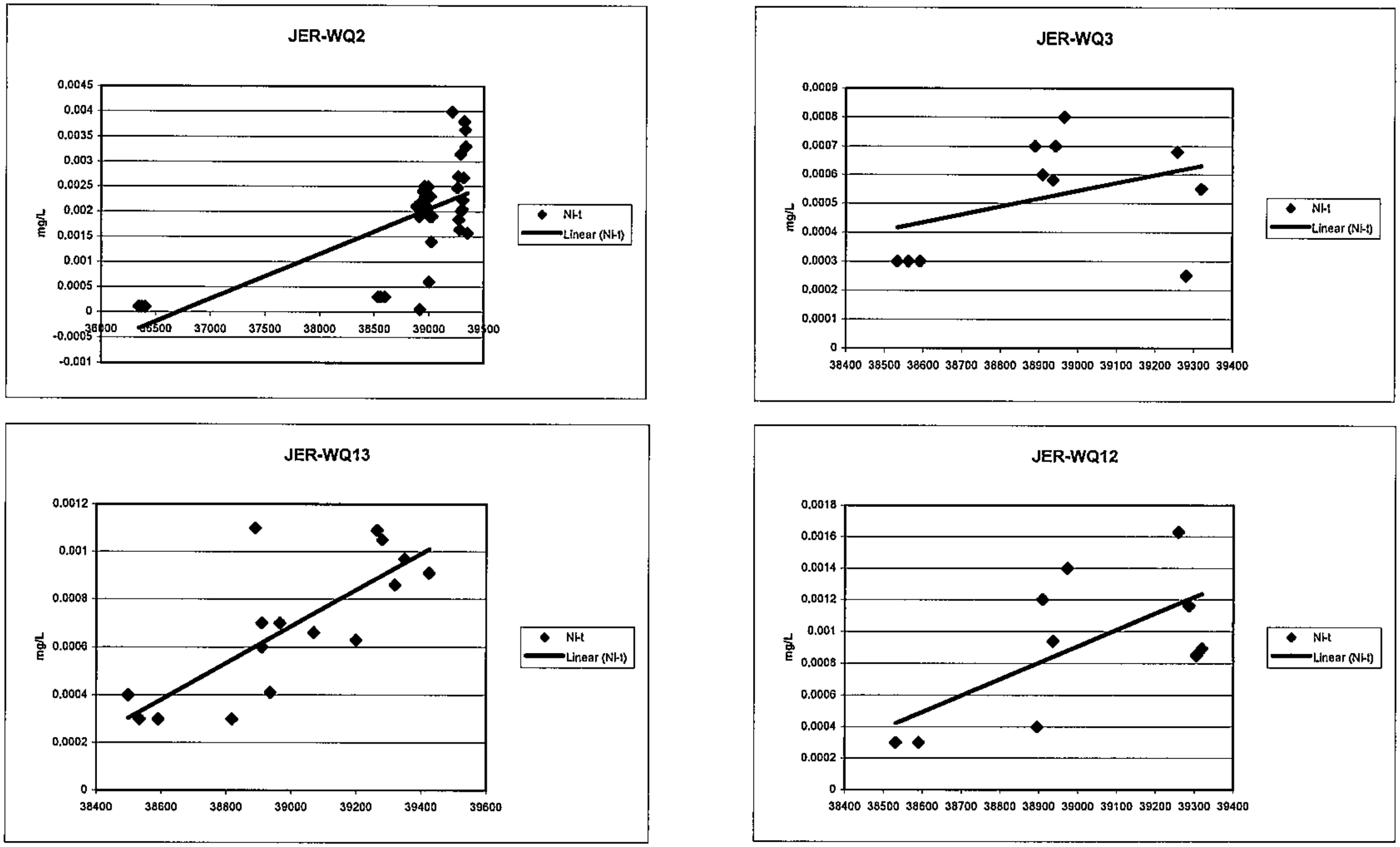


FIGURE 3-7 Ni-t TEMPORAL VARIATION

Temporal trends were all upward at the stations assessed. Lakes C4, Ash, Key and Lynne, while relatively close to the mine site and small, did not show any increase in nickel, indicating wind blown dust from the mine did not carry enough nickel to affect these water bodies. This may have been due to the fact that only the kimberlite contains nickel above crustal average and not the host rock which has a much larger volume and surface area to mine disturbance subject to wind erosion. The concentrations found are not of any environmental concern.

3.16 Total Uranium

Uranium is found at slightly elevated concentrations (above crustal average) in pegmatites which form a small fraction of the host rock at Jericho. Uranium was not found to be elevated in water samples collected prior to mining at Jericho. Nonetheless, concerns were expressed at NIRB and NWB hearings about the potential for uranium leaching from host rock at Jericho into the environment. There are no guidelines for uranium to protect freshwater aquatic life. The Canadian drinking water guide for uranium is 0.02 mg/L. Uranium is regulated in PKCA discharge at a maximum allowable concentration of 1 mg/L which has never been approached in discharges from the PKCA polishing pond.

3.16.1 Spatial Variation of Total Uranium

Table 3-14 lists the spatial variation for total uranium found at Jericho. Mean uranium was above background in the PKCA discharge, Stream C3, Lake C1 and Stream C1 but still well below the drinking water guideline. The mean total uranium concentration in PKCA discharge was 18 times lower than the drinking water guide and over 900 times lower than the maximum allowable discharge. All other stations were at or below average background.

Table 3-14: Spatial Variation of Total Uranium

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	22	0.00007	0.00012	0.00014	0.00017	0.00025	0.00006	0.40709	14%
Control Lake	JER-WQ10	14	0.00008	0.00014	0.00015	0.00016	0.00024	0.00003	0.23356	0%
Lake C3 S basin	JER-WQ04	17	0.00009	0.00014	0.00015	0.00018	0.00028	0.00005	0.30722	0%
Lake C3 Outlet	JER-WQ05	18	0.00011	0.00015	0.00017	0.00023	0.00027	0.00006	0.32508	17%
Carat Lake Centre	JER-WQ06	22	0.00009	0.00015	0.00017	0.00020	0.00028	0.00006	0.32589	14%
Carat Lake Water Intake	JER-WQ01	15	0.00010	0.00015	0.00017	0.00018	0.00031	0.00005	0.32160	0%
Carat Lake Outlet	JER-WQ07	20	0.00010	0.00016	0.00017	0.00021	0.00025	0.00005	0.28612	15%
Jericho Lake	JER-WQ08	23	0.00007	0.00013	0.00014	0.00016	0.00025	0.00005	0.34855	13%
Jericho River	JER-WQ09	14	0.00008	0.00013	0.00013	0.00013	0.00021	0.00004	0.27751	0%
PKCA West Dam	JER-WQ02	35	0.00003	0.00123	0.00110	0.00136	0.00222	0.00050	0.45507	3%
Stream C3 - mouth	JER-WQ03	11	0.00003	0.00007	0.00008	0.00009	0.00022	0.00005	0.66437	18%
Lake C1	JER-WQ13	21	0.00021	0.00069	0.00083	0.00096	0.00265	0.00064	0.76502	10%
Stream C1 - mouth	JER-WQ12	10	0.00016	0.00085	0.00086	0.00135	0.00165	0.00055	0.63336	0%
Lake C4	JER-WQ14	11	0.00014	0.00021	0.00022	0.00024	0.00027	0.00004	0.16910	0%

Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Stream C4	JER-WQ15	9	0.00015	0.00021	0.00021	0.00023	0.00026	0.00004	0.17608	0%
Stream C6 - control	JER-WQ21	3	0.00009	0.00012	0.00011	0.00012	0.00013	0.00002	0.20489	0%
Ash Lake	JER-WQ16	5	0.00003	0.00008	0.00007	0.00009	0.00009	0.00002	0.35559	0%
Key Lake	JER-WQ17	4	0.00003	0.00006	0.00010	0.00012	0.00028	0.00012	1.13358	25%
Lynne Lake	JER-WQ18	5	0.00005	0.00009	0.00010	0.00010	0.00017	0.00004	0.44734	0%

Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

3.16.2 Temporal Variation of Total Uranium

Figure 3-8 shows temporal variation of total uranium at the four stations that were above background (JER-WQ2, JER-WQ3, JER-WQ13 and JER-WQ12). All four sites show an increasing trend in total uranium concentration except Stream C3 at the mouth (JER-WQ3) where the trend is slightly down (in fact likely level). Variability in concentrations also increased markedly at stations with an historical database. The temporal trend shows that the uranium in Jericho host rock has an influence, albeit small, on the concentration of uranium in discharge. Wind blown dust off the waste rock dump also appears to be having a small influence on uranium concentrations in Lake C1 and Stream C1, but not other water bodies in the project area.

3.17 Total Zinc

3.17.1 Spatial Variation of Total Zinc

Table 3-15 lists spatial variation of total zinc. The mean concentration of total zinc increased somewhat at JER-WQ2 once discharge commenced. This was reflected in a similar increase in zinc concentration at the mouth of Stream C3. Total zinc concentrations also increased above background in Streams C1 and C4 but not in either Lakes C1 or C4. Other stations were at background concentrations. The mean total zinc discharge concentration at JER-WQ2 was 116 times lower than the maximum allowable discharge concentration and over seven times lower than the freshwater guide.

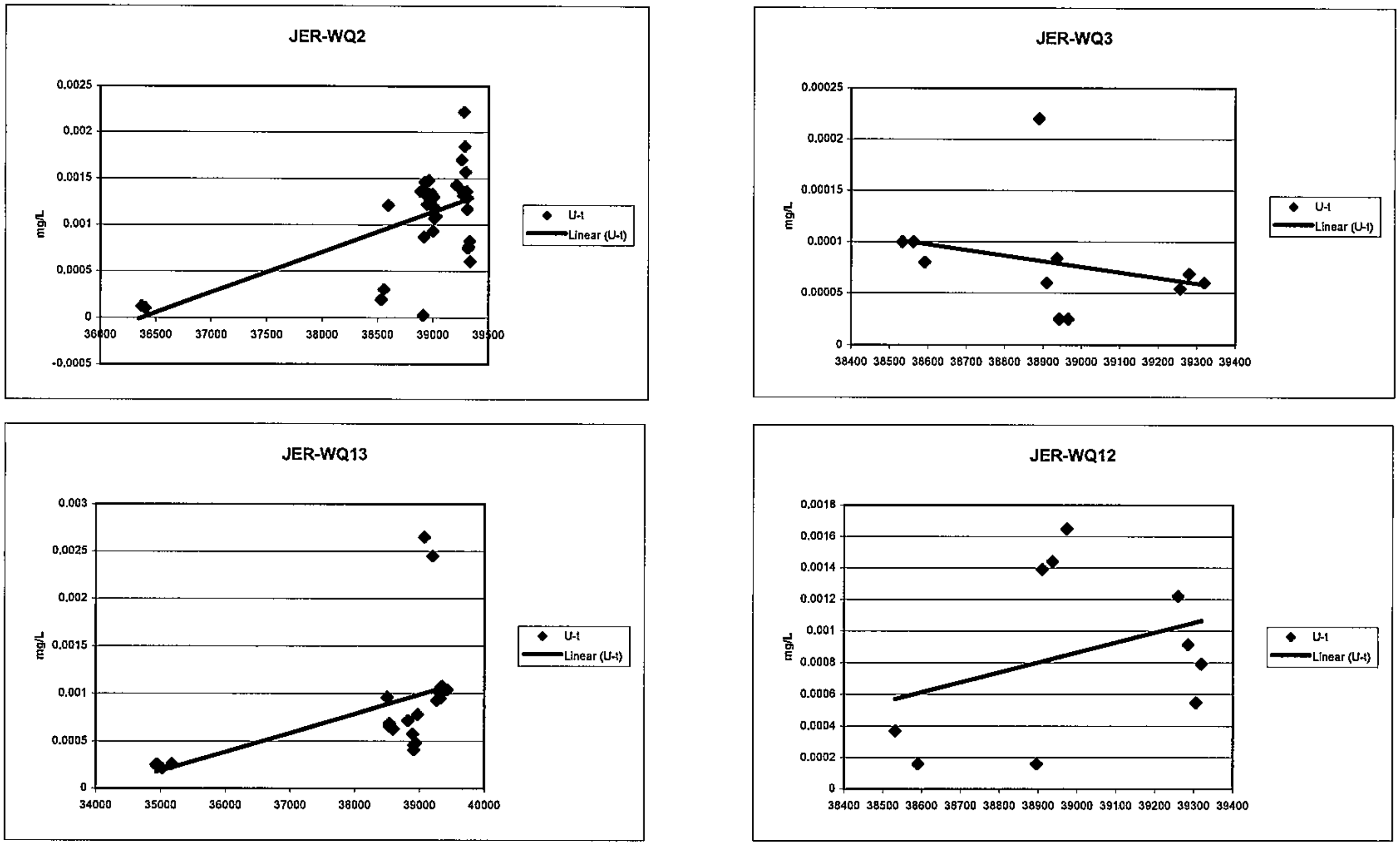


FIGURE 3-8 U-t TEMPORAL VARIATION

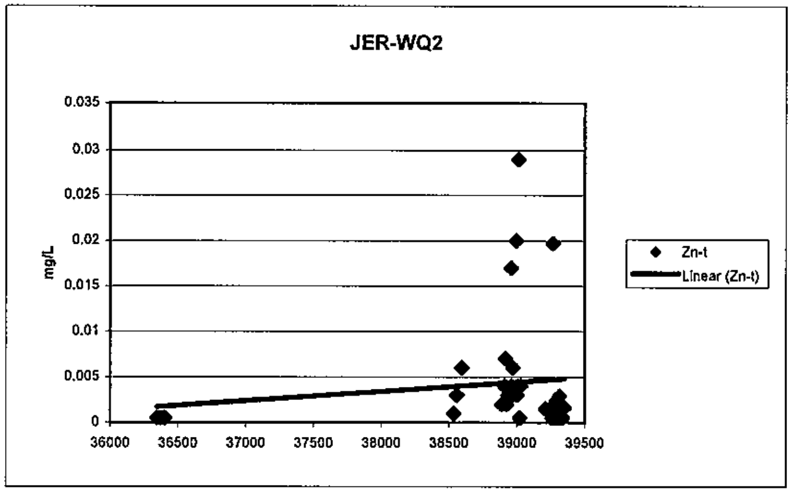
Table 3-15: Spatial Variation of Total Zinc

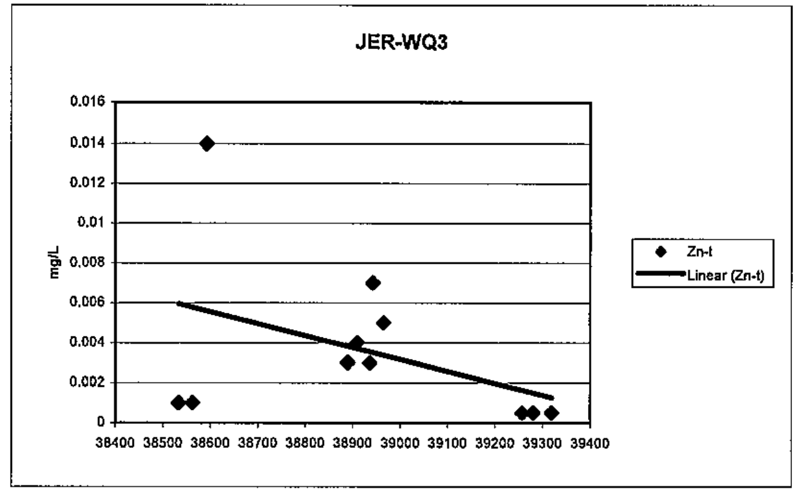
Location	SNP Stn	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Cigar Lake	JER-WQ11	28	<0.001	0.0017	0.0025	0.0026	0.0210	0.0038	1.5282	46%
Control Lake	JER-WQ10	14	<0.001	0.0011	0.0027	0.0030	0.0130	0.0035	1.3044	36%
Lake C3 S basin	JER-WQ04	18	<0.001	0.0012	0.0017	0.0020	0.0050	0.0015	0.8475	50%
Lake C3 Outlet	JER-WQ05	22	<0.001	0.0020	0.0025	0.0025	0.0081	0.0021	0.8264	41%
Carat Lake Centre	JER-WQ06	26	<0.001	0.0016	0.0024	0.0025	0.0190	0.0037	1.4946	62%
Carat Lake Water Intake	JER-WQ01	15	<0.001	0.0020	0.0038	0.0035	0.0190	0.0048	1.2614	20%
Carat Lake Outlet	JER-WQ07	26	<0.001	0.0020	0.0023	0.0029	0.0120	0.0025	1.0898	62%
Jericho Lake	JER-WQ08	28	<0.001	0.0010	0.0016	0.0025	0.0060	0.0014	0.8531	71%
Jericho River	JER-WQ09	14	<0.001	0.0016	0.0022	0.0023	0.0106	0.0025	1.1490	36%
PKCA West Dam	JER-WQ02	37	<0.001	0.0020	0.0043	0.0040	0.0290	0.0064	1.4929	30%
Stream C3 - mouth	JER-WQ03	11	<0.001	0.0030	0.0036	0.0045	0.0140	0.0041	1.1312	45%
Lake C1	JER-WQ13	21	<0.001	0.0017	0.0024	0.0025	0.0100	0.0024	0.9843	57%
Stream C1 - mouth	JER-WQ12	10	<0.001	0.0036	0.0039	0.0050	0.0070	0.0017	0.4412	10%
Lake C4	JER-WQ14	11	<0.001	0.0010	0.0020	0.0022	0.0080	0.0022	1.0794	55%
Stream C4	JER-WQ15	9	<0.001	0.0010	0.0056	0.0050	0.0350	0.0112	1.9909	56%
Stream C6 - control	JER-WQ21	3	<0.001	0.0005	0.0023	0.0032	0.0058	0.0031	1.3500	67%
Ash Lake	JER-WQ16	8	<0.001	0.0010	0.0015	0.0012	0.0057	0.0018	1.1678	50%
Key Lake	JER-WQ17	7	<0.001	0.0010	0.0012	0.0016	0.0030	0.0010	0.7895	57%
Lynne Lake	JER-WQ18	8	<0.001	0.0012	0.0017	0.0022	0.0050	0.0016	0.9221	50%

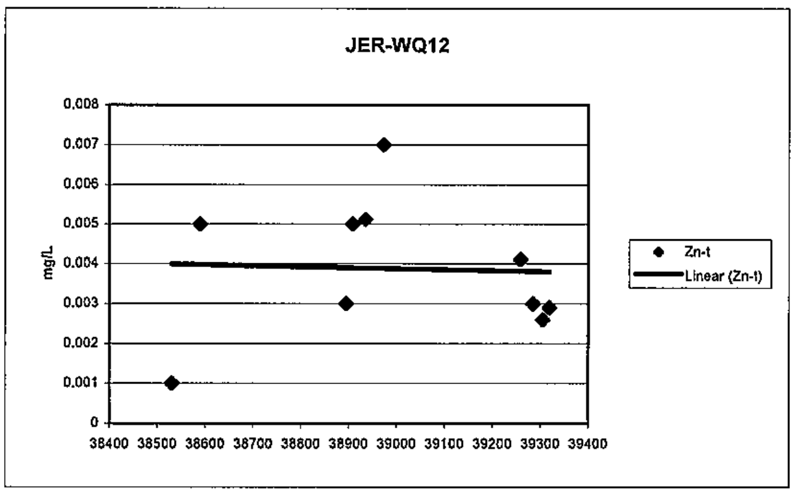
Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

3.17.2 Temporal Variation of Total Zinc

Figure 3-9 shows temporal variation for total zinc at stations where increases occurred after mine development. All stations figured showed an increase in zinc concentrations in 2006, but a reduction after that in 2007. Because only linear trends are shown, this is not apparent in the trend lines. The reason for the spike and drop is not apparent from the data or mine operations, as nothing was different in 2006 from 2007. However, the present zinc concentrations are not a concern at the mine.







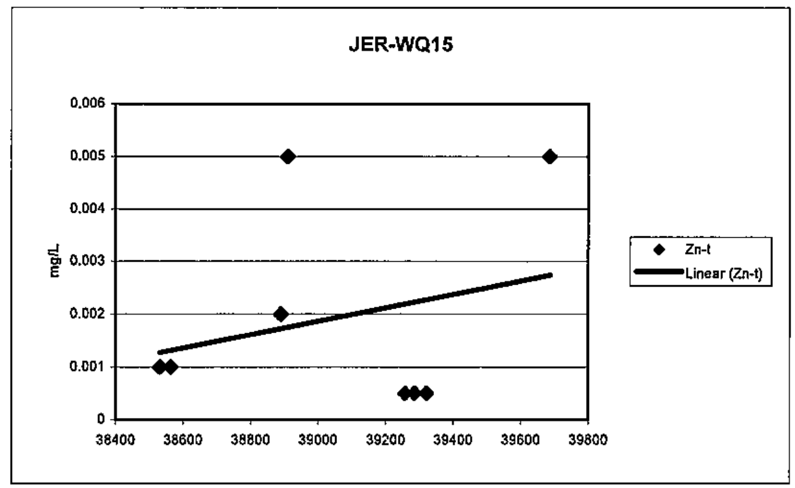


FIGURE 3-9 Zn TEMPORAL VARIATION

4.0 Pit Sump Water Quality

Tahera committed to monitor trends in pit sump water quality over the life of the mine to determine whether predictions of elevated copper and uranium in pit water when the pit overflows were correct. This section discusses results from commencement of open pit development through the end of 2007.

Table 4-1 lists the variation in key parameters. Loadings from the pit sump to the PKCA were small compared with the diamond plant and thus the discharge concentrations at JER-WQ2 were not influenced measurably by pit sump water additions to the PKCA. Water was always pumped to the slurry cell and not the polishing cell.

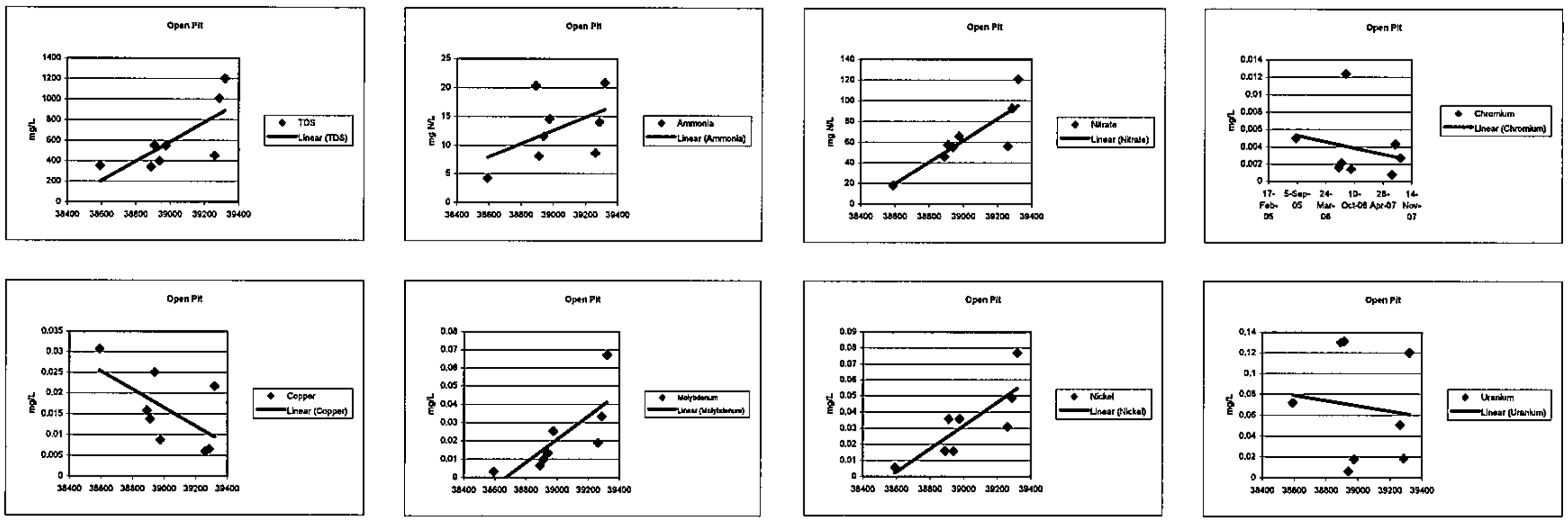
Table 4-1: Variation in Key Pit Sump Parameters

Parameter	PKCA Discharge	n	Min	Median	Mean	3rd Qrt	Max	SD	CV	%<MDL
Total Dissolved Solids	4000	8	340	501	607	667	1200	321	0.530	0
Ammonia	12	8	4.2	12.75	12.75	15.95	20.8	5.85	0.459	0
Nitrate	56	8	17.9	57.0	64.1	72.6	121	30.96	0.483	0
Total Chromium	0.17	8	0.0007	0.0024	0.0038	0.0045	0.0124	0.0038	1.000	0
Total Copper	0.04	8	0.0060	0.0148	0.0160	0.0225	0.0307	0.0091	0.567	0
Total Molybdenum	1.5	8	0.003	0.0161	0.0222	0.0274	0.0672	0.0208	0.937	0
Total Nickel	0.1	8	0.0056	0.0333	0.0331	0.0390	0.0768	0.0225	0.678	0
Total Uranium	1.0	8	0.0060	0.0613	0.0682	0.1225	0.1310	0.0530	0.778	0
Total Zinc	0.5	8	0.0020	0.0038	0.0066	0.0120	0.0150	0.0055	0.825	0

Min: minimum 3rd Qrt: third quartile Max: maximum CV: coefficient of variation (SD/mean) %<MDL: % less than method detection

The mean concentrations of ammonia and nitrate were just above the PKCA maximum allowed discharge concentration. All other parameters were below, or well below, the maximum allowed discharge concentration. Of course, pit sump water was pumped to the PKCA and not released directly to the environment.

Temporal variation in the above parameters during open pit mining from 2005 at start of construction through the end of 2007 are shown in Figure 4-1. Total dissolved solids, ammonia, nitrate, molybdenum and nickel have increased since the start of mining; chromium, copper, uranium and zinc have decreased. The increases are explainable by the increase in the size of the pit and concomitant area for leaching to occur. The decreases may be a result of the decrease in concentration of those metals in ore and host rock as the pit deepened. Results tentatively suggest that copper and uranium may not be problematic at the time the pit overflows, but that additional confirmatory monitoring will be required to confirm trends. Other than TDS, ammonia and nitrate, none of the parameters were at concentrations of concern for direct release to the environment.



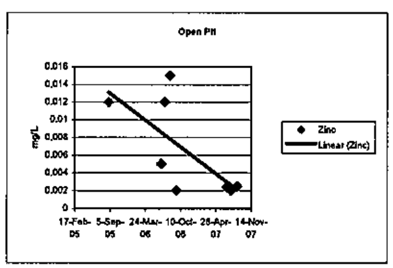


FIGURE 4-1 TEMPORAL VARIATION OF OPEN PIT KEY PARAMETERS

References

AMEC. 2004. Review of Total Dissolved Solids in Proposed Discharge from the Jericho Diamond Project. Attachment N5 of Tahera Diamond Corporation Water License Application, Appendix U.

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