

**POLARIS MINE**

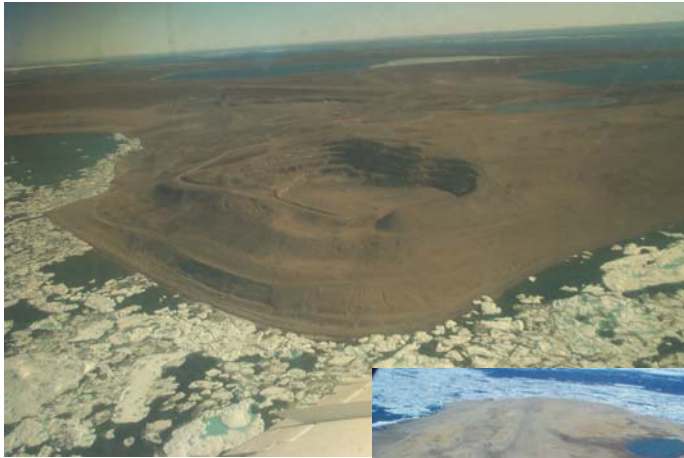
**2007 4<sup>TH</sup> QUARTER & 2007 ANNUAL REPORT**

**FOR THE**

**NUNAVUT WATER BOARD**

**AND**

**INDIAN AND NORTHERN AFFAIRS CANADA**



February 26, 2008

Nunavut Water Board  
Box 119  
Gjoa Haven, NU  
X0B 0J0

**Attention: Phyllis Beaulieu, Manager of Licensing**

Indian and Northern Affairs Canada  
P.O. Box 100  
Iqaluit, Nunavut  
X0A 0H0

**Attention: Spencer Dewar, Manager, Lands Administration**

Dear Ms. Beaulieu and Mr. Dewar;

**Re: Polaris Mine Water Licence NWB1POL0311 – 2007 4th Quarter and Annual Water Licence and Decommissioning and Reclamation Plan Reports**

Please find attached the Polaris Mine 2007 4th Quarter and 2007 Annual Reports required under Polaris's Water Licence and Decommissioning and Reclamation Plan (DRP). I have attached paper copies of this report to this letter in addition to an electronic copy (pdf format on CD).

There were no activities or sampling done at the Polaris Mine site during the 4<sup>th</sup> Quarter of 2007 as the site was snow covered and there were no effluent discharges due to the freezing temperatures. Apart from the sampling of Garrow Lake in the 2<sup>nd</sup> Quarter of 2007, all monitoring was conducted during the 3<sup>rd</sup> Quarter of 2007 which was previously reported. It has now been five years since the mine ceased production and closed and three years since reclamation was completed (with the exception of a few minor items). The Polaris Mine is a Recognized Closed Mine under the Metal Mining Effluent Regulations (MMER) and has no further obligations under MMER.

If you have any questions regarding this report, please do not hesitate to contact me.

Yours truly,

A handwritten signature in black ink, appearing to read "B. J. Donald".

Bruce J. Donald  
Reclamation Manager  
Environment and Corporate Affairs  
Teck Cominco Limited

# **DISTRIBUTION LIST**

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## **1. INTRODUCTION**

The Polaris Mine ceased operation in September of 2002. Immediately upon mine closure, reclamation activities commenced in accordance with the Decommissioning and Reclamation Plan (DRP) approved by the Nunavut Water Board and Indian and Northern Affairs Canada. The DRP as well as the Water Licence requires reporting of work and monitoring activities on both a quarterly and an annual basis. This document includes both the 2007 4<sup>th</sup> Quarter and the 2007 Annual Report for the Polaris Mine site.

An executive summary of this report translated into Inuktitut is included as Appendix 1.

## **2. 2007, 4th QUARTER REPORT**

### **2.1. Reclamation Activities**

During the entire 4<sup>th</sup> Quarter of 2007, the Polaris Mine remained unoccupied by personnel. No reclamation activities were undertaken.

### **2.2. Site Monitoring**

During the entire 4<sup>th</sup> Quarter of 2007, the Polaris Mine remained unoccupied by personnel and no monitoring events occurred as all surface waters were frozen. As a result there is no effluent water quality data to report.

## **3. 2007 ANNUAL REPORT**

Part B, Section 6 of the Water Licence requires that an Annual Report be filed that includes the following topics.

### **3.1. Unauthorized Discharges**

The Polaris Mine had no unauthorized discharges to report.

### **3.2. Progress Report of Studies and Plans**

Progress on reports and/or revision of any studies or plans requested by the Board is listed below:

- Submission of the very comprehensive 2004 Annual Report was made in September 2005 which included the final reporting of the reclamation activities and of the water quality monitoring program results that occurred during 2004. A number of requested studies and as-built drawings remained outstanding when the report was submitted. The submission of the report clearly identified which materials were absent and at the end of 2005, work on completing these deficiencies was in progress. With the exception of a geotechnical review of the potential for mine subsidence, the missing reports will be completed in the 1<sup>st</sup> Quarter of 2008.

### **3.3. Executive Summary of Report Translated into Inuktitut**

Included in Appendix 1 is an executive summary of both the 2007 4<sup>th</sup> Quarter Report and the 2007 Annual Report translated into Inuktitut.

### **3.4. Summary of Closure and/or Reclamation Work Undertaken**

A summary of any closure and reclamation work undertaken during the year and an outline of work anticipated for the next year is outlined below:

- On July 26 a small crew of 5 people re-opened the camp and a minimum of 4 people remained on site until August 1 to complete the annual site inspection.
- Clean up of site litter continued while crews were on site.
- The subsidence survey was not completed due to equipment failure although this area was visually inspected as part of the annual geotechnical inspection. The detailed survey will be undertaken again in July 2008.
- The annual geotechnical inspection was completed by an independent professional geotechnical engineer. Work to place rip-rap over exposed geotextile in the channel at the former Garrow Lake Dam was not completed as planned in 2007. This work is expected to be completed in 2008.
- The annual survey of the elevation of Garrow Lake was completed.
- During the open water period on Garrow Lake, when no personnel were on site, the wind speeds were monitored at Resolute Bay. A high wind event was noted in Resolute on July 21<sup>st</sup> to 23<sup>rd</sup>. Detailed sampling was routinely performed on Garrow Lake Aug. 25<sup>th</sup>.

### **3.5. Update of Reclamation and Monitoring Costs**

An update of reclamation and monitoring costs is presented in Appendix 2. Costs for 2007 were \$249,340. While the MMER requirements were no longer required at the site, the Water Licence and DRP still include the same intense water quality monitoring program. Until rationalization of water quality monitoring program is achieved, monitoring cost will continue at a higher than forecast level.

### **3.6. Public Consultation and Participation**

- No public consultations were conducted as the site is basically dormant other than for monitoring.
- At least one Inuit resident from Resolute assists with the routine sampling at the site or is part of the team working at the site. In addition to providing local employment, the local knowledge for the safety of workers on site is important. Having a local resident involved with monitoring of the site has the additional benefit of ensuring that the nearest community is aware of site activity and site conditions.

### **3.7. Work Conducted in Response to Inspection or Compliance Reports**

A brief summary of work done to address concerns or deficiencies listed in inspection/or compliance reports were as follows:

- 2007 site activities included clean up of debris that will continue in subsequent years during summer monitoring events.

### **3.8. Effluent and water Quality Studies Conducted**

#### **3.8.1. Quantities of Fresh Water Pumped From Frustration Lake**

The water licence requires the monthly and annual quantities (in cubic metres) of water pumped from Frustration Lake to be reported.

- No water was pumped as the site's freshwater system was demolished and reclaimed in 2004.

#### **3.8.2. Garrow Lake Water Column Monitoring**

During 2007, the Water Licence required three monitoring events (at mid-winter, at maximum ice thickness, and at maximum ice melt) in two separate locations of the Garrow Lake water column stratigraphy. The mid-winter monitoring event was not conducted as charter aircraft will

not fly to this isolated, abandoned site in the dark. The maximum ice thickness and maximum melt monitoring events took place as required and were reported in the 2<sup>nd</sup> and 3<sup>rd</sup> Quarter monitoring reports.

To review the trend of water quality, graphs have been prepared of the zinc concentration by depth in Garrow Lake for each sampling event starting in 2002 (the last year the mine was discharging tailings into the lake), through until August of 2007. The monitoring results from each year are included in Appendix 3 in Table 1 and Table 2 with the data plotted in Figures 1 through 4.

**Figure 1 – Station 262-3 Zinc Trends**

Figure 1 displays the zinc concentrations by depth below surface of Garrow Lake at monitoring station 262-3 for each monitoring event from 2002 to 2007. There is a clear and consistent trend of reducing zinc concentrations throughout the water column. Between the bottom of the Mixolimnium layer and the top of the Pycnocline layer there is a sharp transition in density. At the top of the Pycnocline it is postulated that due to a thin accumulated layer of bacterial tissue that zinc concentrations are sharply higher. As the layer is very thin, if water samples are collected from even slightly different depths, the resulting measured zinc concentrations change significantly. This would explain the more scattered nature of the zinc data at about the 10 m depth.

**Figure 2 – Station 262-3A**

Figure 2 at monitoring station 262-3A is a graph of the zinc concentrations from 2004 to 2007 (this is a newer station added into the water licence). This graph displays essentially the identical results as Station 262-3 for the time period that this station has been sampled. There is a clear and consistent trend of reducing zinc concentrations throughout the water column. Similar scattering of results around the 10m depth occurs at this station as seen in Figure 1.

**Figure 3 – Comparison Between Stations 262-3 and 262-3A**

Figure 3 compares the August 2007 zinc concentrations at Station 262-3 and 262-3A. The graph clearly shows there is no difference in the water quality between the two stations. No new or additional information is gained by having two stations sampling the same water sources in Garrow Lake.

**Figure 4 – Station 262-3 19 Meter Depth**

Figure 4 shows the trend from 2002 to August 2007 in zinc concentration at 19 meter depth within the monimolimnion layer. This graph is being provided to eliminate the clutter of excess data in the graphs to clearly illustrate the improving water quality trend. The graph shows rapid decline in zinc concentration immediately after Mine closure and the continuing gradual decline.

**3.8.3. Garrow Lake Effluent Monitoring**

- The Water Licence and the DRP requires sampling of the Final Discharge Point from Garrow Lake during periods of effluent discharge. All water quality results were compliant with the parameters specified in the Water Licence. In addition there was no acute toxicity in either the Rainbow Trout or the Daphnia magna. The details of the monitoring results can be found in the previously submitted 3<sup>rd</sup> Quarter Report.



**3.9. Details of Water Use or Waste Disposal Requested by the Board**

- There is no fresh water use at the site. No details of water use have been requested by the board.
- Waste disposal was restricted to collection of site litter that has been stockpiled for future disposal in LRD Quarry Landfill.

## **APPENDIX 1**

### **EXECUTIVE SUMMARY TRANSLATED INTO INUKTITUT**

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**APPENDIX 2**

**2007 UPDATE**

**OF**

**RECLAMATION AND MONITORING COSTS**

# POLARIS MINE

## POST-RECLAMATION PHASE MONITORING / SITE MAINTENANCE

### COST REVIEW and FORECAST

	2007 Monitoring/Mtce Costs	Cost Forecast From 2005 Annual Reclamation Report			
		2008	2009	2010	2011
<b>Garrow Lake Effluent Monitoring</b>					
Field Staff for Sampling Final Discharge Point / travel	\$ 45,000				
Charter Aircraft	\$ 14,500				
Resolute Hotels / Camp Food / Camp Supplies	\$ 6,000				
Laboratory Costs	\$ 39,000				
Freight for Samples / Sampling Supplies	\$ 4,500				
Coordinating With Labs / Reporting/Planning	\$ 19,200				
	\$ 128,200	\$ 85,000	\$ 85,000	\$ 85,000	\$ 85,000
<b>Garrow Lake Water Column Monitoring</b>					
Field Staff for Sampling Lake / travel	\$ 19,000				
Charter Aircraft	\$ 8,500				
Resolute Hotels / Camp Food / Camp Supplies	\$ 4,400				
Laboratory Costs - see Garrow Lake Effluent costs					
Freight for Samples / Sampling Supplies - see above					
	\$ 31,900	\$ 35,000	\$ 35,000	\$ 35,000	\$ 35,000
<b>Annual Geotechnical Inspection</b>					
Field Staff for Inspection	\$ 12,000				
Travel	\$ 5,300				
Resolute Hotels / Camp Food / Camp Supplies	\$ 600				
Misc. Supply / Survey Costs	\$ 500				
	\$ 18,400	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000
<b>Site Support / Site &amp; Equipment Maintenance</b>					
Labour	\$ 8,000	\$ 3,500	\$ 3,500	\$ 3,500	\$ 3,500
Travel	\$ 4,000	\$ -	\$ -	\$ -	\$ -
Materials / Camp Supplies	\$ 1,500	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Site Communications	\$ 1,540	\$ 2,000	\$ 2,000	\$ 2,000	\$ 2,000
	\$ 15,040				
<b>TCML Site Management Costs</b>					
Labour	\$ 41,000				
Expenses	\$ 10,000				
	\$ 51,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000
<b>Studies / Reporting</b>					
Translations	\$ 1,600				
Air Photo	\$ 3,200				
Repoting costs	\$ 4,800	\$ -	\$ -	\$ 100,000	\$ 60,000
<b>TOTAL ANNUAL COST</b>	<b>\$ 249,340</b>	<b>\$ 190,500</b>	<b>\$ 190,500</b>	<b>\$ 290,500</b>	<b>\$ 250,500</b>

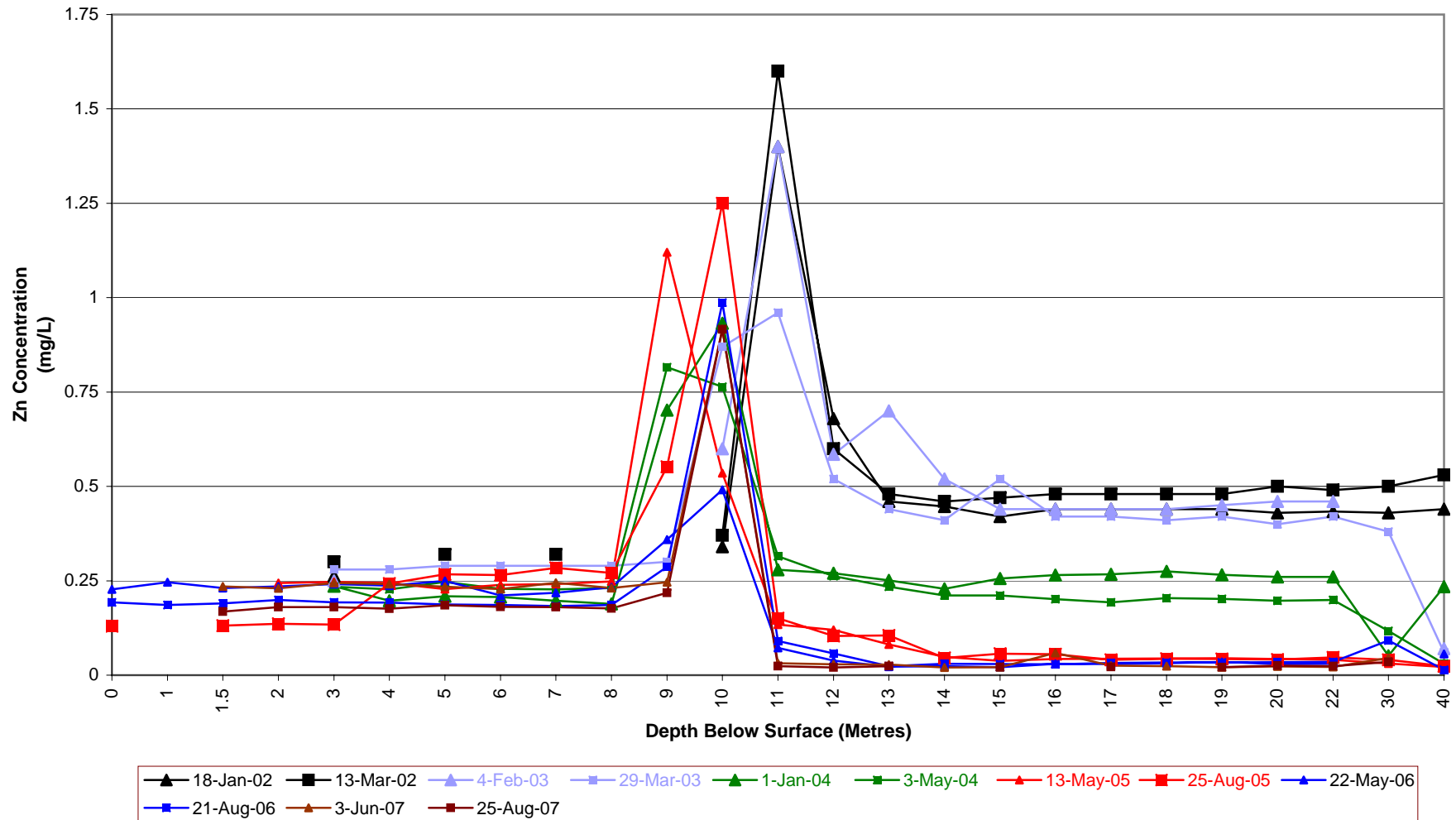
Note 1 : Costs exclude site demobilization costs, financial security, property taxes, lease costs and insurance costs



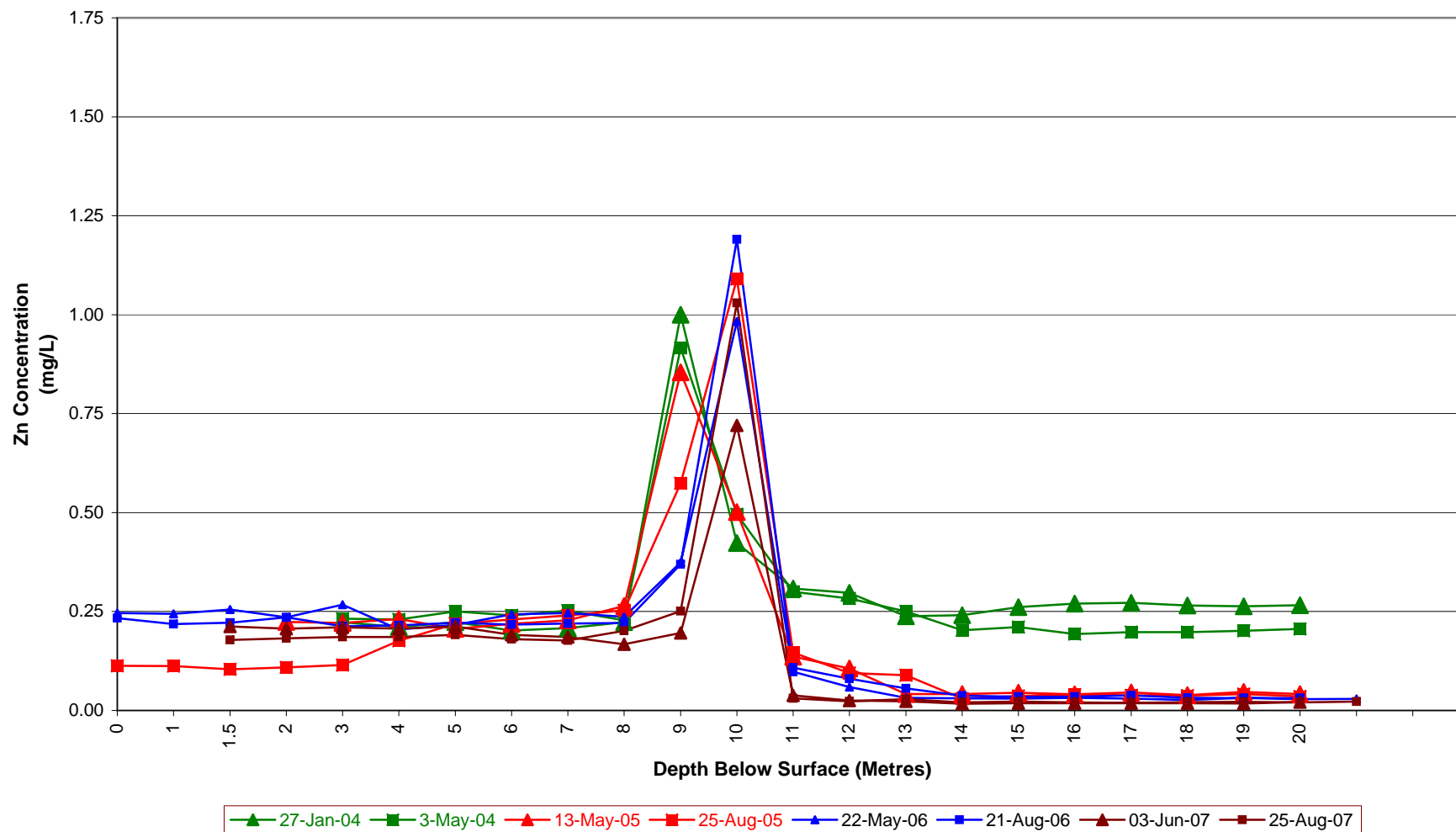
## **APPENDIX 3**

### **GARROW LAKE WATER COLUMN MONITORING DATA**

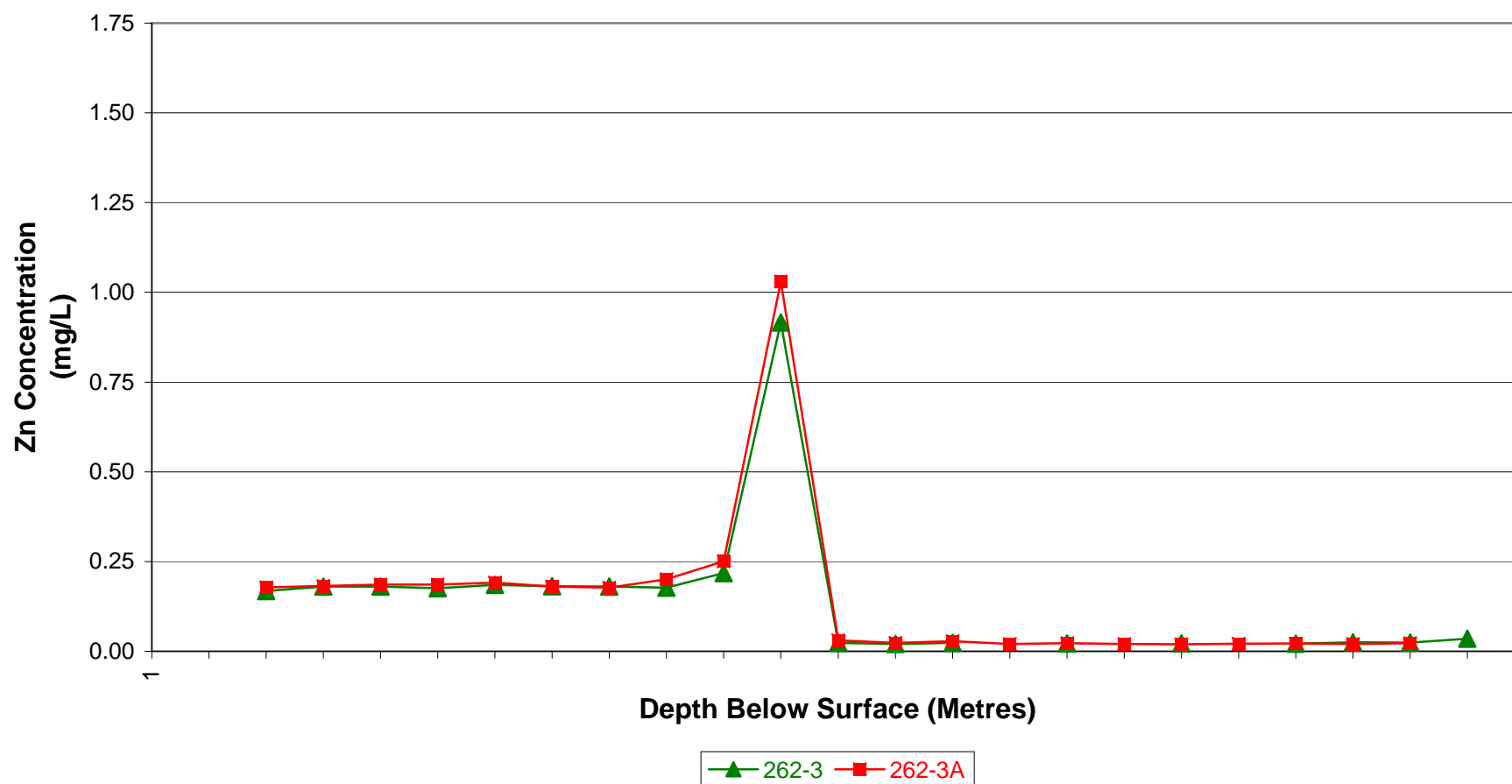
**FIGURE 1**  
**GARROW LAKE - Station 262-3**  
**Trend In Zinc Concentrations In The Water Column 2002 to 2007**



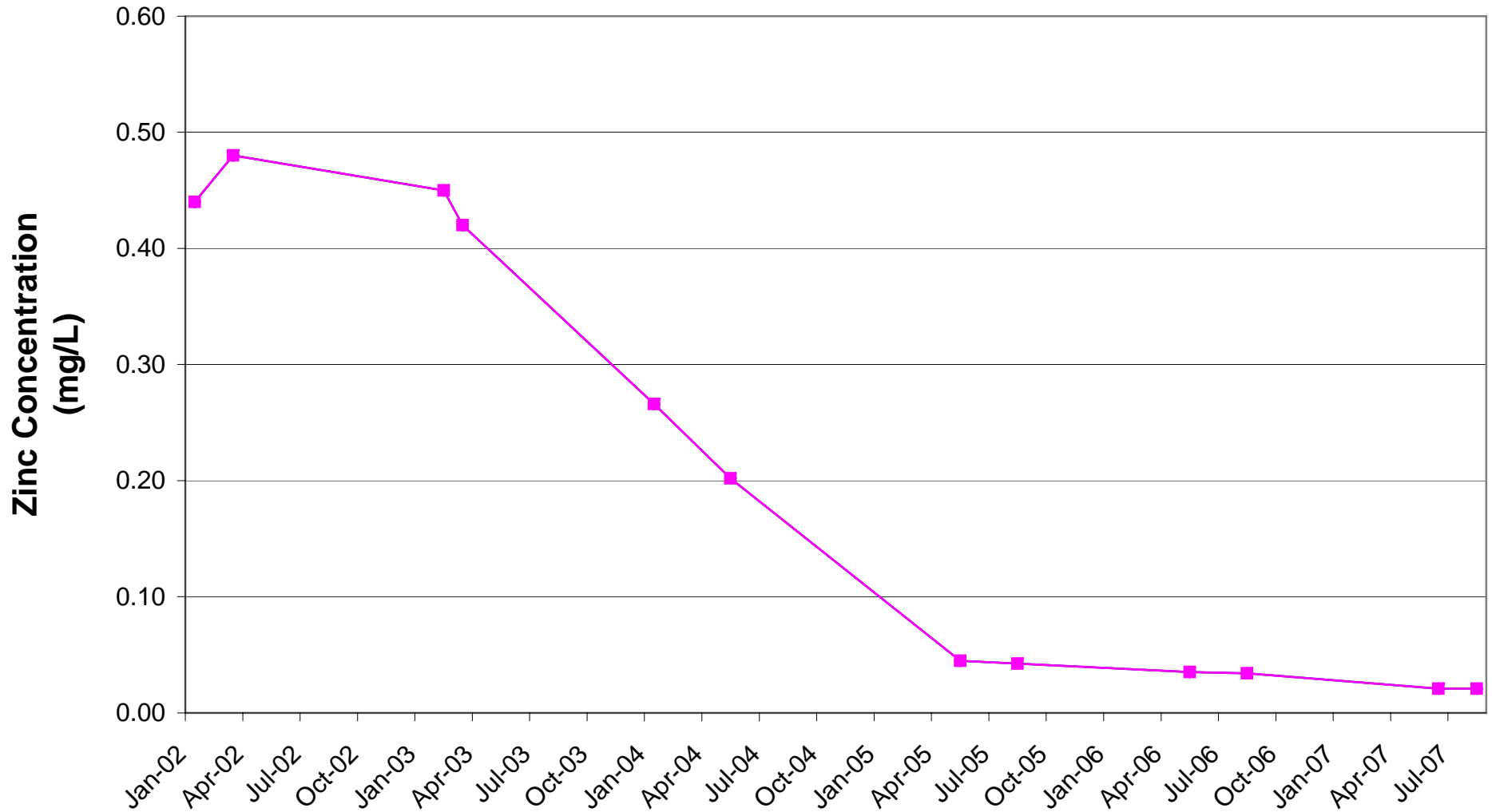
**FIGURE 2**  
**GARROW LAKE - Station 262-3A**  
**Zinc Concentrations In The Water Column**



**FIGURE 3**  
**GARROW LAKE - August 2007**  
**Comparision of Zinc Concentrations In The Water Column Between**  
**Monitoring Stations 262-3 and 262-3A**



**FIGURE 4**  
**GARROW LAKE - Station 262-3**  
**19 Meter Depth, Zinc Concentration Trend**



**TABLE 1**  
**GARROW LAKE**  
**WATER COLUMN MONITORING**  
**STATION 262-3: Garrow Lake at Centre**

Depth	Zinc Concentrations (mg/L)											
	18-Jan-02	13-Mar-02	4-Feb-03	29-Mar-03	1-Jan-04	3-May-04	13-May-05	25-Aug-05	22-May-06	21-Aug-06	3-Jun-07	25-Aug-07
0								0.130	0.227	0.193		
1									0.246	0.186		
1.5								0.131	0.231	0.19	0.235	0.168
2							0.244	0.136	0.235	0.199	0.23	0.180
3	0.26	0.30	0.25	0.28	0.236	0.234	0.247	0.134	0.241	0.193	0.244	0.180
4				0.28	0.197	0.227	0.244	0.243	0.237	0.192	0.241	0.176
5		0.32		0.29	0.209	0.247	0.228	0.267	0.25	0.187	0.234	0.185
6				0.29	0.207	0.229	0.239	0.265	0.211	0.186	0.228	0.181
7		0.32		0.29	0.197	0.227	0.241	0.284	0.218	0.183	0.245	0.180
8				0.29	0.189	0.231	0.248	0.271	0.233	0.186	0.231	0.177
9				0.30	0.702	0.816	1.120	0.552	0.359	0.287	0.246	0.218
10	0.34	0.37	0.60	0.87	0.932	0.764	0.535	1.250	0.491	0.987	0.917	0.916
11	1.40	1.6	1.40	0.96	0.279	0.315	0.134	0.151	0.0721	0.0903	0.0319	0.0235
12	0.68	0.60	0.585	0.52	0.27	0.262	0.120	0.104	0.0383	0.0578	0.0288	0.0200
13	0.46	0.48	0.70	0.44	0.251	0.234	0.0812	0.105	0.0226	0.0241	0.0279	0.0235
14	0.45	0.460	0.52	0.41	0.229	0.211	0.0482	0.0457	0.024	0.0304	0.0204	
15	0.42	0.47	0.44	0.52	0.256	0.211	0.0378	0.0565	0.021	0.0297	0.0208	0.0219
16	0.44	0.48	0.44	0.42	0.265	0.201	0.0429	0.0556	0.03	0.0287	0.0589	
17	0.44	0.48	0.44	0.42	0.267	0.193	0.0435	0.0409	0.0294	0.032	0.0252	0.0218
18	0.44	0.48	0.44	0.41	0.275	0.204	0.0440	0.0435	0.0314	0.0336	0.0238	
19	0.44	0.48	0.45	0.42	0.266	0.202	0.0448	0.0425	0.0351	0.034	0.0208	0.0209
20	0.43	0.50	0.46	0.40	0.260	0.197	0.0425	0.0413	0.0293	0.0346	0.0228	0.0253
22	0.43	0.49	0.46	0.42	0.260	0.199	0.0407	0.0468	0.0301	0.0351	0.0218	0.0240
30	0.43	0.50		0.38	0.0514	0.117	0.0310	0.0404		0.092	0.0453	0.0348
40	0.44	0.53	0.07	0.06	0.234	0.0301	0.0214	0.0235	0.0558	0.0139		

Note: - did not graph the data from 30m depth for May 22/06 as there is clearly a data error. The Zn = 0.561 and the TSS was 111 mg/L. The sample must have been contaminated.

**TABLE 2**  
**GARROW LAKE**  
**WATER COLUMN MONITORING**  
**STATION 262-3A: Garrow Lake Near Discharge**

Depth	Zinc Concentrations (mg/L)							
	27-Jan-04	3-May-04	13-May-05	25-Aug-05	22-May-06	21-Aug-06	3-Jun-07	25-Aug-07
0				0.113	0.246	0.233		
1				0.112	0.244	0.218		
1.5				0.104	0.255	0.222	0.212	0.1780
2			0.224	0.109	0.235	0.235	0.207	0.1820
3	0.223	0.232	0.221	0.115	0.267	0.213	0.21	0.1860
4	0.211	0.230	0.231	0.176	0.205	0.215	0.207	0.1860
5	0.223	0.250	0.206	0.219	0.216	0.222	0.212	0.1910
6	0.202	0.240	0.219	0.23	0.243	0.217	0.191	0.1800
7	0.208	0.252	0.228	0.24	0.246	0.22	0.186	0.1770
8	0.223	0.228	0.264	0.253	0.237	0.221	0.167	0.2010
9	1.000	0.916	0.854	0.574	0.374	0.369	0.196	0.2510
10	0.423	0.496	0.501	1.09	0.983	1.19	0.72	1.0300
11	0.308	0.300	0.136	0.146	0.0981	0.108	0.038	0.0303
12	0.297	0.283	0.106	0.094	0.059	0.0801	0.025	0.0233
13	0.238	0.250	0.0418	0.0888	0.032	0.0558	0.0228	0.0284
14	0.241	0.203	0.0412	0.03	0.0309	0.0371	0.0168	0.0205
15	0.261	0.211	0.045	0.037	0.0301	0.0349	0.0183	0.0226
16	0.27	0.193	0.0408	0.0398	0.032	0.0344	0.0181	0.0202
17	0.272	0.198	0.0458	0.0383	0.0299	0.0383	0.0183	0.0193
18	0.265	0.198	0.0391	0.0372	0.0262	0.032	0.0186	0.0212
19	0.263	0.201	0.047	0.0417	0.0318	0.0311	0.0175	0.0217
20	0.266	0.206	0.0415	0.0354	0.0285	0.031	0.0209	0.0202
22	0.267				0.0291			0.0226
30	0.076							
40	0.0747							

Note - The Water Licence did not require sampling of this station prior to 2004

## **APPENDIX 4**

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