



# CERTIFICATE OF ANALYSIS

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**Date:** August 26, 2005  
**ALS File No.** W2123  
**Report On:** 40692 Water Analysis  
**Report To:** **Gartner Lee Ltd.**  
2251 2nd Ave  
Whitehorse, YT  
Y1A 5W1  
**Attention:** **Mr. Martin Guilbeault**  
**Received:** July 26, 2005

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**ALS ENVIRONMENTAL**

per:

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File No. W2123

**REMARKS**



Please note that the detection limits for certain Dissolved and Total Metals, Dissolved Anions and Nutrients have been increased for some of the samples reported in the following data tables due to sample matrix interferences. In particular, Sulphate and Metals at high concentrations are interferences.

File No. W2123  
**RESULTS OF ANALYSIS - Water**



Sample ID	P03-03-01	P03-03-02	P03-03-03	P03-03-04	P03-03-05
Sample Date	05-07-22	05-07-22	05-07-22	05-07-22	05-07-22
Sample Time	18:15	18:20	18:45	18:50	19:07
ALS ID	1	2	3	4	5

**Physical Tests**

	(uS/cm)				
Conductivity		2190	508	794	772
Hardness	CaCO3	422	274	323	324
pH		4.79	7.81	6.04	6.25

**Dissolved Anions**

		CaCO3				
Alkalinity-Total		<2.0	277	4.0	13.5	87.9
Bromide	Br	<1.0	<0.010	<0.010	<0.010	<0.010
Chloride	Cl	<50	<0.50	<0.50	<0.50	0.53
Fluoride	F	<2.0	0.402	0.046	<0.020	0.090
Sulphate	SO4	1560	3.9	406	396	450

**Nutrients**

Nitrate Nitrogen	N	<10	<0.10	<0.10	<0.10	<0.10
Nitrite Nitrogen	N	<10	<0.10	<0.10	<0.10	<0.10

Remarks regarding the analyses appear at the beginning of this report.  
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 < = Less than the detection limit indicated.

**RESULTS OF ANALYSIS - Water**

Sample ID	P03-03-01	P03-03-02	P03-03-03	P03-03-04	P03-03-05
Sample Date	05-07-22	05-07-22	05-07-22	05-07-22	05-07-22
Sample Time	18:15	18:20	18:45	18:50	19:07
ALS ID	1	2	3	4	5

**Dissolved Metals**

Aluminum	D-Al	2.01	<0.010	0.152	<0.050	<0.10
Antimony	D-Sb	0.043	<0.00050	<0.0025	<0.0025	<0.0050
Arsenic	D-As	<0.050	0.0076	<0.0050	<0.0050	0.010
Barium	D-Ba	<0.020	0.263	<0.020	0.064	0.129
Beryllium	D-Be	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Boron	D-B	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	0.0134	<0.000050	0.00966	0.00212	<0.00050
Calcium	D-Ca	100	80.4	94.0	95.2	127
Chromium	D-Cr	<0.025	<0.00050	<0.0025	<0.0025	<0.0050
Cobalt	D-Co	0.158	0.00162	0.225	0.146	0.0293
Copper	D-Cu	<0.050	<0.0010	<0.0050	<0.0050	<0.010
Iron	D-Fe	482	3.69	29.7	24.6	19.2
Lead	D-Pb	<0.050	<0.0010	<0.0050	<0.0050	<0.010
Lithium	D-Li	<0.050	<0.050	<0.050	<0.050	<0.050
Magnesium	D-Mg	41.6	17.9	21.5	21.0	25.6
Manganese	D-Mn	14.4	0.146	14.6	19.2	34.2
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	<0.050	0.0024	<0.0050	<0.0050	<0.010
Nickel	D-Ni	<0.25	<0.0050	0.269	0.141	<0.050
Selenium	D-Se	<0.050	<0.0010	<0.0050	<0.0050	<0.010
Silver	D-Ag	<0.0025	<0.000050	<0.00025	<0.00025	<0.00050
Sodium	D-Na	13.5	10.2	8.0	14.4	26.3
Thallium	D-Tl	<0.010	<0.00020	<0.0010	<0.0010	<0.0020
Titanium	D-Ti	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium	D-U	<0.010	0.00045	<0.0010	<0.0010	<0.0020
Vanadium	D-V	<0.030	<0.030	<0.030	<0.030	<0.030
Zinc	D-Zn	109	0.0091	12.5	3.69	0.0724

Remarks regarding the analyses appear at the beginning of this report.  
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**RESULTS OF ANALYSIS - Water**

Sample ID	P03-03-06	P01-01A	P01-02A	P01-02B	P01-04A
Sample Date	05-07-22	05-07-20	05-07-21	05-07-21	05-07-21
Sample Time	19:40	18:20	12:55	13:20	17:10
ALS ID	6	7	8	9	10

**Physical Tests**

	(uS/cm)					
Conductivity		1850	1310	621	509	1280
Hardness	CaCO <sub>3</sub>	690	689	322	266	615
pH		6.29	7.71	8.07	8.10	7.46

**Dissolved Anions**

		CaCO <sub>3</sub>				
Alkalinity-Total		9.2	233	208	175	743
Bromide	Br	<0.10	-	-	-	-
Chloride	Cl	<5.0	-	-	-	-
Fluoride	F	<0.20	-	-	-	-
Sulphate	SO <sub>4</sub>	1060	538	135	103	31.8

**Nutrients**

Nitrate Nitrogen	N	<1.0	-	-	-	-
Nitrite Nitrogen	N	<1.0	-	-	-	-

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**RESULTS OF ANALYSIS - Water**

Sample ID	P03-03-06	P01-01A	P01-02A	P01-02B	P01-04A
Sample Date	05-07-22	05-07-20	05-07-21	05-07-21	05-07-21
Sample Time	19:40	18:20	12:55	13:20	17:10
ALS ID	6	7	8	9	10

**Dissolved Metals**

Aluminum	D-Al	<0.050	<0.020	<0.010	<0.010	<0.020
Antimony	D-Sb	<0.0025	<0.0010	<0.00050	<0.00050	<0.0010
Arsenic	D-As	<0.0050	<0.0020	<0.0010	0.0034	<0.0020
Barium	D-Ba	<0.020	0.094	0.062	0.033	0.505
Beryllium	D-Be	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Boron	D-B	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	<0.00025	<0.00010	0.000070	<0.000050	<0.00010
Calcium	D-Ca	189	199	90.0	63.9	152
Chromium	D-Cr	<0.0025	<0.0010	<0.00050	<0.00050	<0.0010
Cobalt	D-Co	<0.0025	0.0011	0.00062	<0.00050	<0.0010
Copper	D-Cu	<0.0050	<0.0020	<0.0010	<0.0010	<0.0020
Iron	D-Fe	114	<0.030	<0.030	0.507	0.815
Lead	D-Pb	<0.0050	<0.0020	<0.0010	<0.0010	<0.0020
Lithium	D-Li	<0.050	<0.050	<0.050	<0.050	0.170
Magnesium	D-Mg	52.9	46.5	23.6	25.8	57.3
Manganese	D-Mn	9.71	2.60	0.724	0.148	0.270
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	0.0058	<0.0020	0.0020	<0.0010	<0.0020
Nickel	D-Ni	<0.025	<0.010	<0.0050	<0.0050	<0.010
Selenium	D-Se	<0.0050	<0.0020	<0.0010	<0.0010	<0.0020
Silver	D-Ag	<0.00025	<0.00010	<0.000050	<0.000050	0.00044
Sodium	D-Na	126	32.0	11.9	12.4	76.5
Thallium	D-Tl	<0.0010	<0.00040	<0.00020	<0.00020	<0.00040
Titanium	D-Ti	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium	D-U	<0.0010	0.00664	0.00228	0.00229	0.00044
Vanadium	D-V	<0.030	<0.030	<0.030	<0.030	<0.030
Zinc	D-Zn	0.0080	0.0979	<0.0050	<0.0050	<0.0050

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**RESULTS OF ANALYSIS - Water**



Sample ID	P01-04B	X17A	X18A	TH86-17	P03-03-01D
Sample Date	05-07-21	05-07-21	05-07-21	05-07-22	05-07-22
Sample Time	16:20	11:30	14:50	10:58	18:15
ALS ID	11	12	13	14	15

**Physical Tests**

Conductivity	(uS/cm)	1340	462	1320	171	2200
Hardness	CaCO3	695	252	728	91.2	427
pH		7.74	8.10	7.93	7.87	4.57

**Dissolved Anions**

Alkalinity-Total		CaCO3	295	225	244	74.4	<2.0
Bromide	Br		-	-	-	-	<1.0
Chloride	Cl		-	-	-	-	<50
Fluoride	F		-	-	-	-	<2.0
Sulphate	SO4		494	35.7	528	16.6	1510

**Nutrients**

Nitrate Nitrogen	N	-	-	-	-	<10
Nitrite Nitrogen	N	-	-	-	-	<10

Remarks regarding the analyses appear at the beginning of this report.  
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 < = Less than the detection limit indicated.

**RESULTS OF ANALYSIS - Water**

Sample ID	P01-04B	X17A	X18A	TH86-17	P03-03-01D
Sample Date	05-07-21	05-07-21	05-07-21	05-07-22	05-07-22
Sample Time	16:20	11:30	14:50	10:58	18:15
ALS ID	11	12	13	14	15

**Dissolved Metals**

Aluminum	D-Al	<0.050	<0.010	<0.020	<0.010	2.04
Antimony	D-Sb	<0.0025	<0.00050	<0.0010	<0.00050	<0.025
Arsenic	D-As	<0.0050	<0.0010	0.0102	<0.0010	<0.050
Barium	D-Ba	0.032	0.152	0.188	0.054	<0.020
Beryllium	D-Be	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Boron	D-B	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	<0.00025	<0.000050	<0.00010	<0.000050	0.0148
Calcium	D-Ca	218	67.9	204	26.6	102
Chromium	D-Cr	<0.0025	<0.00050	<0.0010	<0.00050	<0.025
Cobalt	D-Co	<0.0025	<0.00050	<0.0010	<0.00050	0.160
Copper	D-Cu	<0.0050	<0.0010	<0.0020	0.0010	<0.050
Iron	D-Fe	4.81	<0.030	1.89	0.070	487
Lead	D-Pb	<0.0050	<0.0010	<0.0020	<0.0010	<0.050
Lithium	D-Li	<0.050	<0.050	<0.050	<0.050	<0.050
Magnesium	D-Mg	36.7	19.9	53.2	6.05	41.9
Manganese	D-Mn	1.15	<0.010	0.812	<0.010	14.4
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	<0.0050	<0.0010	<0.0020	<0.0010	<0.050
Nickel	D-Ni	<0.025	<0.0050	<0.010	<0.0050	<0.25
Selenium	D-Se	<0.0050	<0.0010	<0.0020	<0.0010	<0.050
Silver	D-Ag	<0.00025	<0.000050	<0.00010	<0.000050	<0.0025
Sodium	D-Na	46.3	2.6	26.5	2.0	13.5
Thallium	D-Tl	<0.0010	<0.00020	<0.00040	<0.00020	<0.010
Titanium	D-Ti	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium	D-U	0.0033	0.00252	0.00640	0.00050	<0.010
Vanadium	D-V	<0.030	<0.030	<0.030	<0.030	<0.030
Zinc	D-Zn	<0.0050	0.0062	<0.0050	0.0136	109

Remarks regarding the analyses appear at the beginning of this report.  
 Results are expressed as milligrams per litre except where noted.  
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**Appendix 1 - QUALITY CONTROL - Replicates**



Water		P03-03-05	P03-03-05	P01-04B	P01-04B
		05-07-22 19:07	QC # 454009	05-07-21 16:20	QC # 454310
<b><u>Physical Tests</u></b>					
Hardness	CaCO3	423	420	695	683
<b><u>Dissolved Anions</u></b>					
Alkalinity-Total		CaCO3	87.9	87.8	295
Sulphate	SO4		450	455	494
				296	497

Remarks regarding the analyses appear at the beginning of this report.  
 Results are expressed as milligrams per litre except where noted.  
 < = Less than the detection limit indicated.

## Appendix 1 - QUALITY CONTROL - Replicates



Water		P03-03-05	P03-03-05	P01-04B	P01-04B
		05-07-22 19:07	QC # 454009	05-07-21 16:20	QC # 454310
<b>Dissolved Metals</b>					
Aluminum	D-Al	<0.10	<0.10	<0.050	<0.050
Antimony	D-Sb	<0.0050	<0.0050	<0.0025	<0.0025
Arsenic	D-As	0.010	0.011	<0.0050	<0.0050
Barium	D-Ba	0.129	0.127	0.032	0.031
Beryllium	D-Be	<0.0050	<0.0050	<0.0050	<0.0050
Boron	D-B	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	<0.00050	<0.00050	<0.00025	<0.00025
Calcium	D-Ca	127	126	218	216
Chromium	D-Cr	<0.0050	<0.0050	<0.0025	<0.0025
Cobalt	D-Co	0.0293	0.0302	<0.0025	<0.0025
Copper	D-Cu	<0.010	<0.010	<0.0050	<0.0050
Iron	D-Fe	19.2	19.3	4.81	4.73
Lead	D-Pb	<0.010	<0.010	<0.0050	<0.0050
Lithium	D-Li	<0.050	<0.050	<0.050	<0.050
Magnesium	D-Mg	25.6	25.4	36.7	35.0
Manganese	D-Mn	34.2	33.5	1.15	1.13
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	<0.010	<0.010	<0.0050	<0.0050
Nickel	D-Ni	<0.050	<0.050	<0.025	<0.025
Selenium	D-Se	<0.010	<0.010	<0.0050	<0.0050
Silver	D-Ag	<0.00050	<0.00050	<0.00025	<0.00025
Sodium	D-Na	26.3	26.0	46.3	44.1
Thallium	D-Tl	<0.0020	<0.0020	<0.0010	<0.0010
Titanium	D-Ti	<0.050	<0.050	<0.050	<0.050
Uranium	D-U	<0.0020	<0.0020	0.0033	0.0033
Vanadium	D-V	<0.030	<0.030	<0.030	<0.030
Zinc	D-Zn	0.0724	0.0727	<0.0050	<0.0050

Remarks regarding the analyses appear at the beginning of this report.  
Results are expressed as milligrams per litre except where noted.  
< = Less than the detection limit indicated.

## Appendix 2 - METHODOLOGY



Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

### Conductivity in Water

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

Recommended Holding Time:

Sample: 28 days

Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

### pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:

Sample: 2 hours

Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

### Alkalinity in Water by Colourimetry

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

Recommended Holding Time:

Sample: 14 days

Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

### Dissolved Anions in Water by Ion Chromatography

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG17 anion exchange column with a hydroxide eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

Recommended Holding Time:

Sample: 28 days (bromide, chloride, fluoride, sulphate)

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## Appendix 2 - METHODOLOGY - Continued



Sample: 2 days (nitrate, nitrite)  
Reference: APHA and EPA

Laboratory Location: ALS Environmental, Vancouver

### Sulphate in Water

This analysis is carried out using procedures adapted from APHA Method 4500-SO4 "Sulphate". Sulphate is determined using the turbidimetric method.

Recommended Holding Time:  
Sample: 28 days  
Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

### Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:  
Sample: 6 months  
Reference: EPA

Laboratory Location: ALS Environmental, Vancouver

### Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Recommended Holding Time:  
Sample: 28 days  
Reference: EPA

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**Appendix 2 - METHODOLOGY - Continued**



Laboratory Location: ALS Environmental, Vancouver

**Alkalinity in Water by Titration**

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

Recommended Holding Time:

Sample: 14 days

Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

**Results contained within this certificate relate only to the samples as submitted.**

**This Certificate Of Analysis shall only be reproduced in full, except with the written approval of ALS Environmental.**

**End of Report**