L1682103 CONTD....

PAGE 3 of 6 26-OCT-15 09:45 (MT) Version: FINAL REV. 2

	Sample ID Description Sampled Date Sampled Time Client ID	L1682103-6 WATER 30-SEP-15 12:14 LUP-21-150930		
Grouping	Analyte	-		
WATER				
Physical Tests	Hardness (as CaCO3) (mg/L)	6.08		
	Total Suspended Solids (mg/L)	<3.0		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	3.1		
	Ammonia, Total (as N) (mg/L)	<0.050		
Cyanides	Cyanide, Total (mg/L)	<0.0050		
Total Metals	Aluminum (AI)-Total (mg/L)	0.0397		
	Antimony (Sb)-Total (mg/L)	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00037		
	Barium (Ba)-Total (mg/L)	0.00277		
	Beryllium (Be)-Total (mg/L)	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050		
	Boron (B)-Total (mg/L)	<0.010		
	Cadmium (Cd)-Total (mg/L)	<0.000050		
	Calcium (Ca)-Total (mg/L)	1.24		
	Cesium (Cs)-Total (mg/L)	0.000012		
	Chromium (Cr)-Total (mg/L)	0.00012		
	Cobalt (Co)-Total (mg/L)	0.00014		
	Copper (Cu)-Total (mg/L)	0.00079		
	Iron (Fe)-Total (mg/L)	0.069		
	Lead (Pb)-Total (mg/L)	<0.000050		
	Lithium (Li)-Total (mg/L)	0.0012		
	Magnesium (Mg)-Total (mg/L)	0.727		
	Manganese (Mn)-Total (mg/L)	0.00426		
	Mercury (Hg)-Total (mg/L)	<0.000050		
	Molybdenum (Mo)-Total (mg/L)	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.00090		
	Phosphorus (P)-Total (mg/L)	<0.050		
	Potassium (K)-Total (mg/L)	0.354		
	Rubidium (Rb)-Total (mg/L)	0.00097		
	Selenium (Se)-Total (mg/L)	<0.000050		
	Silicon (Si)-Total (mg/L)	0.719		
	Silver (Ag)-Total (mg/L)	<0.000010		
	Sodium (Na)-Total (mg/L)	0.721		
	Strontium (Sr)-Total (mg/L)	0.00721		
	Sulfur (S)-Total (mg/L)	1.16		
	Tellurium (Te)-Total (mg/L)	<0.00020		
	Thallium (TI)-Total (mg/L)	<0.000010		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1682103 CONTD....

PAGE 4 of 6

26-OCT-15 09:45 (MT) Version: FINAL REV. 2

		Sample ID Description Sampled Date Sampled Time Client ID	L1682103-1 WATER 28-SEP-15 15:31 LUP-22-150928	L1682103-2 WATER 28-SEP-15 14:36 LUP-24-150928	L1682103-3 WATER 28-SEP-15 14:00 LUP-25-150928	L1682103-4 WATER 28-SEP-15 14:42 LUP-37-150928	L1682103-5 WATER 30-SEP-15 10:54 LUP-20-150930
Grouping	Analyte						
WATER							
Total Metals	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	0.00015	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		0.00301	0.00062	<0.00030	0.00064	0.00034
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)		0.000031	0.000027	0.000024	0.000027	<0.000010
	Vanadium (V)-Total (mg/L)		0.00079	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		0.0348	0.0062	<0.0030	0.0058	0.181
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1682103 CONTD.... PAGE 5 of 6

26-OCT-15 09:45 (MT) Version: FINAL REV. 2

		Sample ID Description Sampled Date Sampled Time Client ID	L1682103-6 WATER 30-SEP-15 12:14 LUP-21-150930		
Grouping	Analyte				
WATER					
Total Metals	Thorium (Th)-Total (mg/L)		<0.00010		
	Tin (Sn)-Total (mg/L)		<0.00010		
	Titanium (Ti)-Total (mg/L)		0.00065		
	Tungsten (W)-Total (mg/L)		<0.00010		
	Uranium (U)-Total (mg/L)		0.000024		
	Vanadium (V)-Total (mg/L)		<0.00050		
	Zinc (Zn)-Total (mg/L)		<0.0030		
	Zirconium (Zr)-Total (mg/L)		<0.00030		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

#### **Reference Information**

L1682103 CONTD.... PAGE 6 of 6 26-OCT-15 09:45 (MT)

Version: FINAL REV. 2

#### **Qualifiers for Individual Samples Listed:**

Sample Numbe	Client Sample ID	Qualifier	Description
L1682103-2	LUP-24-150928	SPL	Sample was Preserved at the laboratory - HG T
L1682103-3	LUP-25-150928	SPL	Sample was Preserved at the laboratory - HG T
L1682103-4	LUP-37-150928	SPL	Sample was Preserved at the laboratory - HG T
L1682103-6	LUP-21-150930	SPL	Sample was Preserved at the laboratory - HG T

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

**ETL-HARDNESS-TOT-ED** Water Hardness (from Total Ca and Mg) APHA 2340 B-Calculation **HG-T-CVAA-ED** Water Total Mercury in Water by CVAAS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-ED Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

#### Chain of Custody Numbers:

#### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



## Chain of Custody (COC) / Analytical Request Form

COC Number: 14 -

# Affix ALS barcode label here

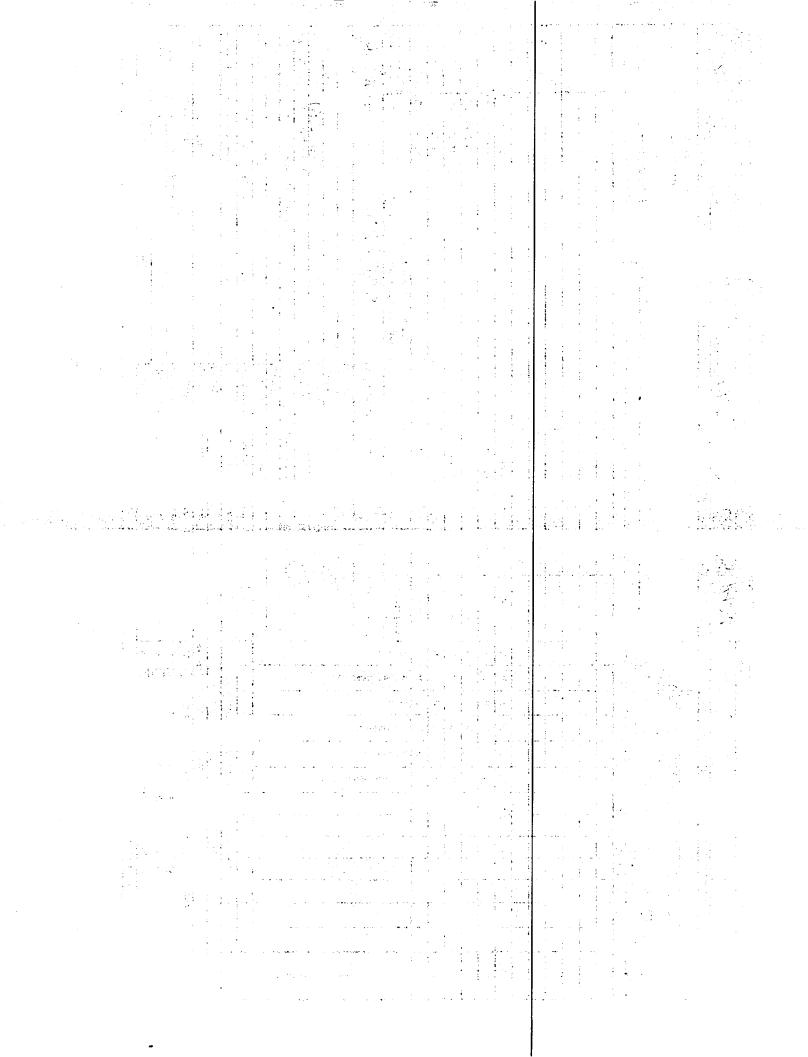
Page 1 of

Canada Toll Free: 1 800 668 9878

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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 08-OCT-15

Report Date: 22-OCT-15 14:48 (MT)

Version: FINAL

Client Phone: 778-386-7340

#### Certificate of Analysis

Lab Work Order #: L1686003
Project P.O. #: NOT SUBMITTED

Job Reference: C of C Numbers: Legal Site Desc:

Comments: ADDITIONAL 21-OCT-15 15:29

Rick Zo kiewski General Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

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L1686003 CONTD....

PAGE 2 of 7 22-OCT-15 14:48 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1686003-1 WATER 02-OCT-15 08:36 LUP-10-151002	L1686003-2 WATER 03-OCT-15 08:46 LUP-10-151003	L1686003-3 WATER 04-OCT-15 08:40 LUP-10-151004	L1686003-4 WATER 05-OCT-15 08:07 LUP-10-151005	L1686003-5 WATER 06-OCT-15 08:16 LUP-10-151006
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	168	175	176	175	184
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	4.1	5.1	4.5	4.4	5.5
	Nitrate and Nitrite (as N) (mg/L)					1.04
	Nitrate (as N) (mg/L)					1.04
	Nitrite (as N) (mg/L)					<0.010
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
<b>Total Metals</b>	Aluminum (AI)-Total (mg/L)	0.0254	0.0297	0.0241	0.0212	0.0242
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00658	0.00710	0.00604	0.00577	0.00643
	Barium (Ba)-Total (mg/L)	0.0142	0.0144	0.0141	0.0143	0.0147
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.054	0.054	0.054	0.054	0.056
	Cadmium (Cd)-Total (mg/L)	0.000203	0.000201	0.000199	0.000204	0.000216
	Calcium (Ca)-Total (mg/L)	55.7	58.7	58.8	58.4	61.9
	Cesium (Cs)-Total (mg/L)	0.000079	0.000080	0.000080	0.000079	0.000082
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	0.0315	0.0311	0.0314	0.0312	0.0313
	Copper (Cu)-Total (mg/L)	0.00197	0.00212	0.00184	0.00170	0.00176
	Iron (Fe)-Total (mg/L)	0.120	0.138	0.115	0.107	0.123
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0229	0.0234	0.0236	0.0225	0.0239
	Magnesium (Mg)-Total (mg/L)	7.07	6.99	7.17	7.08	7.12
	Manganese (Mn)-Total (mg/L)	0.816	0.778	0.802	0.786	0.790
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.0704	0.0701	0.0705	0.0702	0.0698
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	4.60	4.58	4.61	4.61	4.44
	Rubidium (Rb)-Total (mg/L)	0.00215	0.00221	0.00198	0.00197	0.00214
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	1.80	1.80	1.77	1.77	1.74
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	43.2	42.3	43.0	42.8	42.5
	Strontium (Sr)-Total (mg/L)	0.252	0.257	0.258	0.254	0.265
	Sulfur (S)-Total (mg/L)	73.0	73.0	72.2	72.6	71.2
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1686003 CONTD.... PAGE 3 of 7

22-OCT-15 14:48 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1686003-6 WATER 07-OCT-15 08:45 LUP-10-151007		
Grouping	Analyte			
WATER				
Physical Tests	Hardness (as CaCO3) (mg/L)	184		
	Total Suspended Solids (mg/L)	<3.0		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	5.9		
	Nitrate and Nitrite (as N) (mg/L)	1.04		
	Nitrate (as N) (mg/L)	1.04		
	Nitrite (as N) (mg/L)	<0.010		
Cyanides	Cyanide, Total (mg/L)	<0.0050		
Total Metals	Aluminum (AI)-Total (mg/L)	0.0206		
	Antimony (Sb)-Total (mg/L)	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00587		
	Barium (Ba)-Total (mg/L)	0.0144		
	Beryllium (Be)-Total (mg/L)	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050		
	Boron (B)-Total (mg/L)	0.056		
	Cadmium (Cd)-Total (mg/L)	0.000205		
	Calcium (Ca)-Total (mg/L)	61.5		
	Cesium (Cs)-Total (mg/L)	0.000080		
	Chromium (Cr)-Total (mg/L)	<0.00010		
	Cobalt (Co)-Total (mg/L)	0.0310		
	Copper (Cu)-Total (mg/L)	0.00155		
	Iron (Fe)-Total (mg/L)	0.103		
	Lead (Pb)-Total (mg/L)	<0.000050		
	Lithium (Li)-Total (mg/L)	0.0226		
	Magnesium (Mg)-Total (mg/L)	7.26		
	Manganese (Mn)-Total (mg/L)	0.790		
	Molybdenum (Mo)-Total (mg/L)	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.0697		
	Phosphorus (P)-Total (mg/L)	<0.050		
	Potassium (K)-Total (mg/L)	4.70		
	Rubidium (Rb)-Total (mg/L)	0.00211		
	Selenium (Se)-Total (mg/L)	<0.000050		
	Silicon (Si)-Total (mg/L)	1.79		
	Silver (Ag)-Total (mg/L)	<0.000010		
	Sodium (Na)-Total (mg/L)	43.7		
	Strontium (Sr)-Total (mg/L)	0.258		
	Sulfur (S)-Total (mg/L)	72.6		
	Tellurium (Te)-Total (mg/L)	<0.00020		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1686003 CONTD....

PAGE 4 of 7 22-OCT-15 14:48 (MT)

Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1686003-1 WATER 02-OCT-15 08:36 LUP-10-151002	L1686003-2 WATER 03-OCT-15 08:46 LUP-10-151003	L1686003-3 WATER 04-OCT-15 08:40 LUP-10-151004	L1686003-4 WATER 05-OCT-15 08:07 LUP-10-151005	L1686003-5 WATER 06-OCT-15 08:16 LUP-10-151006
Grouping	Analyte						
WATER							
Total Metals	Thallium (TI)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)		0.000021	0.000022	0.000019	0.000019	0.000018
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		0.233	0.231	0.226	0.227	0.226
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1686003 CONTD.... PAGE 5 of 7

22-OCT-15 14:48 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1686003-6 WATER 07-OCT-15 08:45 LUP-10-151007		
Grouping	Analyte				
WATER					
Total Metals	Thallium (TI)-Total (mg/L)		<0.000010		
	Thorium (Th)-Total (mg/L)		<0.00010		
	Tin (Sn)-Total (mg/L)		<0.00010		
	Titanium (Ti)-Total (mg/L)		<0.00030		
	Tungsten (W)-Total (mg/L)		<0.00010		
	Uranium (U)-Total (mg/L)		0.000017		
	Vanadium (V)-Total (mg/L)		<0.00050		
	Zinc (Zn)-Total (mg/L)		0.218		
	Zirconium (Zr)-Total (mg/L)		<0.00030		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1686003 CONTD.... PAGE 6 of 7

22-OCT-15 14:48 (MT) Version: **FINAL** 

#### **Reference Information**

#### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Beryllium (Be)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Bismuth (Bi)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Cesium (Cs)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Chromium (Cr)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Cobalt (Co)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Copper (Cu)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Lead (Pb)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Phosphorus (P)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Silver (Ag)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Tellurium (Te)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Thallium (TI)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Thorium (Th)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Tin (Sn)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Titanium (Ti)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Tungsten (W)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Vanadium (V)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Zinc (Zn)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6
Duplicate	Zirconium (Zr)-Total	DLDS	L1686003-1, -2, -3, -4, -5, -6

#### **Qualifiers for Individual Parameters Listed:**

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-ED	Water	Hardness (from Total Ca and Mg)	APHA 2340 B-Calculation
MET-T-CCMS-ED	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Water **CALCULATION** NO2+NO3-CALC-ED Nitrate+Nitrite NO2-IC-N-ED Water Nitrite in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-ED Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

**SOLIDS-TOTSUS-ED** Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

**Laboratory Definition Code Laboratory Location** 

#### **Chain of Custody Numbers:**

<sup>\*\*</sup> ALS test methods may incorporate modifications from specified reference methods to improve performance.

**Reference Information** 

L1686003 CONTD....

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#### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

## ALS Environmenta

www.alsglobal.com

#### Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

#### Affix ALS barcode label here

(lab use only)

COC Number: 14 -

age 1 of 1

Report To				Report Forma	t / Distribution				Select	Service	Level Bel	ow (Rush	Tumarou	und Time (	(TAT) is no	t availa	ole for all test	s)
Company:	Lupin Mines Incorporated c/o Elgin Mining In	nc.	Select Report Fo	ormat: PDF	EXCEL	EDD (DIGITAL)	R	⊠ R	egular (	Standard	TAT if rec	eived by 3	pm - bu	usiness da	ys)			
Contact:	K. Lewis		Quality Control (	QC) Report with Rep	oort 🔽 Ye	s 「No	Р	□ P	riority (2	-4 bus. d	ays if rece	ived by 3p	m) 50%	surcharg	e - contac	t ALS to	confirm TAT	
Address:	76 Richmond Street East, Suite 330		Criteria on Rep	ort - provide details below	Color Decided to the Second Se		E	E	mergeno	y (1-2 bu	s. days if	received b	y 3pm)	100% sur	charge - c	ontact A	LS to confirm	n TAT
	Toronto, ON M5C 1P1		Select Distributio			FAX	E2	S	ame day	or week	end emerg	ency - cor	tact ALS	S to confir	rm TAT an	d surcha	irge	
Phone:	778-386-7340			klewis@elginmining	g.com		Speci	ify Date	e Requ	ired for	E2,E or	P:						
			Email 2									Ana	lysis	Reques	t			
Invoice To	Same as Report To Yes	□ No			stribution		2	_	Indicate	Filtered (	F), Preser	ved (P) or	Filtered	and Pres	erved (F/P	) below		
	Copy of Invoice with Report Yes	□ No	Select Invoice Di		EMAIL MAIL	FAX	Р	Р										4
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LSD:	Lupin Mine		Location:						Solids, Alkalinity, Hardness									Number of Containers
220.010.00	rk Order# (lab use only)	5003	ALS Contact:	Rick Zoliewski	Sampler:	Corine de Repen	als	nide	S pepued S	Nitrite								ž
ALS Sample # (lab use only)	Sample Identificatio	n and/or Coordinates appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals	Total Cyanide	Total Suspended	Nitrate, N								
	Lup-10-151002			02-oct-15	8:36	Water	R	R	R									3
	Lup-10-151003			03-oct-15	8:46	Water	R	R	R									3
	Lup-10-151004			04-oct-15	8:40	Water	R	R	R	7							THE	3
	Lup-10-151005			05-oct-15	8:07	Water	R	R	R									3
	Lup-10-151006			06-oct-15	8:16	Water	R	R	R	R								3
	Lup-10-151007			07-oct-15	8:45	Water	R	R	R	R	107							3
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LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 08-OCT-15

Report Date: 22-OCT-15 14:59 (MT)

Version: FINAL

Client Phone: 778-386-7340

#### Certificate of Analysis

Lab Work Order #: L1686014
Project P.O. #: NOT SUBMITTED

Job Reference: C of C Numbers: Legal Site Desc:

Comments: ADDITIONAL 22-OCT-15 14:50

Rick Zo kiewski General Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 75 Con Road, PO. Box 2801, Yellowknife, NT, X1A 2R2 Canada | Phone: +1 867 873 5593 | Fax: +1 867 920 4238 ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

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L1686014 CONTD....

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Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1686014-1 WATER 05-OCT-15 15:38 LUP-22-151005	L1686014-2 WATER 05-OCT-15 14:35 LUP-24-151005	L1686014-3 WATER 05-OCT-15 14:05 LUP-25-151005	L1686014-4 WATER 05-OCT-15 14:45 LUP-37-151005	L1686014-5 WATER 06-OCT-15 14:20 LUP-20-151005
Grouping	Analyte	•				
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	45.9	40.5	11.9	41.6	154
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	2.1	2.1	2.6	<2.0	<2.0
	Ammonia, Total (as N) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Nitrate and Nitrite (as N) (mg/L)					
	Nitrate (as N) (mg/L)		0.139		0.143	
	Nitrite (as N) (mg/L)					
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.0434	0.0458	0.0175	0.0441	0.0435
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00075	0.00072	0.00038	0.00075	0.00141
	Barium (Ba)-Total (mg/L)	0.00860	0.00991	0.00433	0.00992	0.0179
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.013	0.012	<0.010	0.012	0.047
	Cadmium (Cd)-Total (mg/L)	0.0000548	0.0000531	0.0000130	0.0000474	0.000158
	Calcium (Ca)-Total (mg/L)	14.2	12.3	3.24	12.8	50.9
	Cesium (Cs)-Total (mg/L)	0.000029	0.000028	0.000012	0.000028	0.000076
	Chromium (Cr)-Total (mg/L)	0.00013	0.00012	<0.00010	0.00019	<0.00010
	Cobalt (Co)-Total (mg/L)	0.00572	0.00502	0.00106	0.00500	0.0201
	Copper (Cu)-Total (mg/L)	0.00110	0.00110	0.00076	0.00114	0.00101
	Iron (Fe)-Total (mg/L)	0.046	0.050	0.019	0.050	0.028
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0060	0.0055	0.0017	0.0057	0.0214
	Magnesium (Mg)-Total (mg/L)	2.51	2.38	0.926	2.32	6.57
	Manganese (Mn)-Total (mg/L)	0.127	0.109	0.0231	0.108	0.485
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000052
	Nickel (Ni)-Total (mg/L)	0.0203	0.0193	0.00501	0.0191	0.0631
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	1.23	1.14	0.540	1.15	3.81
	Rubidium (Rb)-Total (mg/L)	0.00133	0.00151	0.00120	0.00145	0.00223
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	1.24	1.14	0.345	1.13	2.09
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	10.4	9.13	2.39	9.16	35.8
	Strontium (Sr)-Total (mg/L)	0.0631	0.0542	0.0163	0.0558	0.221
	Sulfur (S)-Total (mg/L)	17.7	15.8	3.85	15.6	62.6

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

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22-OCT-15 14:59 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1686014-6 WATER 06-OCT-15 14:42 LUP-21-151005		
Grouping	Analyte	-		
WATER				
Physical Tests	Hardness (as CaCO3) (mg/L)	6.01		
	Total Suspended Solids (mg/L)	<3.0		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	2.8		
	Ammonia, Total (as N) (mg/L)	<0.050		
	Nitrate and Nitrite (as N) (mg/L)	<0.022		
	Nitrate (as N) (mg/L)	<0.020		
	Nitrite (as N) (mg/L)	<0.010		
Cyanides	Cyanide, Total (mg/L)	<0.0050		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0249		
	Antimony (Sb)-Total (mg/L)	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00030		
	Barium (Ba)-Total (mg/L)	0.00248		
	Beryllium (Be)-Total (mg/L)	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050		
	Boron (B)-Total (mg/L)	<0.010		
	Cadmium (Cd)-Total (mg/L)	<0.000050		
	Calcium (Ca)-Total (mg/L)	1.29		
	Cesium (Cs)-Total (mg/L)	0.000010		
	Chromium (Cr)-Total (mg/L)	<0.00010		
	Cobalt (Co)-Total (mg/L)	0.00015		
	Copper (Cu)-Total (mg/L)	0.00080		
	Iron (Fe)-Total (mg/L)	0.041		
	Lead (Pb)-Total (mg/L)	<0.000050		
	Lithium (Li)-Total (mg/L)	0.0012		
	Magnesium (Mg)-Total (mg/L)	0.675		
	Manganese (Mn)-Total (mg/L)	0.00338		
	Molybdenum (Mo)-Total (mg/L)	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.00106		
	Phosphorus (P)-Total (mg/L)	<0.050		
	Potassium (K)-Total (mg/L)	0.309		
	Rubidium (Rb)-Total (mg/L)	0.00097		
	Selenium (Se)-Total (mg/L)	<0.000050		
	Silicon (Si)-Total (mg/L)	0.605		
	Silver (Ag)-Total (mg/L)	<0.000010		
	Sodium (Na)-Total (mg/L)	0.671		
	Strontium (Sr)-Total (mg/L)	0.00718		
	Sulfur (S)-Total (mg/L)	1.11		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1686014 CONTD....

PAGE 4 of 7 22-OCT-15 14:59 (MT)

Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1686014-1 WATER 05-OCT-15 15:38 LUP-22-151005	L1686014-2 WATER 05-OCT-15 14:35 LUP-24-151005	L1686014-3 WATER 05-OCT-15 14:05 LUP-25-151005	L1686014-4 WATER 05-OCT-15 14:45 LUP-37-151005	L1686014-5 WATER 06-OCT-15 14:20 LUP-20-151005
Grouping	Analyte						
WATER							
Total Metals	Tellurium (Te)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (TI)-Total (mg/L)		<0.000010	<0.00010	<0.000010	<0.00010	<0.000010
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		0.00035	0.00041	0.00035	0.00046	<0.00030
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)		0.000023	0.000026	0.000023	0.000026	<0.000010
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		0.0476	0.0420	0.0099	0.0419	0.158
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1686014 CONTD.... PAGE 5 of 7

22-OCT-15 14:59 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1686014-6 WATER 06-OCT-15 14:42 LUP-21-151005		
Grouping	Analyte				
WATER					
Total Metals	Tellurium (Te)-Total (mg/L)		<0.00020		
	Thallium (TI)-Total (mg/L)		<0.000010		
	Thorium (Th)-Total (mg/L)		<0.00010		
	Tin (Sn)-Total (mg/L)		<0.00010		
	Titanium (Ti)-Total (mg/L)		<0.00030		
	Tungsten (W)-Total (mg/L)		<0.00010		
	Uranium (U)-Total (mg/L)		0.000016		
	Vanadium (V)-Total (mg/L)		<0.00050		
	Zinc (Zn)-Total (mg/L)		<0.0030		
	Zirconium (Zr)-Total (mg/L)		<0.00030		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

FINΔI

22-OCT-15 14:59 (MT)

Version:

#### **Reference Information**

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Beryllium (Be)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Bismuth (Bi)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Cesium (Cs)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Chromium (Cr)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Cobalt (Co)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Copper (Cu)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Lead (Pb)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Phosphorus (P)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Silver (Ag)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Tellurium (Te)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Thallium (TI)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Thorium (Th)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Tin (Sn)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Titanium (Ti)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Tungsten (W)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Vanadium (V)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Zinc (Zn)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6
Duplicate	Zirconium (Zr)-Total	DLDS	L1686014-1, -2, -3, -4, -5, -6

#### **Qualifiers for Individual Parameters Listed:**

Qualifier Description

**DLDS** Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

**ETL-HARDNESS-TOT-ED** Water Hardness (from Total Ca and Mg) APHA 2340 B-Calculation **MET-T-CCMS-ED** Total Metals in Water by CRC ICPMS Water EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.

NO2+NO3-CALC-ED Water Nitrate+Nitrite CALCULATION NO2-IC-N-ED Water Nitrite in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-ED Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

**SOLIDS-TOTSUS-ED** Water **Total Suspended Solids** APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

**Laboratory Definition Code Laboratory Location** 

<sup>\*\*</sup> ALS test methods may incorporate modifications from specified reference methods to improve performance.

**Reference Information** 

L1686014 CONTD....

PAGE 7 of 7

22-OCT-15 14:59 (MT)

Version: FINAL

#### **Chain of Custody Numbers:**

#### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

## ALS Environmental

#### Chain of Custody (COC) / Analytical Request Form

#### Affix ALS barcode label here

COC Number: 14 -

Page \_\_\_1 of \_\_\_1

Canada Toll Free: 1 800 668 9878

Report To					Report Format	/ Distribution			3.3	Select	Service	Level Be	elow (Ru	sh Tuma	around Ti	ne (TAT)	is not ava	lable for a	II tests)	
Company:	Lupin Mines Incorporated c/o E	Elgin Mining Inc.		Select Report Fo	Select Report Format: PDF EXCEL   EDD (DIGITAL)															
Contact:	K. Lewis			Quality Control (	QC) Report with Rep	ort Ve	s No	Р	□ P	riority (2	4 bus. o	days if re	ceived by	3pm) 5	0% surch	arge - co	ntact ALS	to confirm	TAT	
Address:	76 Richmond Street East, Suit	e 330		Criteria on Rep	ort - provide details below	v if box checked		E	1 1 8	mergenc	y (1-2 b	us. days	f receive	d by 3pr	n) 100%	surcharg	e - contac	t ALS to co	onfirm TA	T
	Toronto, ON M5C 1P1			Select Distribution	on: 🔀 EN	MAIL MAIL	FAX	E2	S	ame day	or week	end eme	rgency -	contact	ALS to co	onfirm TA	and sur	charge		
Phone:	778-386-7340			Email 1 or Fax	klewis@elginmining	j.com		Speci	ify Dat	e Requ	ired fo	r E2,E	or P:							
				Email 2									Α	nalysi	is Requ	iest				
Invoice To	Same as Report To	₩ Yes	No		Invoice Di	stribution				Indicate	Filtered	(F), Pres	erved (P	or Filte	red and P	reserved	(F/P) belo	w		
	Copy of Invoice with Report	Yes	No	Select Invoice Di	istribution:	EMAIL MAIL	FAX				Р	P	P							
Company:				Email 1 or Fax	klewis@elginmining	j.com														
Contact:				Email 2																S
	Project Inform	nation			il and Gas Require	-	se)													Number of Containers
ALS Quote #:	53119			Approver ID:		Cost Center:														ont
Job #:				GL Account:		Routing Code:														of C
PO/AFE:				Activity Code:					spi									1 1		per
LSD:	Lupin Mine			Location:					Sol											Ē
ALS Lab Wo	rk Order# (lab use only)	L16860	714	ALS Contact:	Rick Zoliewski	Sampler:	C.de Repentigny		Total Suspended Solids	so.	mnonia (NH4)	anide	tals							-
ALS Sample # (lab use only)		Identification a	and/or Coordinates opear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alkalinity	Total Su	Hardness	Amnonia	Total Cyanide	Total Metals	Nitrate						
	LUP-22-151005				05-oct-15	15:38	Water	R	R	R	R	R	R							4
	LUP-24-151005				05-oct-15	14:35	Water	R	R	R	R	R	R							4
	LUP-25-151005				05-oct-15	14:05	Water	R	R	R	R	R	R							4
	LUP-28-151005				05-oct-15	14:45	Water	R	R	R	R	R	R							4
	LUP-20-151006				06-oct-15	14:20	Water	R	R	R	R	R	R							4
	LUP-21-151006				06-oct-15	14:42	Water	R	R	R	R	R	R	R						4
						Alberta time						1	1		1	1	1	1		
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Drinkin	g Water (DW) Samples¹ (clien	t use)	Specia	Instructions / Spec	ify Criteria to add on	report (client Use)	)/				SAM	PLE C	ONDIT			IVED (		only)		
	n from a Regulated DW System?			2.0 10 00 10 00	2,1000000000000000000000000000000000000	100000000000000000000000000000000000000		Froze			H				bserva		Yes	님	No	H
⊢ Y								Coolin	acks ng Initi	Yes		No		Custo	dy seal	intact	Yes		No	
	uman drinking water use?							N	INTIAL S	OOLER	TEMPE	RATURE	s °C		I	INAL CO	OLER TE	MPERAT	IRES °C	
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Released by:	Date		S 47 Receiv	ed by:		Date: Oct8/15	Time:	Rece	eived b	y:					Date:		Time	:		
REFER TO BACK	PAGE FOR ALS LOCATIONS AND		RMATION		/\/HI	TE - LABORATORY	COPY VELLO	N - CH	ENT C	)PV		_			NI	EM 0126a VO	Front 04 Jan	ary 2014		



LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 09-OCT-15

Report Date: 02-NOV-15 11:42 (MT)

Version: FINAL

Client Phone: 778-386-7340

#### Certificate of Analysis

Lab Work Order #: L1686101

Project P.O. #:

**NOT SUBMITTED** 

Job Reference:

C of C Numbers:

Legal Site Desc:

Rick Zolkiewski General Manager

 $[This\ report\ shall\ not\ be\ reproduced\ except\ in\ full\ without\ the\ written\ authority\ of\ the\ Laboratory.]$ 

ADDRESS: 75 Con Road, PO. Box 2801, Yellowknife, NT, X1A 2R2 Canada | Phone: +1 867 873 5593 | Fax: +1 867 920 4238 ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

Environmental 🚴

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L1686101 CONTD.... PAGE 2 of 5

#### 02-NOV-15 11:42 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1686101-1 WATER 08-OCT-15 07:45 LUP-10-151008	L1686101-2 WATER 08-OCT-15 07:50 LUP-35-151008		
Grouping	Analyte				
WATER					
Physical Tests	Hardness (as CaCO3) (mg/L)	175	185		
	Total Suspended Solids (mg/L)	<3.0	<3.0		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	4.6	4.5		
	Ammonia, Total (as N) (mg/L)	0.087	0.089		
	Nitrate and Nitrite (as N) (mg/L)	0.908	0.894		
	Nitrate (as N) (mg/L)	0.908	0.894		
	Nitrite (as N) (mg/L)	<0.010	<0.010		
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050		
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.0187	0.0193		
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00627	0.00627		
	Barium (Ba)-Total (mg/L)	0.0143	0.0144		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	0.055	0.057		
	Cadmium (Cd)-Total (mg/L)	0.000203	0.000190		
	Calcium (Ca)-Total (mg/L)	58.0	61.6		
	Cesium (Cs)-Total (mg/L)	0.000084	0.000078		
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010		
	Cobalt (Co)-Total (mg/L)	0.0313	0.0317		
	Copper (Cu)-Total (mg/L)	0.00152	0.00155		
	Iron (Fe)-Total (mg/L)	0.110	0.113		
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050		
	Lithium (Li)-Total (mg/L)	0.0244	0.0248		
	Magnesium (Mg)-Total (mg/L)	7.20	7.47		
	Manganese (Mn)-Total (mg/L)	0.813	0.813		
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.0693	0.0709		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	4.64	4.74		
	Rubidium (Rb)-Total (mg/L)	0.00211	0.00221		
	Selenium (Se)-Total (mg/L)	0.000054	<0.000050		
	Silicon (Si)-Total (mg/L)	1.82	1.83		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	42.5	44.6		
	Strontium (Sr)-Total (mg/L)	0.263	0.263		
	Sulfur (S)-Total (mg/L)	73.0	73.7		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1686101 CONTD.... PAGE 3 of 5

02-NOV-15 11:42 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1686101-1 WATER 08-OCT-15 07:45 LUP-10-151008	L1686101-2 WATER 08-OCT-15 07:50 LUP-35-151008		
Grouping	Analyte					
WATER						
Total Metals	Tellurium (Te)-Total (mg/L)		<0.00020	<0.00020		
	Thallium (TI)-Total (mg/L)		0.000012	<0.00010		
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010		
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00030		
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010		
	Uranium (U)-Total (mg/L)		0.000020	0.000017		
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)		0.228	0.232		
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030		
Radiological Parameters	Ra-226 (Bq/L)		<0.0100	<0.0100		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

#### L1686101 CONTD.... PAGE 4 of 5

PAGE 4 of 5 02-NOV-15 11:42 (MT) Version: FINAL

#### **Reference Information**

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)-Total	DLDS	L1686101-1, -2
Duplicate	Beryllium (Be)-Total	DLDS	L1686101-1, -2
Duplicate	Bismuth (Bi)-Total	DLDS	L1686101-1, -2
Duplicate	Cesium (Cs)-Total	DLDS	L1686101-1, -2
Duplicate	Chromium (Cr)-Total	DLDS	L1686101-1, -2
Duplicate	Cobalt (Co)-Total	DLDS	L1686101-1, -2
Duplicate	Copper (Cu)-Total	DLDS	L1686101-1, -2
Duplicate	Lead (Pb)-Total	DLDS	L1686101-1, -2
Duplicate	Phosphorus (P)-Total	DLDS	L1686101-1, -2
Duplicate	Silver (Ag)-Total	DLDS	L1686101-1, -2
Duplicate	Tellurium (Te)-Total	DLDS	L1686101-1, -2
Duplicate	Thallium (TI)-Total	DLDS	L1686101-1, -2
Duplicate	Thorium (Th)-Total	DLDS	L1686101-1, -2
Duplicate	Tin (Sn)-Total	DLDS	L1686101-1, -2
Duplicate	Titanium (Ti)-Total	DLDS	L1686101-1, -2
Duplicate	Tungsten (W)-Total	DLDS	L1686101-1, -2
Duplicate	Vanadium (V)-Total	DLDS	L1686101-1, -2
Duplicate	Zinc (Zn)-Total	DLDS	L1686101-1, -2
Duplicate	Zirconium (Zr)-Total	DLDS	L1686101-1, -2

#### **Qualifiers for Individual Parameters Listed:**

Qualifier Description

DLDS Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

#### **Test Method References:**

ALS Test Code Matrix		Test Description	Method Reference**
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-EDWaterHardness (from Total Ca and Mg)APHA 2340 B-CalculationMET-T-CCMS-EDWaterTotal Metals in Water by CRC ICPMSEPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the

automated phenate colourimetric method.

NO2+NO3-CALC-EDWaterNitrate+NitriteCALCULATIONNO2-IC-N-EDWaterNitrite in Water by ICEPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-ED Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

RA226-MMER-FC Water Ra226 by Alpha Scint, MDC=0.01 Bq/L EPA 903.1

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<sup>\*\*</sup> ALS test methods may incorporate modifications from specified reference methods to improve performance.

**Reference Information** 

L1686101 CONTD....

PAGE 5 of 5
02-NOV-15 11:42 (MT)

Version: FINAL

#### **Chain of Custody Numbers:**

#### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



## Radium-226 Case Narrative

#### **ALS Environmental**

L1686101

Work Order Number: 1510223

- 1. This report consists of the analytical results for two water samples received by ALS on 10/14/2015.
- 2. These samples were prepared and analyzed according to the current revision of SOP 783. The analyses were completed on 10/23/2015.
- 3. The analysis results for these samples are reported in units of BQ/I. The samples were not filtered prior to analysis.
- 4. Due to uncertainty associated with the ICP-AES determination of barium concentration in the samples, the calculated yield for samples RE151015-2MB and RE151015-2LCSD fell between 100% and 110%. To minimize the potential for low bias, results have been calculated conservatively assuming quantitative chemical yield (100%). The magnitude of the low bias is estimated to be less than 10% of the reported value and is acceptable according the ALS LQAP. These samples are identified with a "Y1" qualifier on the final report.
- 5. No further anomalous situations were encountered during the preparation or analysis of these samples. All remaining quality control criteria were met.



The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Jill Latelle Date

Radiochemistry Primary Data Reviewer

10/27/15

Date

Radiochemistry Final Data Reviewer Date

#### **ALS Environmental -- FC**

#### Sample Number(s) Cross-Reference Table

**OrderNum:** 1510223

Client Name: ALS Environmental

**Client Project Name:** 

Client Project Number: L1686101 Client PO Number: L1686101

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1686101-1	1510223-1		WATER	08-Oct-15	
L1686101-2	1510223-2		WATER	08-Oct-15	





#### **Subcontract Request Form**

#### **Subcontract To:**

<b>ALS ENVIRONMENTAL -</b>	<b>FORT CO</b>	LLINS, CO	LORADO,	USA
----------------------------	----------------	-----------	---------	-----

225 COMMERCE DRIVE FORT COLLINS,CO 80524

Please see	enclosed	2 sar	nple(s) in	2 Container(s)			
SAMPLE NUMBER			ICAL REQUI		DATE SA	AMPLED DUE DATE	Priority Flag
 L1686101-1	LUP-10-151				10/8/2		
			Alpha Scint,	, MDC=0.01 Bq/L (RA226-I		11/2/2015	
L1686101-2	LUP-29-151	.008			10/ 8/ 2	015	
		Ra226 by	Alpha Scint,	, MDC=0.01 Bq/L (RA226-I	MMER-FC 1)	11/2/2015	
Subcontract	Info Contact	:	Sean Wh	nitaker (867) 873-5593			
Analysis and	reporting in	fo contact:	Unit 116	AIRPORT ROAD			
			Phone:	(867) 873-5593	Email: Rick	Zolkiewski@als	global.com
Please ema	il confirmat	tion of rece	ipt to:	Rick.Zolkiewski	@alsglobal	.com	
Shipped By:				Date Shipped:			
Received By:		A		Date Received:	10/19	ilis le	015
Verified By:				Date Verified:			
				Temperature:			



### ALS Environmental - Fort Collins CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Als yellow links	Workorder No: 518	222		_
Project Manager: ARA	Initials: SDm	_ Date: _	10-14-1	5
Does this project require any special handling in addition to st	andard ALS procedures?		YES	<b>®</b>
2. Are custody seals on shipping containers intact?		NONE	YES	NO
3. Are Custody seals on sample containers intact?		NON	YES	NO
4. Is there a COC (Chain-of-Custody) present or other repr	esentative documents?		(E)	NO
5. Are the COC and bottle labels complete and legible?			Œ	NO
6. Is the COC in agreement with samples received? (IDs, o containers, matrix, requested analyses, etc.)	lates, times, no. of samples, no. of		YES	NO
7. Were airbills / shipping documents present and/or remo	vable?	DROP OFF	(ES	NO
8. Are all aqueous samples requiring preservation preserved corn	ectly? (excluding volatiles)	N/A	(YES)	NO
9. Are all aqueous non-preserved samples pH 4-9?		(N/A)	YES	NO
10. Is there sufficient sample for the requested analyses?			YE	NO
11. Were all samples placed in the proper containers for the	requested analyses?		TE)	NO
12. Are all samples within holding times for the requested a	inalyses?		Œ	NO
13. Were all sample containers received intact? (not broken	n or leaking, etc.)		AE8	NO
14. Are all samples requiring no headspace (VOC, GRO, R headspace free? Size of bubble: < green pea	SK/MEE, Rx CN/S, radon)> green pea	N/A	YES	NO
15. Do any water samples contain sediment?  Amount of sediment: dusting moderate	Amountheavy	N/A	YES	<b>™</b> 9
16. Were the samples shipped on ice?			YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #2 #4	(RAD)	YES	NO
Cooler #:				
Temperature (°C): 12.1				
No. of custody seals on cooler:				
DOT Survey/ Acceptance External µR/hr reading: 17				
Information Background μR/hr reading:		· -		•
Were external µR/hr readings ≤ two times background and within DOT acce	eptance criteria? (YES / NO / NA (If no, se	ee Form 008.)		
Additional Information: PROVIDE DETAILS BELOW FOR A NO F				
				-
VO 11 11 and 12 15 and 12 VES / NO (VA)		Date/Ti	me.	
If applicable, was the client contacted? YES / NO (NA) contact:	11 11.	Date II		
Project Manager Signature / Date:	<del>7 10/14/15</del>			

\*IR Gun #2: Oakton, SN 29922500201-0066 \*IR Gun #4: Oakton, SN 2372220101-0002

## 15/0273



After printing this label:

#### **CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH**

- 1. Fold the printed page along the horizontal line.
- Place label in shipping pouch and affix it to your shipment.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

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#### Radium-226 by Radon Emanation - Method 903.1

#### PAI 783 Rev 11 Method Blank Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510223

Client Name: ALS Environmental

ClientProject ID: L1686101

Lab ID: RE151015-2MB

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 15-Oct-15

Date Prepared: 15-Oct-15

Date Analyzed: 23-Oct-15

Prep Batch: RE151015-2

QCBatchID: RE151015-2-1 Run ID: RE151015-2A

Count Time: 30 minutes

Final Aliquot: 995 ml Result Units: BQ/l

File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	BDL	0.0068	0.00999	NA	Y1,U

#### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	15190	15400	ug	102	40 - 110 %	Y1

#### **Comments:**

#### Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: RE1510223-1

Date Printed: Tuesday, October 27, 2015

**ALS Environmental -- FC** 

Page 1 of 1

LIMS Version: 6.790

#### Radium-226 by Radon Emanation - Method 903.1

#### **PAI 783 Rev 11**

#### Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC

Work Order Number: 1510223

Client Name: ALS Environmental ClientProject ID: L1686101

Lab ID: RE151015-2LCS

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11 Date Collected: 15-Oct-15

Date Prepared: 15-Oct-15

Date Analyzed: 23-Oct-15

**Prep Batch:** RE151015-2 QCBatchID: RE151015-2-1

Run ID: RE151015-2A Count Time: 15 minutes

Final Aliquot: 995 ml Result Units: BQ/I

File Name: Manual Entry

CA	SNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added		Contro I Limits	Lab Qualifier
1398	82-63-3	Ra-226	1.65 +/- 0.412	0.0105	1.704	96.8	67 - 120	P,M3

#### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	15190	15100	ug	99.2	40 - 110 %	

#### Comments:

#### Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Data Package ID: RE1510223-1

Date Printed: Tuesday, October 27, 2015

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Page 1 of 2 **ALS Environmental -- FC** 

LIMS Version: 6.790

#### Radium-226 by Radon Emanation - Method 903.1

#### **PAI 783 Rev 11**

#### **Laboratory Control Sample(s)**

Lab Name: ALS Environmental -- FC

Work Order Number: 1510223

Client Name: ALS Environmental ClientProject ID: L1686101

Lab ID: RE151015-2LCSD

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 15-Oct-15
Date Prepared: 15-Oct-15
Date Analyzed: 23-Oct-15

AI 783 Rev 11 **QCBatchID:** RE151015-2-1 5-Oct-15 **Run ID:** RE151015-2A

Count Time: 15 minutes

**Prep Batch:** RE151015-2

Final Aliquot: 995 ml Result Units: BQ/l

File Name: Manual Entry

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added		Contro I Limits	Lab Qualifier
13982-63-3	Ra-226	1.60 +/- 0.399	0.0108	1.704	93.8	67 - 120	P,Y1,M3

#### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	15190	15800	ug	104	40 - 110 %	Y1

#### **Comments:**

#### Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Data Package ID: RE1510223-1

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Date Printed: Tuesday, October 27, 2015 ALS Environmental -- FC Page 2 of 2

LIMS Version: 6.790

#### **PAI 783 Rev 11**

#### **Duplicate Sample Results (DER)**

Lab Name: ALS Environmental -- FC

Work Order Number: 1510223

Client Name: ALS Environmental

ClientProject ID: L1686101

Field ID:

Lab ID: RE151015-2LCSD

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 15-Oct-15

Date Prepared: 15-Oct-15

Date Analyzed: 23-Oct-15

Prep Batch: RE151015-2 QCBatchID: RE151015-2-1

Run ID: RE151015-2A
Count Time: 15 minutes

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA

Result Units: BQ/I

File Name: Manual Entry

CASNO	Analyte	Sample			Duplica	DER	DER		
	Analyte	Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		Lim
13982-63-3	Ra-226	1.65 +/- 0.412	0.0105	P,M3	1.60 +/- 0.399	0.0108	P,Y1,M3	0.0897	2.13

#### Comments:

#### Duplicate Qualifiers/Flags:

- $\ensuremath{\mathsf{U}}$  Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 Chemical Yield outside default limits.
- $\ensuremath{\mathsf{W}}$  DER is greater than Warning Limit of 1.42
- D DER is greater than Control Limit of 2.13
- $\ensuremath{\mathsf{LT}}$  Result is less than Request MDC, greater than sample specific MDC
- M Requested MDC not met.
- M3 The requested MDC was not met, but the reported
- activity is greater than the reported MDC.
- L LCS Recovery below lower control limit.
  H LCS Recovery above upper control limit.
- P LCS, Matrix Spike Recovery within control limits.
- N Matrix Spike Recovery outside control limits

Data Package ID: RE1510223-1

Date Printed: Tuesday, October 27, 2015

Abbreviations:

TPU - Total Propagated Uncertainty

DER - Duplicate Error Ratio

BDL - Below Detection Limit

NR - Not Reported

ALS Environmental -- FC
LIMS Version: 6.790

# PAI 783 Rev 11 Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510223

Client Name: ALS Environmental ClientProject ID: L1686101

Field ID: L1686101-1 Lab ID: 1510223-1 Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 08-Oct-15

Date Prepared: 15-Oct-15

Date Analyzed: 23-Oct-15

Prep Batch: RE151015-2 QCBatchID: RE151015-2-1

Run ID: RE151015-2A Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 995 ml

Prep Basis: Unfiltered
Moisture(%): NA
Result Units: BQ/I

File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.0091 +/- 0.0060	0.0072	0.00999	NA	LT

#### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	15190	14400	ug	95.0	40 - 110 %	

#### **Comments:**

#### Qualifiers/Flags:

- U Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- LT Result is less than Requested MDC, greater than sample specific MDC.
- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: RE1510223-1

Date Printed: Tuesday, October 27, 2015

**ALS Environmental -- FC** 

Page 1 of 2

#### **PAI 783 Rev 11** Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510223

Client Name: ALS Environmental ClientProject ID: L1686101

Field ID: L1686101-2 Lab ID: 1510223-2

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11 Date Collected: 08-Oct-15 Date Prepared: 15-Oct-15

Date Analyzed: 23-Oct-15

Prep Batch: RE151015-2 QCBatchID: RE151015-2-1

Run ID: RE151015-2A Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 995 ml

Prep Basis: Unfiltered Moisture(%): NA Result Units: BQ/I

File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.0086 +/- 0.0057	0.0066	0.00999	NA	LT

#### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	15190	14800	ug	97.4	40 - 110 %	

#### **Comments:**

#### Qualifiers/Flags:

- U Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- LT Result is less than Requested MDC, greater than sample specific MDC.
- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: RE1510223-1

Date Printed: Tuesday, October 27, 2015

**ALS Environmental -- FC** 

Page 2 of 2

# ALS Environmental

#### Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

#### Affix ALS barcode label here

(lab use only)

COC Number: 14 -

Page \_\_\_1 of \_\_\_1

	www.alsglobal.com																	
Report To			Report Forma	t / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)												
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Contact:	K. Lewis	Quality Control (	QC) Report with Rep	port Ve	s T No	P	P	riority (2	2-4 bus. d	lays if re	ceived b	(3pm)	50% su	rcharge -	contact A	S to confirm	n TAT	
Address:	76 Richmond Street East, Suite 330	Criteria on Reg	ort - provide details belo	w if box checked		E	1 1 8	mergen	cy (1-2 bu	us. days	if receive	d by 3p	m) 100	% surcha	irge - cont	act ALS to c	onfirm T	AT
	Toronto, ON M5C 1P1	Select Distribution	on: 🛛 E	MAIL MAIL	FAX	E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge												
Phone:	778-386-7340	Email 1 or Fax	klewis@elginmining	g.com		Spec	ify Dat	e Requ	ired for	E2,E	or P:							
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Invoice To	Same as Report To   ✓ Yes   ✓ No		Invoice D	istribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below											
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Company:		Email 1 or Fax	klewis@elginmining		_									$\vdash$	-			
Contact:																	10	
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ALS Lab Wo	ork Order# (lab use only) L1686101	ALS Contact:	Rick Zoliewski	Sampler:	C.de Repentign	Fotal Metals	fotal Cyanide	Fotal Suspended	>	ss	Nitrite	ë						
ALS Sample # (lab use only)	Sample Identification and/or Coordinates		Date	Time	Sample Type	M M	0 10	al Su	Mkalinity	Hardness	Vitrate,	Ammonia	Radium		- 111			
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LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 15-OCT-15

Report Date: 27-OCT-15 08:58 (MT)

Version: FINAL

Client Phone: 778-386-7340

# Certificate of Analysis

Lab Work Order #: L1688171

Project P.O. #:

**NOT SUBMITTED** 

Job Reference:

C of C Numbers: Legal Site Desc:

General Manager

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L1688171 CONTD....

PAGE 2 of 7 27-OCT-15 08:58 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1688171-1 WATER 09-OCT-15 08:10 LUP-10-151009	L1688171-2 WATER 10-OCT-15 07:55 LUP-10-151010	L1688171-3 WATER 11-OCT-15 08:05 LUP-10-151011	L1688171-4 WATER 12-OCT-15 09:15 LUP-10-151012	L1688171-5 WATER 13-OCT-15 08:40 LUP-10-151013
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	183	187	178	184	185
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	4.7	5.0	4.8	4.6	4.2
	Nitrate and Nitrite (as N) (mg/L)	0.933	0.936	0.939	0.946	0.943
	Nitrate (as N) (mg/L)	0.933	0.936	0.939	0.946	0.943
	Nitrite (as N) (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Metals	Aluminum (Al)-Total (mg/L)	0.0199	0.0225	0.0203	0.0287	0.0387
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00602	0.00656	0.00638	0.00697	0.00783
	Barium (Ba)-Total (mg/L)	0.0136	0.0135	0.0137	0.0136	0.0134
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.061	0.060	0.057	0.059	0.060
	Cadmium (Cd)-Total (mg/L)	0.000210	0.000212	0.000215	0.000203	0.000207
	Calcium (Ca)-Total (mg/L)	61.1	62.0	58.4	61.0	61.3
	Cesium (Cs)-Total (mg/L)	0.000074	0.000076	0.000077	0.000074	0.000076
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	0.0313	0.0315	0.0314	0.0316	0.0320
	Copper (Cu)-Total (mg/L)	0.00156	0.00157	0.00147	0.00183	0.00217
	Iron (Fe)-Total (mg/L)	0.113	0.123	0.114	0.123	0.134
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000078
	Lithium (Li)-Total (mg/L)	0.0233	0.0226	0.0215	0.0224	0.0222
	Magnesium (Mg)-Total (mg/L)	7.52	7.72	7.76	7.64	7.74
	Manganese (Mn)-Total (mg/L)	0.816	0.806	0.798	0.804	0.813
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.0696	0.0705	0.0700	0.0700	0.0714
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	4.56	4.61	4.57	4.47	4.65
	Rubidium (Rb)-Total (mg/L)	0.00207	0.00210	0.00190	0.00208	0.00201
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	1.83	1.82	1.86	1.89	1.91
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010
	Sodium (Na)-Total (mg/L)	41.9	42.7	42.7	42.4	42.5
	Strontium (Sr)-Total (mg/L)	0.255	0.255	0.250	0.260	0.259
	Sulfur (S)-Total (mg/L)	73.8	74.3	74.4	75.9	76.1
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1688171 CONTD.... PAGE 3 of 7

27-OCT-15 08:58 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1688171-6 WATER 14-OCT-15 08:20 LUP-10-151014		
Grouping	Analyte			
WATER				
Physical Tests	Hardness (as CaCO3) (mg/L)	191		
	Total Suspended Solids (mg/L)	<3.0		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	3.3 RRV		
	Nitrate and Nitrite (as N) (mg/L)	0.955		
	Nitrate (as N) (mg/L)	0.955		
	Nitrite (as N) (mg/L)	<0.010		
Cyanides	Cyanide, Total (mg/L)	<0.0050		
Total Metals	Aluminum (AI)-Total (mg/L)	0.0410		
	Antimony (Sb)-Total (mg/L)	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00787		
	Barium (Ba)-Total (mg/L)	0.0137		
	Beryllium (Be)-Total (mg/L)	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050		
	Boron (B)-Total (mg/L)	0.061		
	Cadmium (Cd)-Total (mg/L)	0.000216		
	Calcium (Ca)-Total (mg/L)	63.7		
	Cesium (Cs)-Total (mg/L)	0.000074		
	Chromium (Cr)-Total (mg/L)	<0.00010		
	Cobalt (Co)-Total (mg/L)	0.0323		
	Copper (Cu)-Total (mg/L)	0.00220		
	Iron (Fe)-Total (mg/L)	0.136		
	Lead (Pb)-Total (mg/L)	0.000085		
	Lithium (Li)-Total (mg/L)	0.0229		
	Magnesium (Mg)-Total (mg/L)	7.75		
	Manganese (Mn)-Total (mg/L)	0.809		
	Molybdenum (Mo)-Total (mg/L)	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.0720		
	Phosphorus (P)-Total (mg/L)	<0.050		
	Potassium (K)-Total (mg/L)	4.64		
	Rubidium (Rb)-Total (mg/L)	0.00212		
	Selenium (Se)-Total (mg/L)	0.000053		
	Silicon (Si)-Total (mg/L)	1.93		
	Silver (Ag)-Total (mg/L)	<0.000010		
	Sodium (Na)-Total (mg/L)	42.9		
	Strontium (Sr)-Total (mg/L)	0.268		
	Sulfur (S)-Total (mg/L)	76.0		
	Tellurium (Te)-Total (mg/L)	<0.00020		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1688171 CONTD....

PAGE 4 of 7 27-OCT-15 08:58 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1688171-1 WATER 09-OCT-15 08:10 LUP-10-151009	L1688171-2 WATER 10-OCT-15 07:55 LUP-10-151010	L1688171-3 WATER 11-OCT-15 08:05 LUP-10-151011	L1688171-4 WATER 12-OCT-15 09:15 LUP-10-151012	L1688171-5 WATER 13-OCT-15 08:40 LUP-10-151013
Grouping Analyte						
WATER						
Total Metals Thallium (TI)-Total	al (mg/L)	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Tot	al (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total (m	g/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Tota	al (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-To	tal (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Tota	al (mg/L)	0.000014	0.000014	0.000012	0.000014	0.000016
Vanadium (V)-To	tal (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (r	ng/L)	0.223	0.225	0.226	0.227	0.232
Zirconium (Zr)-To	otal (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1688171 CONTD.... PAGE 5 of 7

27-OCT-15 08:58 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1688171-6 WATER 14-OCT-15 08:20 LUP-10-151014		
Grouping	Analyte				
WATER					
Total Metals	Thallium (TI)-Total (mg/L)		<0.000010		
	Thorium (Th)-Total (mg/L)		<0.00010		
	Tin (Sn)-Total (mg/L)		<0.00010		
	Titanium (Ti)-Total (mg/L)		<0.00030		
	Tungsten (W)-Total (mg/L)		<0.00010		
	Uranium (U)-Total (mg/L)		0.000016		
	Vanadium (V)-Total (mg/L)		<0.00050		
	Zinc (Zn)-Total (mg/L)		0.232		
	Zirconium (Zr)-Total (mg/L)		<0.00030		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1688171 CONTD....

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27-OCT-15 08:58 (MT)

Version: FINAL

#### **Reference Information**

#### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
uplicate	Aluminum (AI)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
uplicate	Antimony (Sb)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Ouplicate	Beryllium (Be)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Ouplicate	Bismuth (Bi)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Cadmium (Cd)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Cesium (Cs)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Chromium (Cr)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Cobalt (Co)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Copper (Cu)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Lead (Pb)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Nickel (Ni)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Phosphorus (P)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Selenium (Se)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Silver (Ag)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Tellurium (Te)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Thallium (TI)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Thorium (Th)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Tin (Sn)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Titanium (Ti)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Tungsten (W)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Vanadium (V)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Zirconium (Zr)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Aluminum (AI)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Antimony (Sb)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Beryllium (Be)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Bismuth (Bi)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Cesium (Cs)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
- Duplicate	Chromium (Cr)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Copper (Cu)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Lead (Pb)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Phosphorus (P)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Selenium (Se)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Silver (Ag)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Tellurium (Te)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Thallium (TI)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Thorium (Th)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Tin (Sn)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Titanium (Ti)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Tungsten (W)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Vanadium (V)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Zinc (Zn)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Duplicate	Zirconium (Zr)-Total	DLDS	L1688171-1, -2, -3, -4, -5, -6
Matrix Spike	Nitrate (as N)	MS-B	L1688171-1, -2, -3, -4, -5, -6
Qualifiers for Individual Paran	. ,		
Qualifier Description	ictora Liateu.		
· · · · · · · · · · · · · · · · · · ·	Doing de Dilution required due to high Dis-	solved Colida / Elast	vicel Conductivity
	Raised: Dilution required due to high Diss		•
MS-B Matrix Spike re	covery could not be accurately calculated	due to high analyte	раскугочно ін ѕатріе.

#### **Test Method References:**

Reported Result Verified By Repeat Analysis

RRV

ALS Test Code	Matrix	Test Description	Method Reference**

#### **Reference Information**

L1688171 CONTD....

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27-OCT-15 08:58 (MT)

Version: FINAL

ALK-TOT-ED Water Alkalinity, T APHA 2320 B-Auto-Pot. Titration

CN-T-CFA-VA Water Total Cyanide in water by CFA ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-EDWaterHardness (from Total Ca and Mg)APHA 2340 B-CalculationMET-T-CCMS-EDWaterTotal Metals in Water by CRC ICPMSEPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NO2+NO3-CALC-EDWaterNitrate+NitriteCALCULATIONNO2-IC-N-EDWaterNitrite in Water by ICEPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-ED Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

#### **Chain of Custody Numbers:**

#### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



# Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

COC Number: 14 -

Affix ALS barcode label here (lab use only)

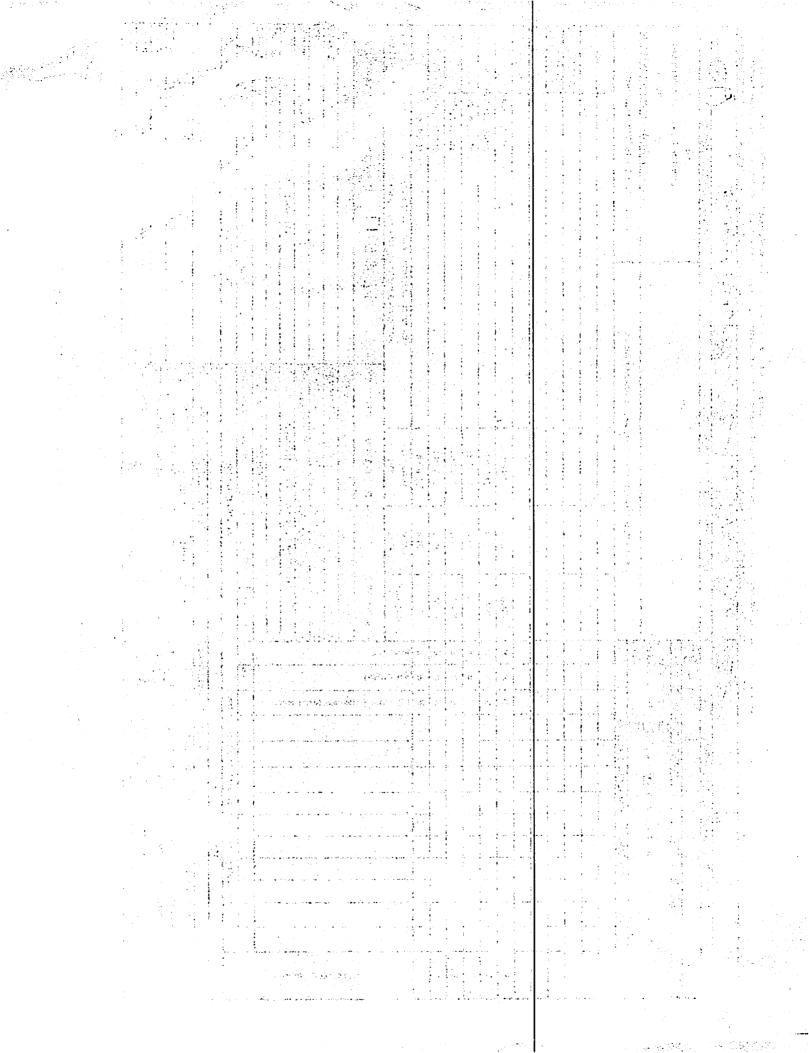
Page 1 of

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Released by:)	re samples for hu ☐ Yes	7	re samples take	Drinki												ALS Sample # (lab use only)	ALS Lab We	SD:	O / AFE:	ob #:	LS Quote #:		ontact:	ompany:		voice To		hone:		ddress:	ontact:	ompany:	eport To
SHIPMENT RELEASE (client use)  Date:  Time	mar	Yes No	re samples taken from a Regulated DW System?	Drinking Water (DW) Samples' (client use)						Lup-10-151014	Lup-10-151013	Lup-10-151012	Lup-10-151011	Lup-10-151010	Lup-10-151009	Sample Identification and/or Coordinates (This description will appear on the report)	ALS Lab Work Order# (lab use only) L1688171	Lupin Mine			53119	Project Information			Copy of Invoice with Report Yes No	Same as Report To Yes I No		778-386-7340	Toronto, ON M5C 1P1	76 Richmond Street East, Suite 330	K. Lewis	Lupin Mines Incorporated c/o Elgin Mining Inc.	
Date: Time: Received by: INITI				Special Instructions / S												or Coordinates r on the report)	7   ALS Contact:	Location:	Activity Code:	GL Account:	Approver ID:		Email 2	Email 1 or Fax		0	Email 2	Email 1 or Fax	Select Distribution:	Criteria on	Quality Contr	Select Report Format:	
INITIAL SHIPMENT RECEPTION (lab use only)  Date:				Special Instructions / Specify Criteria to add on report (client Use)						14-oct-15	13-oct-15	12-oct-15	11-oct-15	10-oct-15	09-oct-15	Date (dd-mmm-yy)	t: Rick Zoliewski		74			Oil and Gas Required Fields (client use)		ax klewis@elginmining.com	Select Invoice Distribution:	Invoice D		ewis@elgin	oution: 🛛 BMAIL	Criteria on Report - provide details below if box checked	ероп	nt Format:   ✓ PoF	Report Forma
Date: Time:				report (client Use)						8:20	8:40	9:15	8:05	7:55	8:10	Time (hh:mm)	Sampler			Routing Code:	Cost Center:	ed Fields (client u		g.com	Mate ☐ Mate	Invoice Distribution		g.com	MAIL MAIL	ox check	port Ves	F ⊠ EXCEL	Report Format / Distribution
Time:										Water	Water	Water	Water	Water	Water	Sample Type	C.de Repentigny					se)			FAX				FAX		No	EDD (DIGITAL)	
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FINAL SHIPMENT RECEPTION (lab use only)  Date: Time:	8. 5   FINAL COOLER TEMPERATURES*C	Custody seal illiact. Tes	Circles Constitution of the Constitution of th	O (lab use only)			1.1688171-COFC			70	70	7	ZJ.	Z	R	TSS, AI	kalinity, I	Hardr	ness	Nitr	rate,	Nitra	ate			indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below	Analysis Request	Specify Date Required for E2,E or P:	Same day or weekend emergency - contact ALS to confirm TAT and surcharge	Emergency (1-2 bus, days if received by 3pm) 100% surcharge - contact ALS to confirm TAT	Priority (2-4 bus, days if received by 3pm) 50% surcharge - contact ALS to confirm TAT	Regular (Standard TAT if received by 3 pm - business days)	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
		С	00							ω	3	ಬ	3	3	3		1	Numb	oer (	of Co	onta	iner	s							7			

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form. REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY





LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 15-OCT-15

Report Date: 27-OCT-15 09:00 (MT)

Version: FINAL

Client Phone: 778-386-7340

# Certificate of Analysis

Lab Work Order #: L1688190

Project P.O. #:

**NOT SUBMITTED** 

Job Reference: C of C Numbers:

Legal Site Desc:

Rick Zolkiewski General Manager

 $[This\ report\ shall\ not\ be\ reproduced\ except\ in\ full\ without\ the\ written\ authority\ of\ the\ Laboratory.]$ 

ADDRESS: 75 Con Road, PO. Box 2801, Yellowknife, NT, X1A 2R2 Canada | Phone: +1 867 873 5593 | Fax: +1 867 920 4238 ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

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L1688190 CONTD....

#### PAGE 2 of 5 27-OCT-15 09:00 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1688190-1 WATER 13-OCT-15 11:10 LUP-25-151013	L1688190-2 WATER 13-OCT-15 10:15 LUP-24-151013	L1688190-3 WATER 13-OCT-15 12:20 LUP-22-151013	L1688190-4 WATER 13-OCT-15 13:25 LUP-21-151013	L1688190-5 WATER 13-OCT-15 12:55 LUP-20-151013
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	16.2	41.4	57.0	6.30	203
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	3.4	2.6	4.5	2.9	2.0
	Ammonia, Total (as N) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Nitrate and Nitrite (as N) (mg/L)	0.042	0.126	0.202	<0.022	0.922
	Nitrate (as N) (mg/L)	0.042	0.126	0.202	<0.020	0.922
	Nitrite (as N) (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Metals	Aluminum (Al)-Total (mg/L)	0.0196	0.0239	0.0277	0.0146	0.0625
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00041	0.00051	0.00063	0.00026	0.00146
	Barium (Ba)-Total (mg/L)	0.00447	0.00728	0.00908	0.00216	0.0230
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	0.012	0.017	<0.010	0.063
	Cadmium (Cd)-Total (mg/L)	0.0000130	0.0000358	0.0000584	<0.000050	0.000204
	Calcium (Ca)-Total (mg/L)	4.66	12.9	17.9	1.31	66.7
	Cesium (Cs)-Total (mg/L)	0.000013	0.000021	0.000029	<0.000010	0.000085
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	0.00115	0.00365	0.00581	<0.00010	0.0243
	Copper (Cu)-Total (mg/L)	0.00066	0.00075	0.00079	0.00072	0.00086
	Iron (Fe)-Total (mg/L)	0.026	0.024	0.033	0.031	0.028
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0022	0.0049	0.0071	<0.0010	0.0248
	Magnesium (Mg)-Total (mg/L)	1.12	2.23	2.98	0.734	8.85
	Manganese (Mn)-Total (mg/L)	0.0272	0.0872	0.141	0.00280	0.634
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00577	0.0152	0.0213	0.00075	0.0755
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.619	1.12	1.51	0.345	4.83
	Rubidium (Rb)-Total (mg/L)	0.00116	0.00134	0.00156	0.00103	0.00267
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.347	0.783	0.914	0.313	2.18
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	3.27	8.83	12.7	0.652	45.6
	Strontium (Sr)-Total (mg/L)	0.0214	0.0523	0.0763	0.00688	0.275
	Sulfur (S)-Total (mg/L)	5.70	15.7	22.4	1.28	82.7

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1688190 CONTD....

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#### Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1688190-1 WATER 13-OCT-15 11:10 LUP-25-151013	L1688190-2 WATER 13-OCT-15 10:15 LUP-24-151013	L1688190-3 WATER 13-OCT-15 12:20 LUP-22-151013	L1688190-4 WATER 13-OCT-15 13:25 LUP-21-151013	L1688190-5 WATER 13-OCT-15 12:55 LUP-20-151013
Grouping	Analyte						
WATER							
Total Metals	Tellurium (Te)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (TI)-Total (mg/L)		<0.000010	<0.00010	<0.000010	<0.00010	<0.000010
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		0.00035	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)		0.000020	0.000016	0.000015	0.000013	<0.000010
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		0.0119	0.0342	0.0538	<0.0030	0.204
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

# L1688190 CONTD.... PAGE 4 of 5 27-OCT-15 09:00 (MT)

**FINAL** 

Version:

#### **Reference Information**

#### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Aluminum (AI)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Antimony (Sb)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Beryllium (Be)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Bismuth (Bi)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Cadmium (Cd)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Cesium (Cs)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Chromium (Cr)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Cobalt (Co)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Copper (Cu)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Lead (Pb)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Nickel (Ni)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Phosphorus (P)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Selenium (Se)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Silver (Ag)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Tellurium (Te)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Thallium (TI)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Thorium (Th)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Tin (Sn)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Titanium (Ti)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Tungsten (W)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Vanadium (V)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Zirconium (Zr)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Aluminum (AI)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Antimony (Sb)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Beryllium (Be)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Bismuth (Bi)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Cesium (Cs)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Chromium (Cr)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Copper (Cu)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Lead (Pb)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Phosphorus (P)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Selenium (Se)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Silver (Ag)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Tellurium (Te)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Thallium (TI)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Thorium (Th)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Tin (Sn)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Titanium (Ti)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Tungsten (W)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Vanadium (V)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Zinc (Zn)-Total	DLDS	L1688190-1, -2, -3, -4, -5
Duplicate	Zirconium (Zr)-Total	DLDS	L1688190-1, -2, -3, -4, -5

#### **Qualifiers for Individual Parameters Listed:**

Qualifier Description

DLDS Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and

#### **Reference Information**

L1688190 CONTD.... PAGE 5 of 5 27-OCT-15 09:00 (MT) Version: FINΔI

CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

**ETL-HARDNESS-TOT-ED** Hardness (from Total Ca and Mg) APHA 2340 B-Calculation Water **MET-T-CCMS-ED** Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

APHA 4500 NH3-NITROGEN (AMMONIA) NH3-CFA-FD Water Ammonia in Water by Colour

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the

automated phenate colourimetric method.

NO2+NO3-CALC-ED Water Nitrate+Nitrite **CALCULATION** NO2-IC-N-ED Water Nitrite in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-ED Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

**SOLIDS-TOTSUS-ED** Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

**Laboratory Definition Code Laboratory Location** 

#### **Chain of Custody Numbers:**

#### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

# Environmental

#### Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

#### Affix ALS barcode label here

(lab use only)

COC Number: 14 -

E	www.alsglobal.com			-	120,000,000			_		201000						in the second				
Report To		2.80 - 7.756			Report Forma				K4 -						ound Time		not availa	able for al	l tests)	
Company:	Lupin Mines Incorporated c/o	Elgin Mining	Inc.	Select Report Fo	2.3	_	EDD (DIGITAL)	R	=						ousiness da					
Contact:	K. Lewis	mile			QC) Report with Rep		No I No	P	_						% surchar					
Address:	76 Richmond Street East, Sui	ite 330			ort - provide details below		☐ FAX	E							100% su				nfirm TA	AT.
Phone:	Toronto, ON M5C 1P1			Select Distribution			L FAX	E2						ontact A	LS to confi	rm TAT a	and surch	arge		
rione.	778-386-7340			Email 1 or Fax Email 2	klewis@elginmining	J.com		Spec	ny Date	Requ	red to	r E2,E o		alveie	Reques	.+	_		_	
Invoice To	Same as Report To	▼ Yes	I No	Elliali 2	Invoice Di	stribution			-	Indicate	Filtered	/E) Bross			d and Pres		m halas		_	_
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Company:	Copy of invoice with report	1 163	, i No	- The English St. Edition Co., To.	klewis@elginmining			-	-	-	-		-	$\rightarrow$	-		H	-	$\neg$	
Contact:				Email 2	Newis@eigninnini	g.wiii		1												
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PO/AFE:				Activity Code:					SSS											er of
LSD:	Lupin Mine			Location:			-		ardne					- 1						Number of Containers
ALS Lab Wo	ork Order# (lab use only)	L168	88190	ALS Contact:	Rick Zoliewski	Sampler:	C.deR./A.Bowie		TSS, Alkalinity, Hardness	als	(NH4)	Cyanide								ž
ALS Sample # (lab use only)			ion and/or Coordinates		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Nitrate	TSS, Alk	Total Metals	Amnonia (NH4)	Total Cya				Ы				
	LUP-25-151013				13-oct-15	11:10	Water	R	R	R	R	R								5
	LUP-24-151013				13-oct-15	10:15	Water	R	R	R	R	R								5
	LUP-22-151013				13-oct-15	12:20	Water	R	R	R	R	R				1				5
	LUP-21-151013				13-oct-15	13:25	Water	R	R	R	R	R	11							5
	LUP-20-151013				13-oct-15	12:55	Water	R	R	R	R	R								5
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Drinkin	g Water (DW) Samples¹ (clie	nt use)	Spec	ial Instructions / Spe	cify Criteria to add or	report (client Use)					SAM	PLE CC			RECEIV	-				
	n from a Regulated DW System	-				4.4.		Froze			님				servatio		Yes		No	10
□ Ye								Coolin	acks ng Initia	Yes	무	No		Custod	y seal in	tact	Yes		No	
Are samples for h	numan drinking water use?							4.000,000,0	1		TEMPE	RATURES	°C I		FIN	AL COOL	ED TEM	PERATU	DES *C	
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	SHIPMENT RELEASE (d	dient use)		ΙΝΙΤΙΔΙ	SHIPMENT RECEP	TION (lab use only	2)	1,6	2	-	F	INAL SE	IPMEN	IT REC	EPTION	d (lab ii	se onh	1		
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REFER TO BACK	PAGE FOR ALS LOCATIONS AN	DSAMPLING	INFORMATION	1 1-10	WHI	TE - LABORATORY	COPY YELLOV	N - CLI	ENT CC	PY	_				NA-FM	0326a v09 Fm	ont/G4 January	2014		



LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 15-OCT-15

Report Date: 09-NOV-15 15:22 (MT)

Version: FINAL

Client Phone: 778-386-7340

# Certificate of Analysis

Lab Work Order #: L1688508
Project P.O. #: NOT SUBMITTED

Project P.O. #:
Job Reference:
C of C Numbers:

Legal Site Desc:

Rick Zolkiewski General Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 75 Con Road, PO. Box 2801, Yellowknife, NT, X1A 2R2 Canada | Phone: +1 867 873 5593 | Fax: +1 867 920 4238 ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

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L1688508 CONTD....

PAGE 2 of 4 09-NOV-15 15:22 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1688508-1 WATER 15-OCT-15 09:25 LUP-10-151015	L1688508-2 WATER 15-OCT-15 09:30 LUP-35-151015	L1688508-3 WATER 15-OCT-15 09:55 LUP-36-151015	
Grouping	Analyte	-			
WATER					
Physical Tests	Hardness (as CaCO3) (mg/L)	184	186	<0.13	
	pH (pH)	6.53	6.69	5.23	
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	3.1	3.8	<2.0	
	Ammonia, Total (as N) (mg/L)	0.066	0.075	<0.050	
	Nitrate and Nitrite (as N) (mg/L)	0.55	0.55	<0.022	
	Nitrate (as N) (mg/L)	0.55	0.55	<0.020	
	Nitrite (as N) (mg/L)	<0.10	<0.10	<0.010	
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0370	0.0389	<0.0030	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00791	0.00793	<0.00010	
	Barium (Ba)-Total (mg/L)	0.0151	0.0153	<0.000050	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	0.057	0.057	<0.010	
	Cadmium (Cd)-Total (mg/L)	0.000219	0.000219	<0.0000050	
	Calcium (Ca)-Total (mg/L)	62.4	62.6	<0.050	
	Cesium (Cs)-Total (mg/L)	0.000084	0.000079	<0.000010	
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Total (mg/L)	0.0319	0.0323	<0.00010	
	Copper (Cu)-Total (mg/L)	0.00213	0.00219	<0.00050	
	Iron (Fe)-Total (mg/L)	0.123	0.124	<0.010	
	Lead (Pb)-Total (mg/L)	0.000079	0.000081	<0.000050	
	Lithium (Li)-Total (mg/L)	0.0263	0.0249	<0.0010	
	Magnesium (Mg)-Total (mg/L)	6.88	7.28	0.0092	
	Manganese (Mn)-Total (mg/L)	0.814	0.843	0.00048	
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	
	Nickel (Ni)-Total (mg/L)	0.0709	0.0720	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	4.69	4.86	<0.050	
	Rubidium (Rb)-Total (mg/L)	0.00225	0.00222	<0.00020	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	1.84	1.84	<0.050	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	40.6	41.3	<0.050	
	Strontium (Sr)-Total (mg/L)	0.273	0.265	0.00023	

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1688508 CONTD....

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Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1688508-1 WATER 15-OCT-15 09:25 LUP-10-151015	L1688508-2 WATER 15-OCT-15 09:30 LUP-35-151015	L1688508-3 WATER 15-OCT-15 09:55 LUP-36-151015	
Grouping	Analyte					
WATER						
Total Metals	Sulfur (S)-Total (mg/L)		76.5	77.0	<0.50	
	Tellurium (Te)-Total (mg/L)		<0.00020	<0.00020	<0.00020	
	Thallium (TI)-Total (mg/L)		<0.000010	<0.00010	<0.000010	
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)		0.000020	0.000017	<0.000010	
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)		0.234	0.236	<0.0030	
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	
Parameters						

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1688508 CONTD....
PAGE 4 of 4

09-NOV-15 15:22 (MT)

#### Reference Information

**Qualifiers for Individual Parameters Listed:** 

Qualifier Description

DLDS Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

**Test Method References:** 

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-EDWaterHardness (from Total Ca and Mg)APHA 2340 B-CalculationMET-T-CCMS-EDWaterTotal Metals in Water by CRC ICPMSEPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.

NO2+NO3-CALC-EDWaterNitrate+NitriteCALCULATIONNO2-IC-N-EDWaterNitrite in Water by ICEPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-ED Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-ED Water pH APHA 4500 H-Electrode

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

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RA226-MMER-FC Water Ra226 by Alpha Scint, MDC=0.01 Bq/L EPA 903.1

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

 Laboratory Definition Code
 Laboratory Location

 ED
 ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

#### Chain of Custody Numbers:

#### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



# Radium-226 Case Narrative

#### **ALS Environmental**

#### L1688508

Work Order Number: 1510342

- 1. This report consists of the analytical results for three water samples received by ALS on 10/21/15.
- 2. These samples were prepared and analyzed according to the current revision of SOP 783. The analyses were completed on 11/3/15.
- 3. The analysis results for these samples are reported in units of Bq/L. These samples were not filtered prior to analysis.
- 4. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.
- 5. ICP-AES measurement of barium concentrations prior to chemical separation for the associated QC samples showed concentrations less than zero. To avoid a low bias in the final analytical results, the initial barium concentration was taken to be zero.
- 6. Due to uncertainty associated with the ICP-AES determination of barium concentration in the samples, the calculated yield for samples RE151023-1LCSD fell between 100% and 110%. To minimize the potential for low bias, results have been calculated conservatively assuming quantitative chemical yield (100%). The magnitude of the low bias is estimated to be less than 10% of the reported value and is acceptable according the ALS LQAP. This sample is identified with a "Y1" flag on the final reports.
- 7. No further anomalous situations were encountered during the preparation or analysis of these samples. All remaining quality control criteria were met.



The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Hannah Alt
Hannah Alt
Radiochemistry Primary Data Reviewer

11/4/15
Date

11/6/15
Radiochemistry Final Data Reviewer

Date

# **ALS Environmental -- FC**

### Sample Number(s) Cross-Reference Table

**OrderNum:** 1510342

Client Name: ALS Environmental

**Client Project Name:** 

Client Project Number: L1688508 Client PO Number: L1688508

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1688508-1	1510342-1		WATER	15-Oct-15	
L1688508-2	1510342-2		WATER	15-Oct-15	
L1688508-3	1510342-3		WATER	15-Oct-15	



15/0342

L1688508

YELLOWKNIFE

#### **Subcontract Request Form**

#### **Subcontract To:**

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE FORT COLLINS,CO 80524

Please see enclosed 3 san	nple(s) in <u>3</u> Container(s)			
SAMPLE NUMBER	CAL BEOUTES	DATE SA		Priorit
	ICAL REQUIRED		DUE DATE	Flag
L1688508-1 LUP-10-151015	Allele Cale MDO COL BUT (DICCO)	10/15/2		
Ra226 by	Alpha Scint, MDC=0.01 Bq/L (RA226-N	MMEK-FC 1)	11/9/2015	
L1688508-2 LUP-35-151015		10/15/2	2015	
Ra226 by	Alpha Scint, MDC=0.01 Bq/L (RA226-N	MMER-FC 1)	11/9/2015	
L1688508-3 LUP-36-151015		10/15/2	2015	
Ra226 by	Alpha Scint, MDC=0.01 Bq/L (RA226-N	MMER-FC 1)	11/9/2015	
Subcontract Info Contact:	Sean Whitaker (867) 873-5593			
Analysis and reporting info contact:	Rick Zolkiewski			
	314 OLD AIRPORT ROAD Unit 116			
•	YELLOWKNIFE,NT X1A 3T3			
	Phone: (867) 873-5593	Email: Rick	.Zolkiewski@als	global.com
Please email confirmation of rece	ipt to: Rick.Zolkiewski	@alsglobal.	com	
Shipped By:	Date Shipped:			
Received By:	Date Received:	lo-u-	17/0935	
Varified Dv.	Date Verified:		•	
Verified By:	Date vernica.			



# ALS Environmental - Fort Collins CONDITION OF SAMPLE UPON RECEIPT FORM

(ALS) Client:	Als yellowhike	Workorder No: 1510	1342		
Project Manager:	AR W	Initials: SDM		いむに	5
Does this project require	e any special handling in addition to stan	ndard ALS procedures?		YES	(D)
	shipping containers intact?		MONE	YES	NO
	sample containers intact?		NONE	YES	NO
	n-of-Custody) present or other repres	sentative documents?		(YES)	NO
	tle labels complete and legible?			YES)	NO
6. Is the COC in agreem	nent with samples received? (IDs, datequested analyses, etc.)	tes, times, no. of samples, no. of		YES	NO
	ing documents present and/or remova	able?	DROP OFF	(ES)	NO
8 Are all aqueous sample	es requiring preservation preserved correc	ctly? (excluding volatiles)	N/A	YES	NO
	preserved samples pH 4-9?	• • • • • • • • • • • • • • • • • • • •	(N/A)	YES	NO
	mple for the requested analyses?			(PES)	NO
	ced in the proper containers for the r	requested analyses?		(YES)	NO
	in holding times for the requested an			YE8	NO
	tainers received intact? (not broken			YES	NO
14. Are all samples requi	iring no headspace (VOC, GRO, RSI Size of bubble: < green pea		IQ/A)	YES	NO
15. Do any water sample Amount of sediment:	es contain sediment? : dusting moderate	Amountheavy	N/A	YES	<u>(NO)</u>
16. Were the samples sh				KES	NO
	atures measured at 0.1-6.0°C?	IR gun used*: #(2) #4	(AD)	YES	N
No. of cu    DOT Survey/    Acceptance   Ex-   Information   Backs    Were external µR/hr reading	Cooler #:	tance criteria? YPS / NO / NA (If no, s	see Form 008.)	ND#16.	
If applicable, was the client Project Manager Signa	t contacted? YES / NO / NA Contact:	M 10/21/15	Date/T	ime:	

\*IR Gun #2: Oakton, SN 29922500201-0066 \*IR Gun #4: Oakton, SN 2372220101-0002 DEFINITIONS: On the Air Waybill We', 'Our,' 'us' and 'Fedex' refer to Federal Express Corporation, its subsidiaries and branches and their respective employees, agents and independent contractors. 'You' and your' refer to the shipper, its employees, principals and agents. If your shipment originates outside the United States, your contract of certains is with the Federal Express subsidiary, branch or independent contractor who originally accepts the shipment from you. 'Package' means any container or aware and their respective employees, agents and independent contractors. You' and your' refer to the shipper, its employees, amends and agents. If your shipment, you are reparations of a single Air Waybill, or yourself and as agent for and on behalf of any other person having an interest in this shipment to a single Air Waybill. NEGOTIABLE Air Waybill, in any applicable tarff, and in our current Service Quide or Standard Conditions which are evaluable upon request. If there is a conflict between this shipment is an interest of any ustomer automation agreement between the shipment and Federal Express will control (the Service Quide or Standard Conditions) and the shipment is properly described on this Air Waybill shall be binding on us when the shipment is properly described on this Air Waybill shall be used to alter or modify the terms YOUR OBLICATIONS. You warrent that a cash article in the shipment is properly described on this Air Waybill and is acceptable for transport by us, and that the shipment is properly marked, addressed (industing postal codes) and packaged to ensure safe MOTE CONCENNAC Lawaritations of carriage as described below. The interpretation of carriage she paylic, may be applicable, which treats would then govern and in most cases limit our liability for loss or delay of or damage to your shipment in the U.S. the Warsaw Convention, an international treat present heright to rough shipment in anyway we deem appropriate.

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HARJIT GILL

ALS ENVIRONMENTAL LAB GROUP LOUGHEED HIGHWAY

BURNABY, BC V5A1W9 CANADA



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1510342

Ship Date: 19OCT15 ActWat: 25.0 LB MAN CAD: 0347419/CAFE2807

REF: Sublets

DESC-1: environmental Water samples for anlysis

6116 7669 8320

XH FTCA

DESC-2: DESC-3: DESC-4:

0430

COUNTRY MFG: CA 

SIGN: HARJIT GILL EIN/VAT

PKG TYPE: CUSTOMER

10:30A

**INTL PRIORITY** 

ISR

80524 CO-US

DEN



#### PAI 783 Rev 11 Method Blank Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510342

Client Name: ALS Environmental

ClientProject ID: L1688508

Lab ID: RE151023-1MB

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 23-Oct-15
Date Prepared: 23-Oct-15

Date Analyzed: 03-Nov-15

Prep Batch: RE151023-1

QCBatchID: RE151023-1-1 Run ID: RE151023-1A

Count Time: 30 minutes

Final Aliquot: 995 ml Result Units: BQ/l

File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	BDL	0.0067	0.00999	NA	U

#### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	16340	15100	ug	92.2	40 - 110 %	

#### **Comments:**

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Date Printed: Wednesday, November 04, 2015

Data Package ID: RE1510342-1

**ALS Environmental -- FC** 

Page 1 of 1

#### **PAI 783 Rev 11**

#### **Laboratory Control Sample(s)**

Lab Name: ALS Environmental -- FC

Work Order Number: 1510342

Client Name: ALS Environmental ClientProject ID: L1688508

Lab ID: RE151023-1LCS

Sample Matrix: WATER

**Prep SOP:** PAI 783 Rev 11

Date Collected: 23-Oct-15
Date Prepared: 23-Oct-15

Date Analyzed: 03-Nov-15

Prep Batch: RE151023-1

QCBatchID: RE151023-1-1 Run ID: RE151023-1A

Count Time: 15 minutes

Final Aliquot: 995 ml Result Units: BQ/l

File Name: Manual Entry

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added		Contro I Limits	Lab Qualifier
13982-63-3	Ra-226	1.52 +/- 0.379	0.0115	1.704	89.1	67 - 120	P,M3

#### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	16340	15600	ug	95.7	40 - 110 %	

#### Comments:

#### Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Data Package ID: RE1510342-1

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Page 1 of 2

#### **PAI 783 Rev 11**

#### Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC

Work Order Number: 1510342

Client Name: ALS Environmental ClientProject ID: L1688508

Lab ID: RE151023-1LCSD

Sample Matrix: WATER

Prep Batch: RE151023-1

QCBatchID: RE151023-1-1 Run ID: RE151023-1A

Final Aliquot: 995 ml Result Units: BQ/I

Date Collected: 23-Oct-15 Date Prepared: 23-Oct-15

Prep SOP: PAI 783 Rev 11

Count Time: 15 minutes

File Name: Manual Entry

Date Analyzed: 03-Nov-15

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added		Contro I Limits	Lab Qualifier
13982-63-3	Ra-226	1.29 +/- 0.323	0.0106	1.704	75.9	67 - 120	P,Y1,M3

#### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	16340	16400	ug	100	40 - 110 %	Y1

#### Comments:

#### Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Data Package ID: RE1510342-1

Date Printed: Wednesday, November 04, 2015

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

#### PAI 783 Rev 11

#### **Duplicate Sample Results (DER)**

Lab Name: ALS Environmental -- FC

Work Order Number: 1510342

Client Name: ALS Environmental

ClientProject ID: L1688508

Field ID:

Lab ID: RE151023-1LCSD

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 23-Oct-15

Date Prepared: 23-Oct-15

Date Analyzed: 03-Nov-15

**Prep Batch:** RE151023-1 **QCBatchID:** RE151023-1-1

Run ID: RE151023-1A

Count Time: 15 minutes

Final Aliquot: 995 ml

Prep Basis: Unfiltered Moisture(%): NA Result Units: BQ/I

File Name: Manual Entry

CASNO	Analyte	Sample	e		Duplica	ate		DER	DER
	Analyte	Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		Lim
13982-63-3	Ra-226	1.52 +/- 0.379	0.0115	P,M3	1.29 +/- 0.323	0.0106	P,Y1,M3	0.452	2.13

#### Comments:

#### Duplicate Qualifiers/Flags:

- U Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 Chemical Yield outside default limits.
- $\ensuremath{\mathsf{W}}$  DER is greater than Warning Limit of 1.42
- D DER is greater than Control Limit of 2.13
- LT Result is less than Request MDC, greater than sample specific MDC
- M Requested MDC not met.
- M3 The requested MDC was not met, but the reported
- activity is greater than the reported MDC.
- L LCS Recovery below lower control limit.
  H LCS Recovery above upper control limit.
- P LCS, Matrix Spike Recovery within control limits.
- N Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty

DER - Duplicate Error Ratio

BDL - Below Detection Limit

NR - Not Reported

Data Package ID: RE1510342-1

Date Printed: Wednesday, November 04, 2015

Page 1 of 1

# PAI 783 Rev 11 Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510342

Client Name: ALS Environmental ClientProject ID: L1688508

Field ID: L1688508-1 Lab ID: 1510342-1 Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 15-Oct-15

Date Prepared: 23-Oct-15

Date Analyzed: 03-Nov-15

Prep Batch: RE151023-1 QCBatchID: RE151023-1-1

Run ID: RE151023-1A
Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 1190 ml

Prep Basis: Unfiltered Moisture(%): NA Result Units: BQ/I

File Name: Manual Entry

	CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
Γ	13982-63-3	Ra-226	BDL	0.0063	0.00999	NA	U

#### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	16340	15100	ug	92.5	40 - 110 %	

#### **Comments:**

#### Qualifiers/Flags:

- U Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- LT Result is less than Requested MDC, greater than sample specific MDC.
- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: RE1510342-1

Date Printed: Wednesday, November 04, 2015

ALS Environmental -- FC

Page 1 of 3

# PAI 783 Rev 11 Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510342

Client Name: ALS Environmental ClientProject ID: L1688508

Field ID: L1688508-2 Lab ID: 1510342-2 Sample Matrix: WATER
Prep SOP: PAI 783 Rev 11

Date Collected: 15-Oct-15
Date Prepared: 23-Oct-15
Date Analyzed: 03-Nov-15

Prep Batch: RE151023-1 QCBatchID: RE151023-1-1 Run ID: RE151023-1A Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 1190 ml
Prep Basis: Unfiltered
Moisture(%): NA

Result Units: BQ/I

File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.015 +/- 0.0066	0.0061	0.00999	NA	

#### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	16340	15000	ug	91.6	40 - 110 %	

#### **Comments:**

#### Qualifiers/Flags:

- U Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- LT Result is less than Requested MDC, greater than sample specific MDC.
- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: RE1510342-1

Date Printed: Wednesday, November 04, 2015

**ALS Environmental -- FC** 

Page 2 of 3

### **PAI 783 Rev 11** Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510342

Client Name: ALS Environmental ClientProject ID: L1688508

Field ID: L1688508-3 Lab ID: 1510342-3

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11 Date Collected: 15-Oct-15 Date Prepared: 23-Oct-15

QCBatchID: RE151023-1-1 Run ID: RE151023-1A Count Time: 30 minutes Report Basis: Unfiltered Date Analyzed: 03-Nov-15

Prep Batch: RE151023-1

Final Aliquot: 1090 ml Prep Basis: Unfiltered Moisture(%): NA Result Units: BQ/I

File Name: Manual Entry

	CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
-	13982-63-3	Ra-226	BDL	0.0068	0.00999	NA	U

### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	16340	14800	ug	90.6	40 - 110 %	

#### **Comments:**

#### Qualifiers/Flags:

- U Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- LT Result is less than Requested MDC, greater than sample specific MDC.
- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: RE1510342-1

Date Printed: Wednesday, November 04, 2015

**ALS Environmental -- FC** 

Page 3 of 3

PLOS YMUTEL BORNING BON ARCCOAPTAN

FINAL SHIPMENT RECEPTION (lab use only)

:әші]

PINAL COOLER TEMPERATURES °C

### Request Form Chain of Custody (COC) / Analytical

S) Environmental

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

SHIPMENT RELEASE (client use)

ON J

Kelessed by

L Yes

Are samples for human drinking water use?

Custody seal intact Yes ce backs Yes Are samples taken from a Regulated DW System? ON П SIF Observations nazo1-Drinking Water (DW) Samples' (client use) Special Instructions / Specify Criteria to add on report (client Use) J-1688508-COFC Alberta Time WOSS: 6 9 R R R R Я Я Water 15-00-15 210121-36-9U 9:30am 9 Я R Я R Water 12-00-12 210121-35-9U. MOZ 8: P 9 Я Я В Я Я Я Water 15-00-15 STOTET-OT-9U. (mm:nd) Nitrate, Nitrite (KK-www-pp) (This description will appear on the report) ISS, Total Cyanide otal Metals (lab use only) Sample Type # eldmes SJA Sample Identification and/or Coordinates Date 80988917 ALS Lab Work Order # (lab use only) Sampler: Diwog.A\- Mowie ALS Contact: Rick Zoliewski Activity Code: :34A / Od of Containers Routing Code: 3L Account: :# qor Approver ID: Cost Center 53119 \*# stoup 814 Oil and Gas Required Fields (client use) Project Information Contact Email 1 or Fax klewis@elginmining.com Company: Select Invoice Distribution: Yes Copy of Invoice with Report XA3 Invoice Distribution ON SOY V Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below Same as Report To oT epiovn Analysis Request Email 1 or Fax klewis@elginmining.com Specify Date Required for E2,E or P: 0467-386-877 : auoud E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge Select Distribution: JIAM 🗆 JIAM3 🖸 Toronto, ON MSC 1P1 Criteria on Report - provide details below if box checked 76 Richmond Street East, Suite 330 ☐ Emergency (1-2 bus, days if received by 3pm) 100% surcharge - contact ALS to confirm TAT Address: Quality Control (QC) Report with Report □ Priority (2-4 bus, days if received by 3pm) 50% surcharge - contact ALS to confirm TAT Contact ☐ EDD (DIGITAL) Select Report Format Lupin Mines Incorporated clo Elgin Mining Inc. Regular (Standard TAT if received by 3 pm - business days) Company: Report Format / Dist., bution Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) Report To www.alsglobal.com Canada Toll Free: 1 800 668 9878 (Isb use only) Affix ALS barcode label here

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INITIAL SHIPMENT RECEPTION (lab use only)

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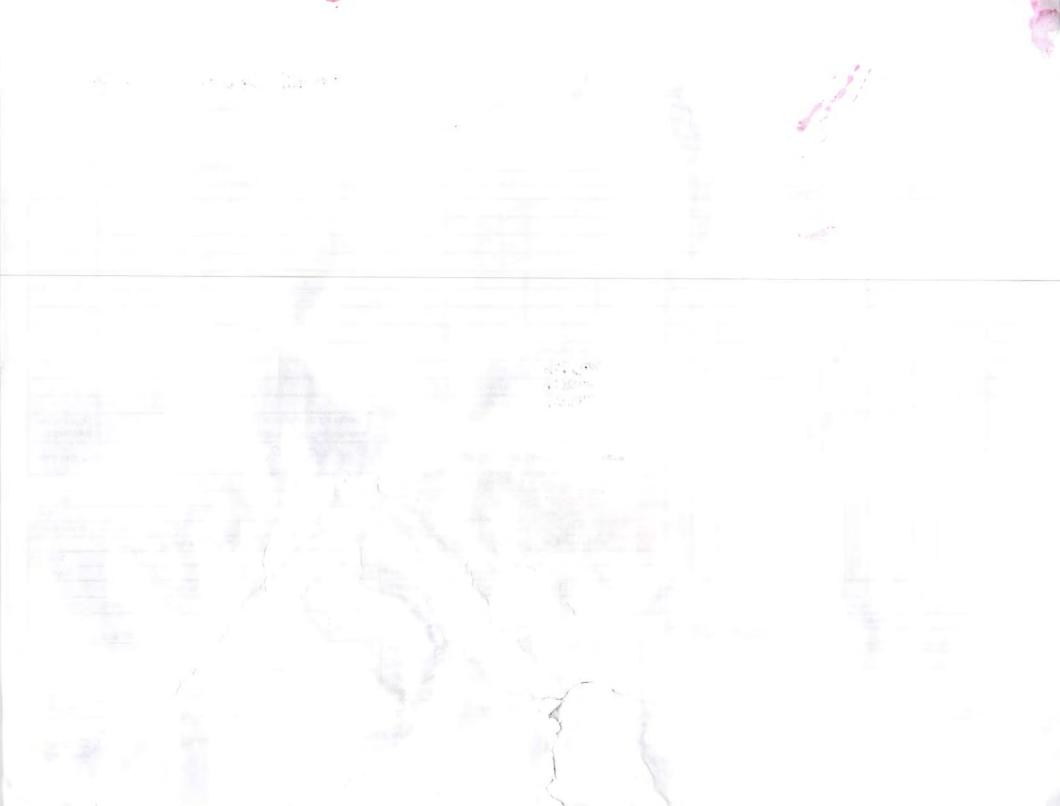
Cooling Initiated

INITIAL COOLER TEMPERATURES °C

4

1. If any water samples are taken from a Regulated Ortnking Water (DW) System, please submit using an Authorized DW COC form. Fallure to complete all portions of this form may delay analysis. Please fill in this form LECIBLY, By the use of this form thguses with the Terms and Conditions as specified on the back page of the while - report copy.

Received by:





LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 23-OCT-15

Report Date: 02-NOV-15 14:44 (MT)

Version: FINAL

Client Phone: 778-386-7340

### Certificate of Analysis

Lab Work Order #: L1692471

Project P.O. #: NOT SUBMITTED

Job Reference: C of C Numbers: Legal Site Desc:

Rick Zolkiewski General Manager

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L1692471 CONTD....

#### PAGE 2 of 6 02-NOV-15 14:44 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1692471-1 WATER 16-OCT-15 07:45 LUP-10-151016	L1692471-2 WATER 17-OCT-15 09:05 LUP-10-151017	L1692471-3 WATER 18-OCT-15 09:00 LUP-10-151018	L1692471-4 WATER 19-OCT-15 08:55 LUP-10-151019	L1692471-5 WATER 20-OCT-15 09:05 LUP-10-151020
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	172	175	173	176	175
	Total Suspended Solids (mg/L)	<3.0	<3.0	3.2	<3.0	<3.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	4.2	3.8 RRV	4.0	4.2	3.9
	Nitrate and Nitrite (as N) (mg/L)					
	Nitrate (as N) (mg/L)					
	Nitrite (as N) (mg/L)					
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Metals	Aluminum (Al)-Total (mg/L)	0.0380	0.0355	0.0402	0.0347	0.0309
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00762	0.00706	0.00798	0.00715	0.00670
	Barium (Ba)-Total (mg/L)	0.0141	0.0140	0.0144	0.0143	0.0146
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.055	0.056	0.055	0.057	0.055
	Cadmium (Cd)-Total (mg/L)	0.000205	0.000205	0.000212	0.000201	0.000214
	Calcium (Ca)-Total (mg/L)	57.2	58.3	57.5	58.3	58.0
	Cesium (Cs)-Total (mg/L)	0.000081	0.000077	0.000080	0.000080	0.000080
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	0.0315	0.0308	0.0317	0.0319	0.0317
	Copper (Cu)-Total (mg/L)	0.00219	0.00205	0.00217	0.00205	0.00206
	Iron (Fe)-Total (mg/L)	0.118	0.111	0.131	0.105	0.094
	Lead (Pb)-Total (mg/L)	0.000085	0.000075	0.000085	0.000075	0.000074
	Lithium (Li)-Total (mg/L)	0.0242	0.0238	0.0241	0.0243	0.0245
	Magnesium (Mg)-Total (mg/L)	7.18	7.23	7.27	7.39	7.43
	Manganese (Mn)-Total (mg/L)	0.809	0.784	0.826	0.825	0.831
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.0717	0.0704	0.0722	0.0718	0.0719
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	4.60	4.57	4.68	4.57	4.64
	Rubidium (Rb)-Total (mg/L)	0.00212	0.00213	0.00210	0.00212	0.00216
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	1.90	1.90	1.88	1.90	1.89
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	43.2	41.2	41.8	42.8	42.5
	Strontium (Sr)-Total (mg/L)	0.249	0.251	0.254	0.256	0.256
	Sulfur (S)-Total (mg/L)	75.0	75.7	74.9	76.3	74.6
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

 $<sup>^{\</sup>star}$  Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1692471 CONTD.... PAGE 3 of 6

02-NOV-15 14:44 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1692471-6 WATER 21-OCT-15 09:20 LUP-10-151021	L1692471-7 WATER 23-OCT-15 LUP-10-151023		
Grouping	Analyte				
WATER					
Physical Tests	Hardness (as CaCO3) (mg/L)	180	174		
	Total Suspended Solids (mg/L)	<3.0	<3.0		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	4.0	5.7		
	Nitrate and Nitrite (as N) (mg/L)		0.960		
	Nitrate (as N) (mg/L)		0.960		
	Nitrite (as N) (mg/L)		<0.010		
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0368	0.0344		
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00736	0.00638		
	Barium (Ba)-Total (mg/L)	0.0142	0.0149		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	0.056	0.056		
	Cadmium (Cd)-Total (mg/L)	0.000211	0.000219		
	Calcium (Ca)-Total (mg/L)	60.3	57.5		
	Cesium (Cs)-Total (mg/L)	0.000083	0.000076		
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010		
	Cobalt (Co)-Total (mg/L)	0.0319	0.0317		
	Copper (Cu)-Total (mg/L)	0.00200	0.00199		
	Iron (Fe)-Total (mg/L)	0.106	0.088		
	Lead (Pb)-Total (mg/L)	0.000074	0.000062		
	Lithium (Li)-Total (mg/L)	0.0253	0.0237		
	Magnesium (Mg)-Total (mg/L)	7.26	7.30		
	Manganese (Mn)-Total (mg/L)	0.818	0.826		
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.0713	0.0719		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	4.58	4.59		
	Rubidium (Rb)-Total (mg/L)	0.00219	0.00217		
	Selenium (Se)-Total (mg/L)	<0.000050	0.000050		
	Silicon (Si)-Total (mg/L)	1.90	1.89		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	42.8	42.7		
	Strontium (Sr)-Total (mg/L)	0.260	0.261		
	Sulfur (S)-Total (mg/L)	75.0	75.3		
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020		

 $<sup>^{\</sup>star}$  Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1692471 CONTD....

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Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1692471-1 WATER 16-OCT-15 07:45 LUP-10-151016	L1692471-2 WATER 17-OCT-15 09:05 LUP-10-151017	L1692471-3 WATER 18-OCT-15 09:00 LUP-10-151018	L1692471-4 WATER 19-OCT-15 08:55 LUP-10-151019	L1692471-5 WATER 20-OCT-15 09:05 LUP-10-151020
Grouping	Analyte						
WATER							
Total Metals	Thallium (Tl)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.00010
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00030	0.00046	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)		0.000019	0.000018	0.000020	0.000018	0.000016
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		0.239	0.234	0.241	0.241	0.241
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1692471 CONTD.... PAGE 5 of 6

### ALS ENVIRONMENTAL ANALYTICAL REPORT

02-NOV-15 14:44 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1692471-6 WATER 21-OCT-15 09:20 LUP-10-151021	L1692471-7 WATER 23-OCT-15 LUP-10-151023		
Grouping	Analyte					
WATER						
Total Metals	Thallium (TI)-Total (mg/L)		<0.000010	<0.000010		
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010		
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)		0.00039	<0.00030		
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010		
	Uranium (U)-Total (mg/L)		0.000018	0.000015		
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)		0.242	0.243		
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

### Reference Information

L1692471 CONTD....

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Version: FINAL

#### **Qualifiers for Individual Parameters Listed:**

 Qualifier
 Description

 RRV
 Reported Result Verified By Repeat Analysis

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**		
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration		
CN-T-CFA-VA Water		Total Cyanide in water by CFA	ISO 14403:2002		

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-EDWaterHardness (from Total Ca and Mg)APHA 2340 B-CalculationMET-T-CCMS-EDWaterTotal Metals in Water by CRC ICPMSEPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NO2+NO3-CALC-EDWaterNitrate+NitriteCALCULATIONNO2-IC-N-EDWaterNitrite in Water by ICEPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-ED Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

#### **Chain of Custody Numbers:**

#### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATÉD, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



#### Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

### Affix ALS barcode label here

(lab use only)

COC Number: 14 -

Page 1 of 1

	www.alsglobal.com						_											
Report To				Report Forma				_						round Time (TA		ilable for	all tests)	
Company:	Lupin Mines Incorporated c/o Elgin Mining Inc.		Select Report Fo	ormat: N PDI		EDD (DIGITAL)	R	⊠ R	egular (	Standard '	TAT if re	ceived b	y 3 pm -	business days	)			
Contact:	K. Lewis		Quality Control (	QC) Report with Rep	port Ve	es No	P	_						% surcharge				
Address:	76 Richmond Street East, Suite 330			Criteria on Report - provide details below if box checked					Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT							IT.		
	Toronto, ON M5C 1P1		Select Distribution: EMAIL MAIL FAX				E2		Same day or weekend emergency - contact ALS to confirm TAT and surcharge									
Phone:	778-386-7340			klewis@elginmining	g.com		Spec	ify Date	Requ	ired for	E2,E							
			Email 2 abowie@srk.com				Analysis Request											
Invoice To	Same as Report To   Yes	No		Invoice Di			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below											
	Copy of Invoice with Report	No	Select Invoice D	istribution:	EMAIL MAI	L FAX	Р	Р			-							
Company:				klewis@elginmining	g.com													
Contact:			Email 2															ε
	Project Information			il and Gas Require		use)		1										aine
ALS Quote#:	53119		Approver ID:		Cost Center:									- 1 1				out
Job #:			GL Account:		Routing Code:			li i										of C
PO / AFE:			Activity Code:				1		ness									per
LSD:	Lupin Mine		Location:						lard								4	Number of Containers
ALS Lab Wo	ork Order # (lab use only)	471	ALS Contact:	Rick Zoliewski	Sampler:	C.de Repentigny	stals	anide	TSS, Alkalinity, Hardness,	Nitrite								-
ALS Sample # (lab use only)	Sample Identification at (This description will app	nd/or Coordinates		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals	Total Cyanide	TSS, All	Nitrate,								
	Lup-10-151016			16-oct-15	7:45	Water	R	R	R	7				=				3
	Lup-10-151017			17-oct-15	9:05	Water	R	R	R	7 - 1					2471-COFC			3
	Lup-10-151018			18-oct-15	9:00	Water	R	R	R						$\equiv$			3
	Lup-10-151019			19-oct-15	8:55	Water	R	R	R		_							3
	Lup-10-151020			20-oct-15	9:05	Water	R	R	R					$\equiv$	$\equiv 8$	-		3
	Lup-10-151021			21-oct-15	9:20	Water	R	R	R		_					-	-	3
	Lup-10-151023			23-oct-15	9:25	Water	R	R	R	R	_				4	-	-	4
	Eup-10-131023			25-001-15	5.25	vvater	K	K	K	K	-				1692471-COFC	-	-	4
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Drinkin	ng Water (DW) Samples¹ (client use)	Special	Instructions / Spec	ify Criteria to add on	report (client Us	e)				SAME	LE CO			RECEIVE				
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T Y							Coolin	acks ng Initia	Yes		No		Custo	dy seal inta	ct Yes		No	
	numan drinking water use?						4000000		W-0-2	TEMPER	ATLIDEC	. 00		FINAL	COOL ED T	MOCDAT	1050 10	
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Released by:	SHIPMENT RELEASE (client use)  Date:	ime: Receive		SHIPMENT RECEP	Date:	Time:	Rece	eived b	v-	FI	NAL SI	HPME		CEPTION ( Date:	lab use or			
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REFER TO BACK	PAGE FOR ALS LOCATIONS AND SAMPLING INFO		Children of the	WHI	TE - LABORATOR		N - CLI	ENT CO	PY			_	_	NA-FM-0326	Se v09 Front/04 Jan	uary 2014		



LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 23-OCT-15

Report Date: 03-NOV-15 14:49 (MT)

Version: FINAL

Client Phone: 778-386-7340

### Certificate of Analysis

Lab Work Order #: L1692475

Project P.O. #:

**NOT SUBMITTED** 

Job Reference: C of C Numbers:

Legal Site Desc:

General Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 75 Con Road, PO. Box 2801, Yellowknife, NT, X1A 2R2 Canada | Phone: +1 867 873 5593 | Fax: +1 867 920 4238 ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

Environmental 🗦

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#### Version: FINAL

ALS	ENVIRONMENTAL	. ANALYTICAL	REPORT
ALS	ENVIRONMENTAL	. ANALYTICAL	KEPORI

	Sample ID Description Sampled Date Sampled Time Client ID	L1692475-1 WATER 21-OCT-15 10:40 LUP-25-151021	L1692475-2 WATER 21-OCT-15 11:45 LUP-24-151021	L1692475-3 WATER 21-OCT-15 12:20 LUP-22-151021	L1692475-4 WATER 21-OCT-15 12:55 LUP-21-151021	L1692475-5 WATER 21-OCT-15 13:15 LUP-20-151021
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	6.97	31.4	75.0	6.06	174
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	3.1	3.1	2.9	3.9	2.4
	Ammonia, Total (as N) (mg/L)	<0.050	<0.050	<0.050	<0.050	0.061
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Metals	Aluminum (Al)-Total (mg/L)	0.0082	0.0160	0.0287	0.0102	0.0583
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00025	0.00041	0.00068	0.00027	0.00127
	Barium (Ba)-Total (mg/L)	0.00281	0.00626	0.0102	0.00222	0.0196
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	0.023	<0.010	0.052
	Cadmium (Cd)-Total (mg/L)	0.0000077	0.0000328	0.0000805	<0.0000050	0.000213
	Calcium (Ca)-Total (mg/L)	1.76	9.83	24.4	1.28	57.0
	Cesium (Cs)-Total (mg/L)	<0.000010	0.000019	0.000037	0.000011	0.000075
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	0.00033	0.00289	0.00852	<0.00010	0.0255
	Copper (Cu)-Total (mg/L)	0.00071	0.00066	0.00077	0.00066	0.00085
	Iron (Fe)-Total (mg/L)	<0.010	0.012	0.026	0.022	0.068
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0013	0.0048	0.0105	0.0013	0.0244
	Magnesium (Mg)-Total (mg/L)	0.622	1.67	3.43	0.693	7.78
	Manganese (Mn)-Total (mg/L)	0.00833	0.0739	0.221	0.00272	0.666
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00199	0.0120	0.0295	0.00064	0.0749
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.431	0.990	1.94	0.359	4.78
	Rubidium (Rb)-Total (mg/L)	0.00109	0.00133	0.00169	0.00109	0.00254
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	0.214	0.478	0.926	0.192	2.01
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.22	7.26	17.0	0.662	43.0
	Strontium (Sr)-Total (mg/L)	0.00910	0.0448	0.106	0.00701	0.250
	Sulfur (S)-Total (mg/L)	1.80	12.2	30.3	1.11	76.8
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (TI)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

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	Sample ID Description Sampled Date Sampled Time Client ID	L1692475-6 WATER 21-OCT-15 11:35 LUP-37-151021
Grouping	Analyte	-
WATER		
Physical Tests	Hardness (as CaCO3) (mg/L)	31.6
•	Total Suspended Solids (mg/L)	<3.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	2.7
	Ammonia, Total (as N) (mg/L)	<0.050
Cyanides	Cyanide, Total (mg/L)	<0.0050
Total Metals	Aluminum (Al)-Total (mg/L)	0.0171
	Antimony (Sb)-Total (mg/L)	<0.00010
	Arsenic (As)-Total (mg/L)	0.00043
	Barium (Ba)-Total (mg/L)	0.00644
	Beryllium (Be)-Total (mg/L)	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050
	Boron (B)-Total (mg/L)	0.012
	Cadmium (Cd)-Total (mg/L)	0.0000292
	Calcium (Ca)-Total (mg/L)	9.94
	Cesium (Cs)-Total (mg/L)	0.000020
	Chromium (Cr)-Total (mg/L)	<0.00010
	Cobalt (Co)-Total (mg/L)	0.00288
	Copper (Cu)-Total (mg/L)	0.00069
	Iron (Fe)-Total (mg/L)	0.013
	Lead (Pb)-Total (mg/L)	<0.000050
	Lithium (Li)-Total (mg/L)	0.0046
	Magnesium (Mg)-Total (mg/L)	1.66
	Manganese (Mn)-Total (mg/L)	0.0740
	Molybdenum (Mo)-Total (mg/L)	<0.000050
	Nickel (Ni)-Total (mg/L)	0.0117
	Phosphorus (P)-Total (mg/L)	<0.050
	Potassium (K)-Total (mg/L)	0.977
	Rubidium (Rb)-Total (mg/L)	0.00138
	Selenium (Se)-Total (mg/L)	<0.000050
	Silicon (Si)-Total (mg/L)	0.470
	Silver (Ag)-Total (mg/L)	<0.000010
	Sodium (Na)-Total (mg/L)	7.25
	Strontium (Sr)-Total (mg/L)	0.0453
	Sulfur (S)-Total (mg/L)	12.6
	Tellurium (Te)-Total (mg/L)	<0.00020
	Thallium (TI)-Total (mg/L)	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010

L1692475 CONTD....

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Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1692475-1 WATER 21-OCT-15 10:40 LUP-25-151021	L1692475-2 WATER 21-OCT-15 11:45 LUP-24-151021	L1692475-3 WATER 21-OCT-15 12:20 LUP-22-151021	L1692475-4 WATER 21-OCT-15 12:55 LUP-21-151021	L1692475-5 WATER 21-OCT-15 13:15 LUP-20-151021
Grouping	Analyte						
WATER							
Total Metals	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)		0.000022	0.000018	0.000012	0.000016	<0.000010
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		0.0041	0.0328	0.0895	<0.0030	0.230
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

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Version: FINAL

	s s	Sample ID Description Sampled Date ampled Time Client ID	L1692475-6 WATER 21-OCT-15 11:35 LUP-37-151021		
Grouping	Analyte				
WATER					
Total Metals	Tin (Sn)-Total (mg/L)		<0.00010		
	Titanium (Ti)-Total (mg/L)		<0.00030		
	Tungsten (W)-Total (mg/L)		<0.00010		
	Uranium (U)-Total (mg/L)		0.000018		
	Vanadium (V)-Total (mg/L)		<0.00050		
	Zinc (Zn)-Total (mg/L)		0.0328		
	Zirconium (Zr)-Total (mg/L)		<0.00030		

L1692475 CONTD....
PAGE 6 of 6
03-NOV-15 14:49 (MT)

Version: FINAL

### **Reference Information**

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-EDWaterHardness (from Total Ca and Mg)APHA 2340 B-CalculationMET-T-CCMS-EDWaterTotal Metals in Water by CRC ICPMSEPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the

automated phenate colourimetric method.

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

#### **Chain of Custody Numbers:**

#### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

# ALS Environmenta

#### Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

### Affix ALS barcode label here

(lab use only)

COC Number: 14 -

Page \_\_\_\_1 of \_\_\_\_1

2000	www.alsglobal.com						_											
Report To					t / Distribution			-			_					t available fo	all tests)	
Company:	Lupin Mines Incorporated c/o Elgin Mining In	IC.	Select Report Fo	ormat: PD		EDD (DIGITAL)	R	=						ousiness da				
Contact:	K. Lewis		Quality Control (	QC) Report with Re	port 🔽 Ye	s No	P									t ALS to conf		
Address:	76 Richmond Street East, Suite 330			port - provide details belo	the second secon		E	1 18	mergen	y (1-2 bu	s. days i	f received	by 3pm)	) 100% sur	rcharge - co	ontact ALS to	confirm T	AT
	Toronto, ON M5C 1P1		Select Distribution			FAX	E2		same day	or week	end eme	rgency - c	ontact Al	LS to confi	rm TAT and	d surcharge		
Phone:	778-386-7340			klewis@elginminin	g.com		Spec	ify Dat	e Requ	ired for	E2,E 0	or P:						
			Email 2	abowie@srk.com								Ar	ıalysis	Reques	st			
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	Project Information			Oil and Gas Require	ed Fields (client u	ise)									1 1		1 1	iner
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LSD:	Lupin Mine		Location:					ardn			100						1	Number of Containers
ALS Lab Wo	ork Order# (lab use only) L169	1475	ALS Contact:	Rick Zoliewski	Sampler:	C.deRepentigny	inide	alinity, H	als	(NH4)								z
ALS Sample # (lab use only)	Sample Identification (This description will a			Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Cyanide	TSS, Alkalinity, Hardness	Total Metals	Amnonia (NH4)								
	LUP-25-151021			21-oct-15	10:40	Water	R	R	R	R	_							4
	LUP-24-151021			21-oct-15	11:45	Water	R	R	R	R								4
	LUP-22-151021			21-oct-15	12:20	Water	R	R	R	R	_					= ()		4
	LUP-21-151021			21-oct-15	12:55	Water	R	R	R	R	_					<u> </u>		4
	LUP-20-151021			21-oct-15	13:15	Water	R	R	R	R	_					692475-COFC	-	4
	LUP-37-151021			21-oct-15	11:35	Water	R	R	R	R	-					12		4
					Alberta time	1	1.0	- 23	- 10							124	-	
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Drinkin	ng Water (DW) Samples' (client use)	Specia	al Instructions / Spe	cify Criteria to add or	report (client Use	)				-	LE CO				-	use only)		
	en from a Regulated DW System?				1		Froze					_		servation		es	No	
⊢ Y							Cooli	acks ng Initi	Yes		No		Sustody	y seal in	tact	Yes	No	
Are samples for h	numan drinking water use?									TEMPER	ATLIDEC	· • · · ·		TIM	AL COOL F	R TEMPERA	TUDES AS	
ΓY							l In	NII I IAL C	JOOLER	TEMPER	ATURES	, •0		FINA	AL COOLE	RIEMPERA	URES *C	
	SHIPMENT RELEASE (client use)		INITIAL	SHIPMENT RECEP	TION (lab use only	()			-	FI	NAL SI	HIPMEN	VT REC	CEPTION	l (lab use	e only)	1	
Released by:	Date: 0ct. 23/5	Time: Receiv	wed by: Des	h	Date: 10/23/15	Time:	Rece	eived b	y:					Date:		Time:		
DEEED TO BACK	PAGE FOR ALS LOCATIONS AND SAMPLING IN	EORMATION	TO IND	\AAI	TE MARORATORY	CODY VELLO	AL CLI	ENT	2DV			_		- To a Company				



LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 23-OCT-15

Report Date: 16-NOV-15 11:15 (MT)

Version: FINAL

Client Phone: 778-386-7340

### Certificate of Analysis

Lab Work Order #: L1692900

Project P.O. #: NOT SUBMITTED

Job Reference: C of C Numbers: Legal Site Desc:

Rick Zolkiewski General Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 75 Con Road, PO. Box 2801, Yellowknife, NT, X1A 2R2 Canada | Phone: +1 867 873 5593 | Fax: +1 867 920 4238 ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company



L1692900 CONTD....

PAGE 2 of 4 16-NOV-15 11:15 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1692900-1 WATER 22-OCT-15 09:15 LUP-10-151022	L1692900-2 WATER 22-OCT-15 09:10 LUP-35-151022	L1692900-3 WATER 22-OCT-15 09:05 LUP-36-151022		
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (EC) (uS/cm)	631	632	1.66		
	Hardness (as CaCO3) (mg/L)	180	177	0.55		
	pH (pH)	6.58	6.56	5.22		
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0		
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	<5.0	<5.0	<5.0		
	Alkalinity, Total (as CaCO3) (mg/L)	4.2	4.1	<2.0		
	Ammonia, Total (as N) (mg/L)	0.108	<0.050	0.112		
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050		
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.0313	0.0317	<0.0030		
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00658	0.00664	<0.00010		
	Barium (Ba)-Total (mg/L)	0.0149	0.0149	0.000071		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	0.054	0.054	<0.010		
	Cadmium (Cd)-Total (mg/L)	0.000231	0.000233	<0.0000050		
	Calcium (Ca)-Total (mg/L)	60.4	59.3	0.198		
	Cesium (Cs)-Total (mg/L)	0.000082	0.000079	<0.000010		
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Cobalt (Co)-Total (mg/L)	0.0332	0.0335	<0.00010		
	Copper (Cu)-Total (mg/L)	0.00202	0.00208	<0.00050		
	Iron (Fe)-Total (mg/L)	0.100	0.101	<0.010		
	Lead (Pb)-Total (mg/L)	0.000063	0.000066	<0.000050		
	Lithium (Li)-Total (mg/L)	0.0234	0.0230	<0.0010		
	Magnesium (Mg)-Total (mg/L)	7.02	6.96	0.0128		
	Manganese (Mn)-Total (mg/L)	0.836	0.839	0.00102		
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.0743	0.0758	<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	4.19	4.28	0.068		
	Rubidium (Rb)-Total (mg/L)	0.00206	0.00220	<0.00020		
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Total (mg/L)	2.01	1.99	<0.050		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	42.5	43.3	0.098		
	Strontium (Sr)-Total (mg/L)	0.260	0.266	0.00086		
	Sulfur (S)-Total (mg/L)	75.5	75.6	<0.50	<u> </u>	

L1692900 CONTD....

PAGE 3 of 4 16-NOV-15 11:15 (MT)

Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1692900-1 WATER 22-OCT-15 09:15 LUP-10-151022	L1692900-2 WATER 22-OCT-15 09:10 LUP-35-151022	L1692900-3 WATER 22-OCT-15 09:05 LUP-36-151022	
Grouping	Analyte					
WATER						
Total Metals	Tellurium (Te)-Total (mg/L)		<0.00020	<0.00020	<0.00020	
	Thallium (TI)-Total (mg/L)		<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)		0.000017	0.000016	<0.000010	
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)		0.256	0.258	<0.0030	
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	
Radiological Parameters	Ra-226 (Bq/L)		0.018	0.0100	<0.0100	

L1692900 CONTD....

PAGE 4 of 4

16-NOV-15 11:15 (MT)

Version: FINAL

#### **Reference Information**

#### **Test Method References:**

ALS Test Code Matrix		Test Description	Method Reference**
ACIDITY-ED	Water	Acidity (as CaCO3)	APHA 2310 B - Potentiometric Titration
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-EDWaterHardness (from Total Ca and Mg)APHA 2340 B-CalculationMET-T-CCMS-EDWaterTotal Metals in Water by CRC ICPMSEPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the

automated phenate colourimetric method.

PH/EC-ED Water pH and Conductivity APHA 4500-H, 2510

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is

recommended for pH where highly accurate results are needed)

RA226-MMER-FC Water Ra226 by Alpha Scint, MDC=0.01 Bq/L EPA 903.1

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

ED ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

#### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



# Radium-226 Case Narrative

### **ALS Environmental**

L1692900

Work Order Number: 1510441

- 1. This report consists of the analytical results for three water samples received by ALS on 10/27/15.
- 2. These samples were prepared and analyzed according to the current revision of SOP 783. The analyses were completed on 11/10/15.
- 3. The analysis results for these samples are reported in units of Bq/L. The samples were not filtered prior to analysis.
- 4. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.
- 5. ICP-AES measurement of barium concentrations prior to chemical separation for sample 1510441-3 and the associated QC samples showed concentrations less than zero. To avoid a low bias in the final analytical results, the initial barium concentration was taken to be zero.
- 6. No further anomalous situations were encountered during the preparation or analysis of these samples. All remaining quality control criteria were met.



The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Hannah Alt
Radiochemistry Primary Data Reviewer

Radiochemistry Final Data Reviewer

11/11/15
Date

11/13/15
Date

### **ALS Environmental -- FC**

### Sample Number(s) Cross-Reference Table

**OrderNum:** 1510441

Client Name: ALS Environmental

**Client Project Name:** 

Client Project Number: L1692900 Client PO Number: L1692900

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1692900-1	1510441-1		WATER	22-Oct-15	
L1692900-2	1510441-2		WATER	22-Oct-15	
L1692900-3	1510441-3		WATER	22-Oct-15	



15/0441

YELLOWKNIFE



### **Subcontract Request Form**

#### **Subcontract To:**

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE FORT COLLINS, CO 80524

Please see enclosed 3 san	nple(s) in <u>3</u> Container(s	;)	
SAMPLE NUMBER ANALYTI	CAL REQUIRED	DATE SAMPLED DUE DATE	Priority Flag
<b>L1692900-1 LUP-10-151022</b> Ra226 by	Alpha Scint, MDC=0.01 Bq/L (RA226	<b>10/22/2015</b> 6-MMER-FC 1) 11/18/2015	
<b>L1692900-2 LUP-35-151022</b> Ra226 by	Alpha Scint, MDC=0.01 Bq/L (RA226	<b>10/22/2015</b> S-MMER-FC 1) 11/18/2015	
<b>L1692900-3 LUP-36-151022</b> Ra226 by	Alpha Scint, MDC=0.01 Bq/L (RA226	<b>10/22/2015</b> MMER-FC 1) 11/18/2015	
Subcontract Info Contact: Analysis and reporting info contact:	Sean Whitaker (867) 873-5593 Rick Zolkiewski 314 OLD AIRPORT ROAD Unit 116 YELLOWKNIFE,NT X1A 3T3	;	
N	Phone: (867) 873-5593	Email: Rick.Zolkiewski@a	lsglobal.com
Please email confirmation of recei	pt to: Rick.Zolkiewsk  Date Shipped:	xi@alsglobal.com 	15
Received By:	Date Received:	1024-15   0930	<b>)</b>
/erified By:	Date Verified:		
	Temperature:		



### ALS Environmental - Fort Collins CONDITION OF SAMPLE UPON RECEIPT FORM

	(ALS)	Client:	Δις	yello	white		Worko	rder No:	154	7441		
	Project 1	 	Δις	A	RA			Initials:	·		65-01	- -2015
1.	Does this pro	oject requir	re any specia	l handling	in addition t	o standard	ALS proc	edures?			YES	(NO)
2.	Are custod	y seals on	shipping co	ontainers	intact?					NONE	YES	NO
3.	Are Custod	ly seals on	sample co	ntainers i	ntact?					NONE	YES	NO
4.	Is there a C	OC (Chai	n-of-Custo	dy) presei	nt or other i	epresenta	tive docu	ments?			(ES	NO
5.	Are the CC	C and bot	ttle labels c	omplete a	nd legible?	•					YES	NO
6.	Is the COC containers,	_		_		s, dates, tir	nes, no. o	of sample	s, no. of		YES	NO
7.	Were airbil	lls / shippi	ing docume	nts preser	nt and/or re	movable?				DROP OFF	YES	NO
8.	Are all aque	ous sample	s requiring p	reservatio	n preserved	correctly? (	excluding	volatiles)	)	N/A	<b>VES</b>	NO
9.	Are all aqu	eous non-	preserved s	amples pl	H 4-9?					(N/A	YES	NO
10.	Is there suf	ficient sar	mple for the	requeste	d analyses?	•					(YE)	NO
11.	Were all sa	mples pla	ced in the p	roper cor	tainers for	the reques	sted analy	yses?			YES	NO
12.	Are all sam	ples withi	in holding t	imes for t	he requeste	ed analyse	s?				YES	NO
13.	Were all sa	mple cont	tainers rece	ived intac	t? (not bro	ken or lea	king, etc	.)			YES	NO
14.	Are all sam	-	iring no hea Size of bub	- '			EE, Rx Cl _> greer		on)	₹\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	YES	NO
15.	Do any wat Amount of	-			moderat	te	heavy	A	mount	N/A	YES	(80)
16.	Were the sa						· •				YES	NO
17.	Were coole	er tempera	tures measi	ared at 0.1	1-6.0°C?	IR	gun used*:	(#2)	#4	RAD ONLY	YES	NO
Г			***	Cooler #:	1		9			ONLI		
				ture (°C):	3-8							
		No. of cus	stody seals o		<u>Q</u>							•
	DOT Survey/ Acceptance		ternal μR/hr		10							
	Information		round μR/hr	_								
	Were external µ	Ŭ	'	·	d within DOT	acceptance cri	teria? YES	NO/N	A (If no, see	Form 008.)		
A	dditional Inf							<del>/                                    </del>			ND #16.	
If	applicable, was	s the client c	contacted? YE	s/no/N	A) Contact:					_ Date/Ti	me:	
	roject Manaş				Chi	100	10/27	+/15		_		
	-	-			γ –	- 1	1-1	1				

\*IR Gun #2: Oakton, SN 29922500201-0066 \*IR Gun #4: Oakton, SN 2372220101-0002

DEFINITIONS: On the Air Waybill We', 'Our', 'us' and 'FedEx' refer to Federal Express Corporation, its subsidiaries and branches and their respective employees, agents and independent contractors. 'You' and 'your' refer to the shipper, its employees, principals and agents. If your shipment or originates outside the United States, your contract of carriage is with the Federal Express subsidiary, branch or independent contractor who originally accepts the shipment from you. 'Package' means any container or employees, principals and agents. If your shipment you shipment from you. 'Package' means any container or employee that is accepted by us for delivery, including any such litems tendered by our unitilizing our automated systems, meters, manifests or waybills. Shipment' means all packages, which are landered to and accepted by us on a single Air Waybill. In All Yealybil, for yourself and as agent for and on behalf of any other person having an interest in this shipment in the shipment is accepted. Air Waybill, for the service Quide or Standard Conditions of Carriage, copies of which are available upon request. If there is a conflict between this Air Waybill and either the tender, the standard Conditions have secondary priority). No one is sufficient or standard Conditions have secondary priority. No one is sufficient or standard Conditions have secondary priority. No one is sufficient or standard Conditions have secondary priority. No one is sufficient or standard Conditions have secondary priority. No one is sufficient or standard Conditions have secondary priority. No one is sufficient to the shipment is properly described on this Air Waybill and is accepted for transport by us, and that the shipment is properly expendent transportation with

NOTE CONCENNING LIMIT A FIONS OF LIABILITY. Air Carriage Notice. If the carriage of your shipment by air involves an ultimate destination or stop in a country other than the country of departure, the Warsaw Convention, an international treaty relating to international carriage by air, may be applicable, which treaty would then govern and in most cases limit our liability for loss or delay of or damage to your shipment. In the U.S. the Warsaw Convention limits our liability to U.S. \$9.07 per pound (U.S. \$20.38 per kilogram). Unless you declare a higher value for carriage as described below. The interpretation of the Warsaw Convention liability limits may vary in other countries. There are no stopping places which are agreed at the time of tender of the shipment and we reserve the right to route shipments in any way we deem appropriate.

Road Transport Notice. Shipments transported parity or solely by road be it explicit agreement to do so or not-in, to, from a country which is party to the Convention on the Contract for the International Carriage of Goods by Road (the 'CMR') are subject to the terms and conditions of the CMR, notwithstanding any other provisions of this Agreement to the contrary. For these shipments transported solely by road, if a conflict arises between the provisions of the CMR and this Air Waybill the terms of the CMR shall

prevail.

Limitation of Liability, if not governed by the Warsaw Convention or the CMR as described above, our maximum liability for loss, damage or delay is limited by this Air Waybill to U.S. \$100 per shipment or U.S. \$9.07 per pound (U.S. \$20.38 per kilo) (or equivalent

cultivation to calcurrency, whichever is greater, unless you declare a higher value for carriage as described below. FedEx does not provide cargo lability or all-text insurance, but you may pay an addition at charge to each additional to 3. \$100 (or equivalent local currency) of described value for carriage. If a higher value for carriage is declared and the additional charge is paid, FedEx maximum liability-will be the lesser of the declared value for carriage or your actual damages.

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caused by events we cannot control, including out not immed to acts or odo, gens or the air, weather continues including the control of the c

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5 0441

samples for anlysis

From: (604) 253-4188

MELISSA YAGI

ALS ENVIRONMENTAL LAB GROUP 8081 LOUGHEED HIGHWAY

SUITE 100

**BURNABY, BC V5A1W9** 

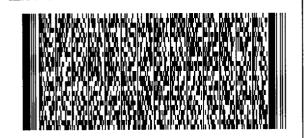
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6116 7669 8375

XH FTCA

REF: sublet

DESC-1: environmenta Val DESC-2:

DESC-3: DESC-4:

TRK#

0430

COUNTRY MFG: CA CARRIAGE VALUE: 0.00 CAD CUSTOMS VALUE: 4.00 CAD

T/C: S \*\*\*\*\*\*\* SIGN: MELISSA YAGI EINVAT:

PKG TYPE: CUSTOMER

10:30A INTL PRIORITY

ISR 80524

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521C2/97D7/6F03

### PAI 783 Rev 11 Method Blank Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510441

Client Name: ALS Environmental

ClientProject ID: L1692900

Lab ID: RE151030-1MB

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

**Date Collected:** 30-Oct-15 **Date Prepared:** 30-Oct-15

Date Analyzed: 10-Nov-15

Prep Batch: RE151030-1

QCBatchID: RE151030-1-1 Run ID: RE151030-1A

Count Time: 30 minutes

Final Aliquot: 995 ml Result Units: BQ/l

File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	BDL	0.0080	0.00999	NA	U

### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	15670	15000	ug	95.5	40 - 110 %	

#### **Comments:**

#### Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Date Printed: Wednesday, November 11, 2015

Data Package ID: RE1510441-1

**ALS Environmental -- FC** 

Page 1 of 1

#### **PAI 783 Rev 11**

### **Laboratory Control Sample(s)**

Lab Name: ALS Environmental -- FC

Work Order Number: 1510441

Client Name: ALS Environmental ClientProject ID: L1692900

Lab ID: RE151030-1LCS

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 30-Oct-15
Date Prepared: 30-Oct-15

Date Analyzed: 10-Nov-15

Prep Batch: RE151030-1

QCBatchID: RE151030-1-1 Run ID: RE151030-1A

Count Time: 15 minutes

Final Aliquot: 995 ml Result Units: BQ/l

File Name: Manual Entry

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added		Contro I Limits	Lab Qualifier
13982-63-3	Ra-226	1.81 +/- 0.453	0.00927	1.704	106	67 - 120	Р

### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	17110		Control Limits	Flag
BARIUM	15670	15100	ug	96.4	40 - 110 %	

#### **Comments:**

#### Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Data Package ID: RE1510441-1

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Page 1 of 2

### **PAI 783 Rev 11**

### Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC

Work Order Number: 1510441

Client Name: ALS Environmental ClientProject ID: L1692900

Lab ID: RE151030-1LCSD

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 30-Oct-15 Date Prepared: 30-Oct-15 Date Analyzed: 10-Nov-15 Prep Batch: RE151030-1 QCBatchID: RE151030-1-1

Run ID: RE151030-1A

Count Time: 15 minutes

Final Aliquot: 995 ml Result Units: BQ/I

File Name: Manual Entry

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added		Contro I Limits	Lab Qualifier
13982-63-3	Ra-226	1.77 +/- 0.442	0.0103	1.704	104	67 - 120	P,M3

### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	15670	14800	ug	94.5	40 - 110 %	

#### Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Data Package ID: RE1510441-1

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Page 2 of 2

Date Printed: Wednesday, November 11, 2015

### **PAI 783 Rev 11**

### **Duplicate Sample Results (DER)**

Lab Name: ALS Environmental -- FC

Work Order Number: 1510441

Client Name: ALS Environmental

ClientProject ID: L1692900

Field ID:

Lab ID: RE151030-1LCSD

Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11 Date Collected: 30-Oct-15

Date Prepared: 30-Oct-15

Date Analyzed: 10-Nov-15

Prep Batch: RE151030-1 QCBatchID: RE151030-1-1

Run ID: RE151030-1A Count Time: 15 minutes

Final Aliquot: 995 ml

Prep Basis: Unfiltered Moisture(%): NA Result Units: BQ/I

File Name: Manual Entry

CASNO	Analyte	nalyte Sample			Duplica	DER	DER		
	Analyte	Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		Lim
13982-63-3	Ra-226	1.81 +/- 0.453	0.00927	Р	1.77 +/- 0.442	0.0103	P,M3	0.0692	2.13

#### **Comments:**

#### **Duplicate Qualifiers/Flags:**

- U Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 Chemical Yield outside default limits.
- W DER is greater than Warning Limit of 1.42
- D DER is greater than Control Limit of 2.13
- LT Result is less than Request MDC, greater than sample specific MDC
- M Requested MDC not met.
- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L LCS Recovery below lower control limit.
- H LCS Recovery above upper control limit.
- P LCS, Matrix Spike Recovery within control limits.
- N Matrix Spike Recovery outside control limits

Data Package ID: RE1510441-1

Abbreviations:

TPU - Total Propagated Uncertainty

DER - Duplicate Error Ratio

BDL - Below Detection Limit

NR - Not Reported

Date Printed: Wednesday, November 11, 2015

**ALS Environmental -- FC** 

Page 1 of 1

# PAI 783 Rev 11 Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510441

Client Name: ALS Environmental ClientProject ID: L1692900

Field ID: L1692900-1 Lab ID: 1510441-1 Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 22-Oct-15

Date Prepared: 30-Oct-15

Date Analyzed: 10-Nov-15

Prep Batch: RE151030-1 QCBatchID: RE151030-1-1

Run ID: RE151030-1A
Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 1190 ml

Prep Basis: Unfiltered Moisture(%): NA Result Units: BQ/I

File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.018 +/- 0.0073	0.0039	0.00999	NA	

### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	15680	15600	ug	99.3	40 - 110 %	

#### **Comments:**

#### Qualifiers/Flags:

- U Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- LT Result is less than Requested MDC, greater than sample specific MDC.
- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: RE1510441-1

Date Printed: Wednesday, November 11, 2015

ALS Environmental -- FC

Page 1 of 3

# PAI 783 Rev 11 Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510441

Client Name: ALS Environmental ClientProject ID: L1692900

Field ID: L1692900-2 Lab ID: 1510441-2 Sample Matrix: WATER
Prep SOP: PAI 783 Rev 11

Date Collected: 22-Oct-15
Date Prepared: 30-Oct-15

Date Analyzed: 10-Nov-15

Prep Batch: RE151030-1

QCBatchID: RE151030-1-1 Run ID: RE151030-1A Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 1190 ml

Prep Basis: Unfiltered Moisture(%): NA Result Units: BQ/I

File Name: Manual Entry

CASNO	Target Nuclide			Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.010 +/- 0.0058	0.0060	0.00999	NA	

### **Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	15680	14100	ug	89.8	40 - 110 %	

#### **Comments:**

#### Qualifiers/Flags:

- U Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- LT Result is less than Requested MDC, greater than sample specific MDC.
- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: RE1510441-1

Date Printed: Wednesday, November 11, 2015

**ALS Environmental -- FC** 

Page 2 of 3

# PAI 783 Rev 11 Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1510441

Client Name: ALS Environmental ClientProject ID: L1692900

Field ID: L1692900-3 Lab ID: 1510441-3 Sample Matrix: WATER

Prep SOP: PAI 783 Rev 11

Date Collected: 22-Oct-15

Date Prepared: 30-Oct-15

Date Analyzed: 10-Nov-15

Prep Batch: RE151030-1 QCBatchID: RE151030-1-1

Run ID: RE151030-1A
Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 1190 ml

Prep Basis: Unfiltered Moisture(%): NA Result Units: BQ/I

File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.0083 +/- 0.0054	0.0066	0.00999	NA	LT

### **Chemical Yield Summary**

Carrier/Tracer	Amount Added Result U		Units	Yield	Control Limits	Flag
BARIUM	15670	14800	ug	94.6	40 - 110 %	

#### **Comments:**

#### Qualifiers/Flags:

- U Result is less than the sample specific MDC.
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- LT Result is less than Requested MDC, greater than sample specific MDC.
- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: RE1510441-1

Date Printed: Wednesday, November 11, 2015

ALS Environmental -- FC

Page 3 of 3

# ALS Environmental

#### Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

### Affix ALS barcode label here

(lab use only)

COC Number: 14 -

Page \_\_\_1 of \_\_\_1

Report To	www.alsglobal.com			1	D									SE POTO SE				7	
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Phone:	778-386-7340			- 1000000000000000000000000000000000000	klewis@elginminin		L FAX	E2						contact A	LS to conf	firm TAT	and surchar	ge	
	114.211.1414			Email 1 or Fax	abowie@srk.com	g.com		Spec	cify Date Required for E2,E or P:  Analysis Request										
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ALS Lab Wo	ork Order# (lab use only)			ALS Contact:	Rick Zoliewski	Sampler:	A.Bowie	als	nide	linity, Ha									ž
ALS Sample # (lab use only)  (This description will appear on the report)					Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Fotal Metals	Total Cyanide	TSS, Alkalinity, Hardness, pH, Acidity	Radium	Ammonia							
LUP-10-151022				22-oct-15	9:15	Water	R	R	R	R	R							5	
	LUP-35-151022				22-oct-15	9:10	Water	R	R	R	R	R	_						5
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REFER TO BACK I	PAGE FOR ALS LOCATIONS AN	D SAMPI NG IN	IEORMATION	wolfe	VAA-III	TE ABODATORY	10.00	11 0111		D) (									



LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 28-OCT-15

Report Date: 30-NOV-15 13:25 (MT)

Version: FINAL

Client Phone: 778-386-7340

### Certificate of Analysis

Lab Work Order #: L1695173

Project P.O. #:

**NOT SUBMITTED** 

Job Reference: C of C Numbers:

Legal Site Desc:

Rick Zolkiewski General Manager

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L1695173 CONTD....

Version:

PAGE 2 of 5 30-NOV-15 13:25 (MT)

**FINAL** 

### ALS ENVIRONMENTAL ANALYTICAL REPORT

L1695173-1 L1695173-2 L1695173-3 Sample ID Description WATER WATER WATER Sampled Date 27-OCT-15 27-OCT-15 27-OCT-15 Sampled Time 09:40 09:45 09:50 LUP-10-151027 LUP-35-151027 LUP-36-151027 Client ID Grouping **Analyte WATER Physical Tests** Hardness (as CaCO3) (mg/L) 183 185 0.15 Total Suspended Solids (mg/L) <3.0 <3.0 <3.0 Anions and Alkalinity, Total (as CaCO3) (mg/L) 4.1 4.1 <2.0 **Nutrients** Ammonia, Total (as N) (mg/L) 0.111 0.112 < 0.050 Nitrate and Nitrite (as N) (mg/L) < 0.022 0.980 0.995 Nitrate (as N) (mg/L) 0.980 0.995 < 0.020 Nitrite (as N) (mg/L) < 0.010 <0.010 < 0.010 Sulfate (SO4) (mg/L) 224 224 < 0.30 Cyanides Cyanide, Total (mg/L) < 0.0050 <0.0050 < 0.0050 **Total Metals** Aluminum (Al)-Total (mg/L) 0.0253 0.0260 < 0.0030 Antimony (Sb)-Total (mg/L) < 0.00010 <0.00010 < 0.00010 Arsenic (As)-Total (mg/L) 0.00602 0.00613 < 0.00010 Barium (Ba)-Total (mg/L) 0.0149 0.0153 0.000126 Beryllium (Be)-Total (mg/L) < 0.00010 < 0.00010 < 0.00010 Bismuth (Bi)-Total (mg/L) < 0.000050 < 0.000050 < 0.000050 Boron (B)-Total (mg/L) 0.064 0.064 < 0.010 Cadmium (Cd)-Total (mg/L) 0.000212 0.000212 < 0.0000050 Calcium (Ca)-Total (mg/L) 61.2 61.2 0.058 Cesium (Cs)-Total (mg/L) 0.000083 0.000081 < 0.000010 Chromium (Cr)-Total (mg/L) < 0.00010 < 0.00010 < 0.00010 Cobalt (Co)-Total (mg/L) 0.0338 0.0340 < 0.00010 Copper (Cu)-Total (mg/L) < 0.00050 0.00197 0.00197 Iron (Fe)-Total (mg/L) 0.082 0.081 < 0.010 Lead (Pb)-Total (mg/L) 0.000052 < 0.000050 < 0.000050 Lithium (Li)-Total (mg/L) 0.0256 0.0251 < 0.0010 Magnesium (Mg)-Total (mg/L) 7.45 7.67 < 0.0050 Manganese (Mn)-Total (mg/L) 0.00059 0.834 0.854 Mercury (Hg)-Total (mg/L) < 0.0000050 < 0.0000050 < 0.0000050 Molybdenum (Mo)-Total (mg/L) < 0.000050 < 0.000050 < 0.000050 Nickel (Ni)-Total (mg/L) 0.0751 0.0763 < 0.00050 Phosphorus (P)-Total (mg/L) < 0.050 < 0.050 < 0.050 Potassium (K)-Total (mg/L) 4.90 5.14 < 0.050 Rubidium (Rb)-Total (mg/L) 0.00215 0.00229 < 0.00020 Selenium (Se)-Total (mg/L) < 0.000050 < 0.000050 < 0.000050 Silicon (Si)-Total (mg/L) < 0.050 1.96 1.90 Silver (Ag)-Total (mg/L) < 0.000010 < 0.000010 < 0.000010 Sodium (Na)-Total (mg/L) < 0.050

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1695173 CONTD.... PAGE 3 of 5

30-NOV-15 13:25 (MT) Version: FINAL

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping Analyte  WATER  Total Metals Strontium (Sr)-Total (mg/L) Sulfur (S)-Total (mg/L) Tellurium (Te)-Total (mg/L)				
Total Metals Strontium (Sr)-Total (mg/L) Sulfur (S)-Total (mg/L)				
Sulfur (S)-Total (mg/L)				
	0.270	0.271	0.00029	
Tellurium (Te)-Total (mg/L)	78.6	77.1	<0.50	
	<0.00020	<0.00020	<0.00020	
Thallium (TI)-Total (mg/L)	<0.000010	<0.000010	<0.000010	
Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	
Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	
Uranium (U)-Total (mg/L)	0.000017	0.000017	<0.000010	
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	
Zinc (Zn)-Total (mg/L)	0.255	0.259	<0.0030	
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	
Radiological Parameters  Ra-226 (Bq/L)	<0.0100	0.015	<0.0100	

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1695173 CONTD....
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Version:

### **Reference Information**

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Sulfate (SO4)	MS-B	L1695173-1, -2, -3

#### **Qualifiers for Individual Parameters Listed:**

Qualifier Description

MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**							
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration							
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002							

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

**ETL-HARDNESS-TOT-ED** Water Hardness (from Total Ca and Mg) APHA 2340 B-Calculation **HG-T-CVAA-ED** Water Total Mercury in Water by CVAAS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-ED Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.

NO2+NO3-CALC-ED Water Nitrate+Nitrite CALCULATION

NO2-IC-N-ED Water Nitrite in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-ED Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

RA226-MMER-FC Water Ra226 by Alpha Scint, MDC=0.01 Bq/L EPA 903.1

SO4-IC-N-ED Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

**Chain of Custody Numbers:** 

**Reference Information** 

L1695173 CONTD....

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### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Ft. Collins, Colorado LIMS Version: 6,794 Page 1 of 1

Tuesday, November 24, 2015

Rick Zolkiewski ALS Environmental 314 Old Airport Road Unit 116 Yellowknife, NT X1A 3T3

Re: ALS Workorder: 1511214

Project Name:

Project Number: L1695173

Dear Mr. Zolkiewski:

Three water samples were received from ALS Environmental, on 11/11/2015. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincarely

ALS Environmenta Amy R. Wolf

**Project Manager** 

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmo	ntal – Fort Collins
ALS ENVIORING	Intal – Fort Collins
Accreditation Body	License or Certification Number
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



# 1511214

### Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

# Sample Number(s) Cross-Reference Table

**OrderNum:** 1511214

Client Name: ALS Environmental

**Client Project Name:** 

Client Project Number: L1695173 Client PO Number: L1695173

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1695173-1	1511214-1		WATER	27-Oct-15	
L1695173-2	1511214-2		WATER	27-Oct-15	
L1695173-3	1511214-3		WATER	27-Oct-15	



15 11714

YELLOWKNIFE

### **Subcontract Request Form**

### **Subcontract To:**

## ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE FORT COLLINS, CO 80524

Please see enclosed 3	sample(s) in 3 Container(s)			
SAMPLE NUMBER ANA	ALYTICAL REQUIRED	DATE SA	AMPLED DUE DATE	Priority Flag
L1695173-1 LUP-10-151027		10/27/	2015	
Ra22	26 by Alpha Scint, MDC=0.01 Bq/L (RA226-I	MMER-FC 1)	11/23/2015	
L1695173-2 LUP-35-151027		10/27/	2015	
Ra22	26 by Alpha Scint, MDC=0.01 Bq/L (RA226-I	MMER-FC 1)	11/23/2015	
L1695173-3 LUP-36-151027		10/27/2	2015	· · · · · · · · · · · · · · · · · · ·
Ra22	26 by Alpha Scint, MDC=0.01 Bq/L (RA226-1		11/23/2015	
Subcontract Info Contact:	Sean Whitaker (867) 873-5593	, (*4 f <sub>e</sub> ************************************	N2-40-	
Analysis and reporting info conta	rct: Rick Zolkiewski 314 OLD AIRPORT ROAD Unit 116 YELLOWKNIFE,NT X1A 3T3			
	Phone: (867) 873-5593	Email: Rick	.Zolkiewski@alsg	lobal.com
Please email confirmation of	receipt to: Rick.Zolkiewski	@alsglobal.	com	
Shipped By:	Date Shipped:			
Received By:	Date Received:	11-11-	15 /0450	
/erified By:	/Date Verified:		<b>-</b>	
	Temperature:			



# ALS Environmental - Fort Collins CONDITION OF SAMPLE UPON RECEIPT FORM

	Client: Als Yellowhuh Workorder No: 150	1214		_
	Project Manager: ARW Initials: SDM	Date:	11-11-4	<u>5</u>
1.	Does this project require any special handling in addition to standard ALS procedures?		YES	(NO)
2.	Project Manager: AR→ Initials: SD Date:  sthis project require any special handling in addition to standard ALS procedures? custody seals on shipping containers intact? Custody seals on sample containers intact? There a COC (Chain-of-Custody) present or other representative documents? The COC and bottle labels complete and legible? The COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of tainers, matrix, requested analyses, etc.) The airly shipping documents present and/or removable? The airly shipping documents present and/or removable? The airly shipping documents preserved correctly? (excluding volatiles)  The airly shipping correctly shipping documents preserved correctly? (excluding volatiles)  The airly shipping correctly shipping correctly shipping correctl		YES	NO
3.	Project Manager: AR Date: Use this project require any special handling in addition to standard ALS procedures?    Custody seals on shipping containers intact?   NOND		YES	NO
4.	Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5.	Are the COC and bottle labels complete and legible?		YES	NO
6.	Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7.	Were airbills / shipping documents present and/or removable?	DROP OFF	(ES)	NO
8.	Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	(ES)	NO
9.	Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10.	Is there sufficient sample for the requested analyses?		YES	NO
11.	Were all samples placed in the proper containers for the requested analyses?		YES	NO
12.	Are all samples within holding times for the requested analyses?		(ES)	NO
13.	Were all sample containers received intact? (not broken or leaking, etc.)		YES.	NO
14.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: < green pea > green pea	N/A)	YES	NO
15.		N/A	YES	(NO)
16.	Were the samples shipped on ice?		YES	NO
17.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	I I	(YES)	NO
	Cooler #:  Temperature (°C):  V. Y  No. of custody seals on cooler:  DOT Survey/ Acceptance Information  External μR/hr reading:  Background μR/hr reading:  Were external μR/hr readings ≤ two times background and within DOT acceptance criteria?  (YES/NO/NA (If no, see	Form 008.)	ND #16.	
	applicable, was the client contacted? YES / NO / NA Contact:  roject Manager Signature / Date:	_ Date/Tir	ne:	

\*IR Gun #2: Oakton, SN 29922500201-0066 \*IR Gun #4: Oakton, SN 2372220101-0002

# 1511214



/templates/components/dotcom\_label\_contents/FoldInstr/en/Folding\_instructions\_shippingLabel.html loading... /templates/components/dotcom\_label\_contents/WarningsOriginalLabel/en/Folding\_warning.html loading... /templates/components/dotcom\_label\_contents/TnCIntl/en/TC\_intl.html loading...

**Legal Location:** 

### SAMPLE SUMMARY REPORT

Matrix: WATER

Client: ALS Environmental Date: 24-Nov-15

 Project:
 L1695173
 Work Order:
 1511214

 Sample ID:
 L1695173-1
 Lab ID:
 1511214-1

**Collection Date:** 10/27/2015 **Percent Moisture:** 

Analyses	Result	Report Dilution Qual Limit Units Factor				Date Analyzed
Radium-226 by Radon Em	PAI	783	Prep	Date: 11/13/2015	PrepBy: <b>ECP</b>	
Ra-226	0.0078 (+/- 0.0053)	LT	0.0065	BQ/I	NA	11/23/2015 13:21
Carr: BARIUM	90.5		40-110	%REC	DL = NA	11/23/2015 13:21

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### SAMPLE SUMMARY REPORT

Client: ALS Environmental Date: 24-Nov-15

 Project:
 L1695173
 Work Order:
 1511214

 Sample ID:
 L1695173-2
 Lab ID:
 1511214-2

Legal Location: Matrix: WATER

Collection Date: 10/27/2015 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Em	anation - Method 903.1	PAI	783	Prep	Date: 11/13/2015	PrepBy: <b>ECP</b>
Ra-226	0.015 (+/- 0.0073)		0.0071	BQ/I	NA	11/23/2015 13:57
Carr: BARIUM	92.5		40-110	%REC	DL = NA	11/23/2015 13:57

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### SAMPLE SUMMARY REPORT

Client: ALS Environmental Date: 24-Nov-15

 Project:
 L1695173
 Work Order:
 1511214

 Sample ID:
 L1695173-3
 Lab ID:
 1511214-3

Legal Location: Matrix: WATER

Collection Date: 10/27/2015 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Em	anation - Method 903.1	PAI	783	Prep	Date: 11/13/2015	PrepBy: <b>ECP</b>
Ra-226	0.0071 (+/- 0.0042)	LT	0.0043	BQ/I	NA	11/23/2015 13:57
Carr: BARIUM	98.6		40-110	%REC	DL = NA	11/23/2015 13:57

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### SAMPLE SUMMARY REPORT

Client: ALS Environmental Date: 24-Nov-15

**Project:** L1695173 **Work Order:** 1511214

Sample ID: L1695173-3 Lab ID: 1511214-3 Legal Location: Matrix: WATER

Collection Date: 10/27/2015 Percent Moisture:

Analyses Result Qual Limit Units Factor Date Analyzed

### **Explanation of Qualifiers**

### Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

\* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested

MDC.

#### Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

\* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

### Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

- B Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E Analyte concentration exceeds the upper level of the calibration range.
- J Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A A tentatively identified compound is a suspected aldol-condensation product.
- X The analyte was diluted below an accurate quantitation level.
- \* The spike recovery is equal to or outside the control criteria used.
- + The relative percent difference (RPD) equals or exceeds the control criteria.
- G A pattern resembling gasoline was detected in this sample.
- D A pattern resembling diesel was detected in this sample.
- M A pattern resembling motor oil was detected in this sample.
- C A pattern resembling crude oil was detected in this sample.
- 4 A pattern resembling JP-4 was detected in this sample.
- 5 A pattern resembling JP-5 was detected in this sample.
- H Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8 - diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

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LIMS Version: 6.794

Client: ALS Environmental

**Work Order:** 1511214 **Project:** L1695173

**Date:** 11/24/2015 10:1

# QC BATCH REPORT

Batch ID: R	E151113-1-1	In	strument ID Alp	ha Scin		Method: R	adium-226	by Rade	on Emanation					
LCS	Sample ID:	RE151113-1				U	nits: <b>BQ/I</b>		Analys	is Date: 1	: 11/23/2015 13:57			
Client ID: Run I		Run II	D: <b>RE151113</b> -	1A	Pr			Prep Date: <b>11/1</b>	3/2015	DF:	: NA			
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-226			1.82 (+/- 0.453)	0.0132	1.704		107	67-120					P,M3	
Carr: BARIL	JM		15200		16110		94.2	40-110						
LCSD	Sample ID:	RE151113-1				U	nits: <b>BQ/I</b>		Analys	is Date: 1	e: 11/23/2015 13:57			
Client ID:			Run II	D: <b>RE151113</b> -	1A	Prep Date:				3/2015	15 DF: NA			
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-226			1.97 (+/- 0.490)	0.0133	1.704		115	67-120		1.82	0.2	2.1	P,M3	
Carr: BARIL	JM		15700		16110		97.5	40-110		15200				
МВ	Sample ID:	RE151113-1				U	nits: <b>BQ/I</b>		Analys	is Date: 1	1/23/20	15 13:57	7	
Client ID:			Run II	D: <b>RE151113</b> -	1A				Prep Date: <b>11/1</b>	3/2015	DF:	: NA		
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-226			ND	0.0063									U	
Carr: BARIL	JM		15800		16110		97.9	40-110						
The follow	ving samples	were analyzed	in this batch:	15112	214-1	15112	14-2	151	1214-3					



### Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

# Affix ALS barcode label here

COC Number: 14 -

Page \_\_\_1 of \_\_\_1

	www.alsglobal.com																				
Report To			Report Forma	t / Distribution				Select	Service	Level Be	elow (Ru	ush Tuma	umaround Time (TAT) is not available for all tests)								
Company:	Lupin Mines Incorporated c/o Elgin Mining Inc.	Select Report Fo	ormat: 🔀 PD	F X EXCEL	EDD (DIGITAL)	R	⊠ R	egular (S	Standard	TAT if re	ceived b	by 3 pm	- busines	s days)		TAT					
Contact:	K. Lewis	Quality Control (	(QC) Report with Re	port Ves	F No	Р	P	iority (2	-4 bus. d	lays if rec	eived b	y 3pm) 5	0% surci	harge - con	tact ALS t	o confirm TA	ř				
Address:	76 Richmond Street East, Suite 330	Criteria on Re	port - provide details belo			E	1   E	mergenc	y (1-2 bi	us. days i	f receive	ed by 3p	m) 100%	surcharge	- contact	ALS to confir	n TAT				
	Toronto, ON M5C 1P1	Select Distribution	on: 🛛 E	MAIL MAIL	FAX	E2	S	me day	or week	end eme	rgency -	contact	ALS to co	onfirm TAT	and surch	arge					
Phone:	778-386-7340	Email 1 or Fax	klewis@elginminin	g.com		Speci	ify Date	Requ	ired for	E2,E 0	or P:										
		Email 2									F	Analys	is Requ	uest							
Invoice To	Same as Report To		Invoice Distribution					Indicate	Filtered	(F), Pres	erved (P	) or Filte	red and F	Preserved (	F/P) belov	1					
	Copy of Invoice with Report	Select Invoice D	istribution:	EMAIL MAIL	FAX	Р	P		P P P						7						
Company:		Email 1 or Fax	klewis@elginminin	g.com					-												
contact: Em																	γo				
	Project Information		Oil and Gas Require	ed Fields (client u	se)			o o									iner				
ALS Quote #:	53119		Cost Center:				Sulphate									onta					
Job #:		GL Account:		Routing Code:				Sul									o o				
PO / AFE:		Activity Code:						inity,									Je.				
LSD:	Lupin Mine	Location:						Alkalinity,					1				Number of Containers				
ALS Lab Wo	ork Order# (lab use only) L1695173	ALS Contact:	Rick Zoliewski	Sampler:	C.de Repentigny	tals	anide	TSS, Hardness,	rcury		a	litrate					2				
ALS Sample # (lab use only)	Sample Identification and/or Coordinate (This description will appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals	Total Cyanide	TSS, Hz	Total Mercury	Radium	Ammonia	Nitrate/Nitrate									
	Lup-10-151027		27-oct-15	9:40	Water	R	R	R	R	R	R	R					7				
	Lup-35-151027		27-oct-15	9:45	Water	R	R	R	R	R	R	R					7				
	Lup-36-151027		27-oct-15	9:50	Water	R	R	R	R	R	R	R					7				
				Alberta Time	3						-										
				7.00-7,10,111115	-		-			-											
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L1695173-COFC SAMPL Special Instructions / Specify Criteria to add on report (client Use) Drinking Water (DW) Samples1 (client use) Frozen Are samples taken from a Regulated DW System? Ice packs Yes Custody seal intact T Yes Cooling Initiated Are samples for human drinking water use? NIITIAL COOLER TEMPERATURES °C FINAL COOLER TEMPERATURES °C | Yes FINAL SHIPMENT RECEPTION (lab use only) SHIPMENT RELEASE (client use) INITIAL SHIPMENT RECEPTION (lab use only) Received by Received by: Date: Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DWLCOC form.

NA-FM-0326e v09 Front/04 January 2014



LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 28-OCT-15

Report Date: 30-NOV-15 13:28 (MT)

Version: FINAL

Client Phone: 778-386-7340

# Certificate of Analysis

Lab Work Order #: L1695179

Project P.O. #:

**NOT SUBMITTED** 

Job Reference: C of C Numbers:

Legal Site Desc:

General Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 75 Con Road, PO. Box 2801, Yellowknife, NT, X1A 2R2 Canada | Phone: +1 867 873 5593 | Fax: +1 867 920 4238 ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

Environmental 🗦

www.alsglobal.com

RIGHT SOLUTIONS RIGHT PARTNER

PAGE 2 of 6 30-NOV-15 13:28 (MT)

### Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1695179-1 WATER 27-OCT-15 09:45 LUP-25-151027	L1695179-2 WATER 27-OCT-15 10:20 LUP-24-151027	L1695179-3 WATER 27-OCT-15 11:15 LUP-22-151027	L1695179-4 WATER 27-OCT-15 11:55 LUP-21-151027	L1695179-5 WATER 27-OCT-15 12:30 LUP-20-151027
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	5.29	5.51	85.0	6.45	183
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	2.6	2.8	2.8	3.9	<2.0
	Ammonia, Total (as N) (mg/L)	<0.050	<0.050	<0.050	<0.050	0.092
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Metals	Aluminum (AI)-Total (mg/L)	0.0067	0.0069	0.0314	0.0085	0.0992
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00025	0.00025	0.00073	0.00026	0.00183
	Barium (Ba)-Total (mg/L)	0.00245	0.00279	0.0128	0.00252	0.0273
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	0.027	<0.010	0.063
	Cadmium (Cd)-Total (mg/L)	0.0000053	<0.0000050	0.000100	<0.0000050	0.000220
	Calcium (Ca)-Total (mg/L)	1.21	1.27	27.6	1.34	60.1
	Cesium (Cs)-Total (mg/L)	<0.000010	<0.000010	0.000042	0.000016	0.000080
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	0.00014	0.00014	0.0127	<0.00010	0.0360
	Copper (Cu)-Total (mg/L)	0.00064	0.00062	0.00096	0.00069	0.00112
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	0.123	0.024	1.04
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0117	0.0011	0.0254
	Magnesium (Mg)-Total (mg/L)	0.548	0.569	3.89	0.752	8.00
	Manganese (Mn)-Total (mg/L)	0.00344	0.00344	0.308	0.00272	0.857
	Mercury (Hg)-Total (mg/L)		<0.0000050		<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00123	0.00123	0.0351	0.00067	0.0764
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.409	0.427	2.32	0.409	4.91
	Rubidium (Rb)-Total (mg/L)	0.00120	0.00106	0.00185	0.00123	0.00275
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000056
	Silicon (Si)-Total (mg/L)	0.141	0.100	1.00	0.205	2.05
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.765	0.805	20.2	0.696	45.5
	Strontium (Sr)-Total (mg/L)	0.00672	0.00690	0.117	0.00744	0.263
	Sulfur (S)-Total (mg/L)	0.98	0.97	34.8	1.04	79.8
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (TI)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	0.000013

L1695179 CONTD.... PAGE 3 of 6

ALS ENVIRONMENTAL ANALYTICAL REPORT

30-NOV-15 13:28 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1695179-6 WATER 27-OCT-15 10:10 LUP-37-151027		
Grouping	Analyte			
WATER				
Physical Tests	Hardness (as CaCO3) (mg/L)	5.53		
	Total Suspended Solids (mg/L)	<3.0		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	3.1		
	Ammonia, Total (as N) (mg/L)	<0.050		
Cyanides	Cyanide, Total (mg/L)	<0.0050		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0062		
	Antimony (Sb)-Total (mg/L)	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00026		
	Barium (Ba)-Total (mg/L)	0.00256		
	Beryllium (Be)-Total (mg/L)	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050		
	Boron (B)-Total (mg/L)	<0.010		
	Cadmium (Cd)-Total (mg/L)	<0.0000050		
	Calcium (Ca)-Total (mg/L)	1.29		
	Cesium (Cs)-Total (mg/L)	<0.000010		
	Chromium (Cr)-Total (mg/L)	<0.00010		
	Cobalt (Co)-Total (mg/L)	0.00014		
	Copper (Cu)-Total (mg/L)	0.00056		
	Iron (Fe)-Total (mg/L)	<0.010		
	Lead (Pb)-Total (mg/L)	<0.000050		
	Lithium (Li)-Total (mg/L)	<0.0010		
	Magnesium (Mg)-Total (mg/L)	0.559		
	Manganese (Mn)-Total (mg/L)	0.00360		
	Mercury (Hg)-Total (mg/L)	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.00123		
	Phosphorus (P)-Total (mg/L)	<0.050		
	Potassium (K)-Total (mg/L)	0.418		
	Rubidium (Rb)-Total (mg/L)	0.00106		
	Selenium (Se)-Total (mg/L)	<0.000050		
	Silicon (Si)-Total (mg/L)	0.096		
	Silver (Ag)-Total (mg/L)	<0.000010		
	Sodium (Na)-Total (mg/L)	0.793		
	Strontium (Sr)-Total (mg/L)	0.00713		
	Sulfur (S)-Total (mg/L)	1.16		
	Tellurium (Te)-Total (mg/L)	<0.00020		
	Thallium (TI)-Total (mg/L)	<0.000010		

L1695179 CONTD....

PAGE 4 of 6 30-NOV-15 13:28 (MT)

Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPOR
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Sample ID L1695179-1 L1695179-2 L1695179-3 L1695179-4 L1695179-5 WATER Description WATER WATER WATER WATER 27-OCT-15 27-OCT-15 27-OCT-15 27-OCT-15 27-OCT-15 Sampled Date 09:45 10:20 11:15 11:55 12:30 Sampled Time LUP-25-151027 LUP-24-151027 LUP-22-151027 LUP-21-151027 LUP-20-151027 Client ID Grouping **Analyte WATER Total Metals** Thorium (Th)-Total (mg/L) < 0.00010 < 0.00010 <0.00010 <0.00010 <0.00010 Tin (Sn)-Total (mg/L) <0.00010 < 0.00010 < 0.00010 <0.00010 <0.00010 Titanium (Ti)-Total (mg/L) < 0.00030 < 0.00030 < 0.00030 < 0.00030 0.00101 Tungsten (W)-Total (mg/L) <0.00010 <0.00010 <0.00010 < 0.00010 <0.00010 Uranium (U)-Total (mg/L) 0.000020 0.000020 0.000013 0.000023 0.000017 Vanadium (V)-Total (mg/L) < 0.00050 < 0.00050 <0.00050 <0.00050 <0.00050 Zinc (Zn)-Total (mg/L) < 0.0030 <0.0030 0.104 < 0.0030 0.227 Zirconium (Zr)-Total (mg/L) < 0.00030 < 0.00030 < 0.00030 <0.00030 <0.00030 Radiological Ra-226 (Bq/L) 0.011 < 0.0100 **Parameters** 

L1695179 CONTD.... PAGE 5 of 6

ALS ENVIRONMENTAL ANALYTICAL REPORT

30-NOV-15 13:28 (MT) Version: FINAL

Crouping			Sample ID Description Sampled Date Sampled Time Client ID	L1695179-6 WATER 27-OCT-15 10:10 LUP-37-151027	
Total Metals         Thorium (Th)-Total (mg/L)         <0.00010           Tin (Sn)-Total (mg/L)         <0.00010           Titanium (Ti)-Total (mg/L)         <0.00030           Tungsten (W)-Total (mg/L)         <0.00010           Uranium (U)-Total (mg/L)         0.000020           Vanadium (V)-Total (mg/L)         <0.00050           Zinc (Zn)-Total (mg/L)         <0.00030           Zirconium (Zr)-Total (mg/L)         <0.00030           Radiological         Ra-226 (Bq/L)	Grouping	Analyte			
Tin (Sn)-Total (mg/L)	WATER				
Titanium (Ti)-Total (mg/L)	Total Metals	Thorium (Th)-Total (mg/L)		<0.00010	
Tungsten (W)-Total (mg/L)		Tin (Sn)-Total (mg/L)		<0.00010	
Uranium (U)-Total (mg/L) 0.000020  Vanadium (V)-Total (mg/L) <0.00050  Zinc (Zn)-Total (mg/L) <0.0030  Zirconium (Zr)-Total (mg/L) <0.00030  Radiological Ra-226 (Bq/L) <0.0100		Titanium (Ti)-Total (mg/L)		<0.00030	
Vanadium (V)-Total (mg/L)		Tungsten (W)-Total (mg/L)		<0.00010	
Zinc (Zn)-Total (mg/L) <0.0030  Zirconium (Zr)-Total (mg/L) <0.00030  Radiological Ra-226 (Bq/L) <0.0100		Uranium (U)-Total (mg/L)		0.000020	
Zirconium (Zr)-Total (mg/L) <0.00030  Radiological Ra-226 (Bq/L) <0.0100		Vanadium (V)-Total (mg/L)		<0.00050	
Radiological Ra-226 (Bq/L) <0.0100		Zinc (Zn)-Total (mg/L)		<0.0030	
Radiological Parameters  Ra-226 (Bq/L)  <0.0100		Zirconium (Zr)-Total (mg/L)		<0.00030	
	Radiological	Ra-226 (Bq/L)		<0.0100	
	T di dillictoro				

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L1695179 CONTD....
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### **Reference Information**

### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

**ETL-HARDNESS-TOT-ED** Water Hardness (from Total Ca and Mg) APHA 2340 B-Calculation **HG-T-CVAA-ED** Water Total Mercury in Water by CVAAS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-ED Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the

 $automated\ phenate\ colourimetric\ method.$ 

RA226-MMER-FC Water Ra226 by Alpha Scint, MDC=0.01 Bq/L EPA 903.1

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

### **Chain of Custody Numbers:**

### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

<sup>\*\*</sup> ALS test methods may incorporate modifications from specified reference methods to improve performance.



Ft. Collins, Colorado LIMS Version: 6,794 Page 1 of 1

Tuesday, November 24, 2015

Rick Zolkiewski ALS Environmental 314 Old Airport Road Unit 116 Yellowknife, NT X1A 3T3

Re: ALS Workorder: 1511216

Project Name:

Project Number: L1695179

Dear Mr. Zolkiewski:

Three water samples were received from ALS Environmental, on 11/11/2015. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely.

Amy R. Wolf

Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins							
ALS ENVIORING	Intal – Fort Collins						
Accreditation Body	License or Certification Number						
Alaska (AK)	UST-086						
Alaska (AK)	CO01099						
Arizona (AZ)	AZ0742						
California (CA)	06251CA						
Colorado (CO)	CO01099						
Connecticut (CT)	PH-0232						
Florida (FL)	E87914						
Idaho (ID)	CO01099						
Kansas (KS)	E-10381						
Kentucky (KY)	90137						
L-A-B (DoD ELAP/ISO 170250)	L2257						
Louisiana (LA)	05057						
Maryland (MD)	285						
Missouri (MO)	175						
Nebraska(NE)	NE-OS-24-13						
Nevada (NV)	CO000782008A						
New York (NY)	12036						
North Dakota (ND)	R-057						
Oklahoma (OK)	1301						
Pennsylvania (PA)	68-03116						
Tennessee (TN)	2976						
Texas (TX)	T104704241						
Utah (UT)	CO01099						
Washington (WA)	C1280						



# 1511216

### Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

# Sample Number(s) Cross-Reference Table

**OrderNum:** 1511216

Client Name: ALS Environmental

**Client Project Name:** 

Client Project Number: L1695179 Client PO Number: L1695179

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1695179-2	1511216-1		WATER	27-Oct-15	
L1695179-4	1511216-2		WATER	27-Oct-15	
L1695179-6	1511216-3		WATER	27-Oct-15	

YELLOWKNIFE



1511216

### **Subcontract Request Form**

### **Subcontract To:**

### ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE FORT COLLINS, CO 80524

1	report and invoice: PO# <u>L169</u> be provided with your final result	9 <u>5179</u> :s.	
Please see enclosed 3 sam	pple(s) in <u>3</u> Container(s)	)	
SAMPLE NUMBER ANALYTI	CAL REQUIRED	DATE SAMPLED DUE DATE	Priority Flag
<b>L1695179-2 LUP-24-151027</b> Ra226 by	Alpha Scint, MDC=0.01 Bq/L (RA226-	<b>10/27/2015</b> MMER-FC 1) 11/23/2015	
<b>L1695179-4 LUP-21-151027</b> Ra226 by	Alpha Scint, MDC=0.01 Bq/L (RA226-	<b>10/27/2015</b> MMER-FC 1) 11/23/2015	
<b>L1695179-6 LUP-37-151027</b> Ra226 by	Alpha Scint, MDC=0.01 Bq/L (RA226-	<b>10/27/2015</b> MMER-FC 1) 11/23/2015	
Subcontract Info Contact:  Analysis and reporting info contact:	Sean Whitaker (867) 873-5593 Rick Zolkiewski 314 OLD AIRPORT ROAD Unit 116 YELLOWKNIFE,NT X1A 3T3		
	Phone: (867) 873-5593	Email: Rick.Zolkiewski@	alsglobal.com
Please email confirmation of recei  Shipped By:  Received By:	Date Shipped:Date Received:	i@alsglobal.com	Ь
Verified By: Sample Integrity Issues:	Date Verified: Temperature:	-	



# ALS Environmental - Fort Collins CONDITION OF SAMPLE UPON RECEIPT FORM

	Client: A 15 Yellowhife Workorder No: 15	11216		
	Project Manager: And Initials: SDM	Date:	11-11-15	-
1.	Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2.	Are custody seals on shipping containers intact?	NONE	YES	NO
3.	Are Custody seals on sample containers intact?	NONE	YES	NO
4.	Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5.	Are the COC and bottle labels complete and legible?		YES	NO
6.	Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7.	Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8.	Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	(YES)	NO
9.	Are all aqueous non-preserved samples pH 4-9?	(N/A)	YES	NO
10.	Is there sufficient sample for the requested analyses?		(YE)	NO
11.	Were all samples placed in the proper containers for the requested analyses?		(YES)	NO
12.	Are all samples within holding times for the requested analyses?		YES	NO
13.	Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: < green pea > green pea	N/A	YES	NO
15.	Do any water samples contain sediment?  Amount of sediment:dusting moderateheavy	N/A	YES	NO
16.	Were the samples shipped on ice?		ŒS	NO
⊢	• Were cooler temperatures measured at 0.1-6.0°C? R gun used*: #2 #4	RAD ONLY	(YES	NO
	Cooler #:    Temperature (°C):	e Form 008.)		
	f applicable, was the client contacted? YES / NO / NA Contact:  Project Manager Signature / Date:	Date/Ti	me:	

\*IR Gun #2: Oakton, SN 29922500201-0066 \*IR Gun #4: Oakton, SN 2372220101-0002



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### SAMPLE SUMMARY REPORT

Client: ALS Environmental Date: 24-Nov-15

 Project:
 L1695179
 Work Order:
 1511216

 Sample ID:
 L1695179-2
 Lab ID:
 1511216-1

Legal Location: Matrix: WATER

Collection Date: 10/27/2015 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		PAI	783	Prep	Date: 11/13/2015	PrepBy: <b>ECP</b>
Ra-226	0.011 (+/- 0.0065)		0.0075	BQ/I	NA	11/23/2015 13:57
Carr: BARIUM	90.5		40-110	%REC	DL = NA	11/23/2015 13:57

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### SAMPLE SUMMARY REPORT

Client: ALS Environmental Date: 24-Nov-15

 Project:
 L1695179
 Work Order:
 1511216

 Sample ID:
 L1695179-4
 Lab ID:
 1511216-2

 Legal Location:
 Matrix:
 WATER

Collection Date: 10/27/2015 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		PAI	783	Prep	Date: 11/13/2015	PrepBy: <b>ECP</b>
Ra-226	ND (+/- 0.0056)	U	0.0095	BQ/I	NA	11/23/2015 13:57
Carr: BARIUM	73.5		40-110	%REC	DL = NA	11/23/2015 13:57

AR Page 2 of 4 9 of 12

### SAMPLE SUMMARY REPORT

Client: ALS Environmental Date: 24-Nov-15

 Project:
 L1695179
 Work Order:
 1511216

 Sample ID:
 L1695179-6
 Lab ID:
 1511216-3

Legal Location: Matrix: WATER

Collection Date: 10/27/2015 Percent Moisture:

Analyses	Result	Qual	Report Dilutio Qual Limit Units Factor			Date Analyzed				
Radium-226 by Radon Ema	PAI	783	Prep	Date: 11/13/2015	PrepBy: <b>ECP</b>					
Ra-226	ND (+/- 0.0059)	U	0.0087	BQ/I	NA	11/23/2015 13:57				
Carr: BARIUM	84		40-110	%REC	DL = NA	11/23/2015 13:57				

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LIMS Version: 6.794

### SAMPLE SUMMARY REPORT

Client: ALS Environmental Date: 24-Nov-15

**Project:** L1695179 **Work Order:** 1511216

Sample ID: L1695179-6 Lab ID: 1511216-3
Legal Location: Matrix: WATER

Collection Date: 10/27/2015 Percent Moisture:

Report Dilution
Analyses Result Qual Limit Units Factor Date Analyzed

### **Explanation of Qualifiers**

### Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

\* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested

MDC.

#### Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

\* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

### Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

- B Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E Analyte concentration exceeds the upper level of the calibration range.
- J Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A A tentatively identified compound is a suspected aldol-condensation product.
- X The analyte was diluted below an accurate quantitation level.
- \* The spike recovery is equal to or outside the control criteria used.
- + The relative percent difference (RPD) equals or exceeds the control criteria.
- G A pattern resembling gasoline was detected in this sample.
- D A pattern resembling diesel was detected in this sample.
- M A pattern resembling motor oil was detected in this sample.
- C A pattern resembling crude oil was detected in this sample.
- 4 A pattern resembling JP-4 was detected in this sample.
- 5 A pattern resembling JP-5 was detected in this sample.
- H Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8 - diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS Environmental -- FC

LIMS Version: 6.794

Client: ALS Environmental

**Work Order:** 1511216 **Project:** L1695179 **Date:** 11/24/2015 10:2

# QC BATCH REPORT

Batch ID: R	E151113-1-1	In	strument ID Alp	ha Scin		Method: R	adium-226	by Rad	on Emanation									
LCS	Sample ID:	RE151113-1	1113-1 Units: <b>BQ/I</b>							Analysis Date: 11/23/2015 13:57								
Client ID: Run			Run II	D: <b>RE151113-1A</b>					Prep Date: <b>11/1</b>	3/2015	DF:							
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual					
Ra-226			1.82 (+/- 0.453)	0.0132	1.704		107	67-120					P,M3					
Carr: BARIL	JM		15200		16110		94.2	40-110										
LCSD	Sample ID:	Sample ID: RE151113-1 Units: BQ/I Analysis Dat									e: <b>11/23/2015 13:57</b>							
Client ID:			Run II	D: <b>RE151113-1A</b>				Prep Date: <b>11/1</b>	3/2015	DF:								
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual					
Ra-226			1.97 (+/- 0.490)	0.0133	1.704		115	67-120		1.82	0.2	2.1	P,M3					
Carr: BARIUM 15700				16110		97.5	40-110		15200	ı								
МВ	Sample ID:	RE151113-1				U	nits: <b>BQ/I</b>		Analys	is Date: 1	1/23/20	)15 13:57	7					
Client ID:			Run II	D: <b>RE151113</b> -	1A	Pre			Prep Date: <b>11/1</b>	3/2015	DF:							
Analyte			Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual					
Ra-226			ND	0.0063									U					
Carr: BARIL	JM		15800		16110		97.9	40-110										
The follow	ving samples	were analyzed	in this batch:	15112	216-1	15112	16-2	151	1216-3									



### Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here

COC	Number:	1	4

Page \_\_1 of \_\_1

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	WWW.dioglobal.oom																					
Report To				Report Format / Distribution				Select Service Level Below (Rush Tumaround Time (TAT) is not available for all tests)														
Company:	npany: Lupin Mines Incorporated c/o Elgin Mining Inc.			Select Report Fo	Select Report Format:					R Regular (Standard TAT if received by 3 pm - business days)												
Contact:	K. Lewis	uality Control (QC) Report with Report						-4 bus. c	lays if re	ceived	by 3pm)	50% sur	rcharge -	contact A	LS to conf	irm TAT						
Address:	76 Richmond Street East, Suite 3	330		Criteria on Rep	Criteria on Report - provide details below if box checked						E   Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT											
	Toronto, ON M5C 1P1				Select Distribution: EMAIL MAIL FAX						2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge											
Phone:	778-386-7340	Email 1 or Fax	klewis@elginmining	g.com		Specify Date Required for E2,E or P:																
				Email 2	Email 2 abowie@srk.com					Analysis Request  Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below												
Invoice To	Same as Report To	V Yes	□ No		Invoice Distribution						Filtered	(F), Pres	_	(P) or Filte	ered and	Preserve	ed (F/P) b	elow				
	Copy of Invoice with Report	Yes	□ No	7,516,21,010,121,55	Select Invoice Distribution: EMAIL MAIL FAX					Р	Р	Р	Р							1		
Company:					klewis@elginmining	g.com					14-1				175	111						
Contact:				Email 2		-1-1-1-1-1-1							1							S		
	Project Informa	ition			il and Gas Require		ise)													of Containers		
ALS Quote #:	53119			Approver ID:		Cost Center:							1							Con		
Job #:				GL Account:		Routing Code:	_	-	quess							1		4	į.	, p		
PO / AFE:	Total Area			Activity Code:				-												Number		
LSD:	Lupin Mine			Location:					Har											N N		
ALS Lab Work Order # (lab use only) L1695179			ALS Contact:	Rick Zoliewski	Sampler:	C.deRepentigny	anide	TSS, Alkalinity, Hardness	stals	Amnonia (NH4)		ercury				- : 8						
ALS Sample # (lab use only)						Time (hh:mm)	Sample Type	Total Cyanide	TSS, AI	Total Metals	Amnoni	Radium	Total Mercury									
	LUP-25-151027				27-oct-15	9:45	Water	R	R	R	R			T					5	4		
	LUP-24-151027				27-oct-15	10:20	Water	R	R	R	R	R	R						6	6		
	LUP-22-151027				27-oct-15	11:15	Water	R	R	R	R								· Ö	4		
	LUP-21-151027	27-oct-15	11:55	Water	R	R	R	R	R	R				- 1		9-COFC	6					
	LUP-20-151027					12:30	Water	R	R	R	R								17	4		
	LUP-37-151027				27-oct-15	10:10	Water	R	R	R	R	R	R						69517	4 6 4		
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		_	T.				1				SAM	DIEC	ONDI	TION A	S DEC	CEIVED	/lab u	o only				
Drinkin	ng Water (DW) Samples <sup>1</sup> (client u	ıse)	S	pecial Instructions / Spec	I Instructions / Specify Criteria to add on report (client Use)				en		JAIN	FLE C	ONDI	100000		ations	Ye		No			
Are samples take	en from a Regulated DW System?							Ice pa		Yes	H	No				al intac		es 🗆	No	ä		
Are samples for human drinking water use?								AL COOLER TEMPERATURE						FINAL	COOLER	TEMPERA	TURES	C				
□ Yes □ No										1,49						FINAL COOLER TEMPERATURES °C						
1/	SHIPMENT RELEASE (clien	nt use)	<u> </u>	INITIAL	SHIPMENT RECEP	TION (lab use only	y)	FINAL SHIPMENT RECEPTION (lab use only)														
			eceived by:								Received by: Date: Time:											
DESERVED DAON	DOCE CORN OF DOCUMENTS AND O	V-11-1	11.00	Va X	144.0	TE LABORATORY	, 000W WELLO		ENT O	2017		_										



LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 28-OCT-15

Report Date: 06-NOV-15 18:59 (MT)

Version: FINAL

Client Phone: 778-386-7340

# Certificate of Analysis

Lab Work Order #: L1695192

Project P.O. #:

**NOT SUBMITTED** 

Job Reference:

C of C Numbers:

Legal Site Desc:

Rick Zolkiewski General Manager

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PAGE 2 of 4 06-NOV-15 18:59 (MT)

Version: FINAL

## ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1695192-1 WATER 24-OCT-15 09:15 LUP-10-151024	L1695192-2 WATER 25-OCT-15 09:15 LUP-10-151025	L1695192-3 WATER 26-OCT-15 09:15 LUP-10-151026	L1695192-4 WATER 28-OCT-15 09:55 LUP-10-151028	
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	176	191	179	189	
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	4.0	4.1	4.0	3.8	
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0333	0.0264	0.0288	0.0284	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00699	0.00615	0.00625	0.00622	
	Barium (Ba)-Total (mg/L)	0.0156	0.0158	0.0154	0.0154	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	0.056	0.059	0.055	0.057	
	Cadmium (Cd)-Total (mg/L)	0.000217	0.000221	0.000247	0.000234	
	Calcium (Ca)-Total (mg/L)	58.9	64.8	59.5	64.1	
	Cesium (Cs)-Total (mg/L)	0.000081	0.000083	0.000081	0.000080	
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Total (mg/L)	0.0320	0.0322	0.0344	0.0341	
	Copper (Cu)-Total (mg/L)	0.00199	0.00193	0.00205	0.00208	
	Iron (Fe)-Total (mg/L)	0.099	0.082	0.089	0.090	
	Lead (Pb)-Total (mg/L)	0.000066	0.000059	0.000059	0.000055	
	Lithium (Li)-Total (mg/L)	0.0259	0.0261	0.0249	0.0247	
	Magnesium (Mg)-Total (mg/L)	6.94	7.07	7.31	7.00	
	Manganese (Mn)-Total (mg/L)	0.847	0.807	0.863	0.836	
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Nickel (Ni)-Total (mg/L)	0.0709	0.0721	0.0765	0.0755	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	4.77	4.89	4.41	4.36	
	Rubidium (Rb)-Total (mg/L)	0.00228	0.00225	0.00221	0.00219	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.00050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	1.90	1.90	2.01	2.03	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	41.2	42.3	44.4	43.1	
	Strontium (Sr)-Total (mg/L)	0.260	0.271	0.265	0.283	
	Sulfur (S)-Total (mg/L)	77.9	77.3	78.2	77.6	
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (TI)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

L1695192 CONTD....

PAGE 3 of 4 06-NOV-15 18:59 (MT)

Version: FINAL

# ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1695192-1 WATER 24-OCT-15 09:15 LUP-10-151024	L1695192-2 WATER 25-OCT-15 09:15 LUP-10-151025	L1695192-3 WATER 26-OCT-15 09:15 LUP-10-151026	L1695192-4 WATER 28-OCT-15 09:55 LUP-10-151028	
Grouping	Analyte						
WATER							
Total Metals	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)		0.000019	0.000017	0.000017	0.000015	
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)		0.237	0.239	0.265	0.262	
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	

L1695192 CONTD....

PAGE 4 of 4

06-NOV-15 18:59 (MT)

Version: FINAL

### **Reference Information**

### **Test Method References:**

ALS Test Code Matrix		Test Description	Method Reference**	
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration	
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002	

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-EDWaterHardness (from Total Ca and Mg)APHA 2340 B-CalculationMET-T-CCMS-EDWaterTotal Metals in Water by CRC ICPMSEPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

### Chain of Custody Numbers:

### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



### Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number:	14
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Page 1 of 1

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Report To				Report Forma	t / Distribution				4	Service Level			A-1-1			ot availat	ble for a	ill tests)	
Company:	Lupin Mines Incorporated c/o Elgin Mining In	nc.	Select Report Fo	ormat: N PDF	EXCEL	EDD (DIGITAL)	R	⊠ R	egular (	Standard TAT i	f rec	eived by 3	s pm - b	ousiness da	ays)				
Contact:	K. Lewis		Quality Control (	Quality Control (QC) Report with Report FYes No				_	Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT  Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT										
Address:	76 Richmond Street East, Suite 330			Criteria on Report - provide details below if box checked					mergen	y (1-2 bus. da	ys if	received t	y 3pm)	100% sur	rcharge -	contact A	ALS to c	onfirm TA	AT
	Toronto, ON M5C 1P1		Select Distribution			FAX	E2			or weekend e	_		ntact AL	S to confir	rm TAT a	nd surcha	arge		
Phone:	778-386-7340			klewis@elginmining	g.com		Spec	ify Date	e Requ	ired for E2,	E or								
			Email 2	abowie@srk.com			_					_		Reques					
Invoice To	Same as Report To Yes	□ No			stribution		_	_	Indicate	Filtered (F), P	reser	ved (P) o	Filtered	d and Pres	erved (F/	P) below			
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Company:			The state of the s	klewis@elginmining	g.com		1												
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PO/AFE:			Activity Code:				1		nes										per
LSD:	Lupin Mine		Location:				1		Hard					_					P
ALS Lab Wo	ork Order# (lab use only) L16	95192	ALS Contact:	Rick Zoliewski	Sampler:	C.de Repentign	stals	anide	SS, Alkalinity, Hardness										
ALS Sample # (lab use only)		n and/or Coordinates appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals	Total Cyanide	TSS, All					E					
	Lup-10-151024			24-oct-15	9:15	Water	R	R	R					=		G	Ī		3
	Lup-10-151025			25-oct-15	9:15	Water	R	R	R	3 1 1				Ξ		8			3
	Lup-10-151026			26-oct-15	9:15	Water	R	R	R					=		2-0	1		3
	Lup-10-151028			28-oct-15	9:55	Water	R	R	R							19	-		3
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2.25		Canal	al lasterations / Cas-	nife. Critoria to add as	ropert (allest 11-	• • • • • • • • • • • • • • • • • • • •				SAMPLE	СО	NDITIO	N AS	RECEIV	/ED (lal	use o	nly)		
	ng Water (DW) Samples¹ (client use)	Specia	ai instructions / Spec	cify Criteria to add or	report (client Us	e)	Froze	en				S	IF Ob	servation	ns	Yes		No	
Are samples take	en from a Regulated DW System? Yes Vo						Colonia	acks ng Initia	Yes ated		0		ustody	y seal int	tact	Yes		No	
Are samples for I	human drinking water use?						1000	- COSC 1	4	TEMPERATU	RES	C		FIN	AL COOL	ER TEM	PERATI	URES °C	
ΓY	es Vo						100												
/	/ SHIPMENT RELEASE (client use)		INITIAL	SHIPMENT RECEP	TION (lab use on	ly)	1		-	FINAL	. SH	IPMEN	TREC	CEPTION	N (lab u	se only	)		
Released by:	Date: + LINIS	Time: Receiv	ved by:	/	Ott 28/15		-	eived b					C	Date:		Time:			
REFERIO BACK	PAGE FOR ALS LOCATIONS AND SAMPLING I		/	WH	TE - LABORATOR	Y COPY YELLO	W-CLI	ENT CO	YAC					NA-FM/	-0326e V09 Fro	nt/04 January	2014		



LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 28-OCT-15

Report Date: 30-NOV-15 13:31 (MT)

Version: FINAL

Client Phone: 778-386-7340

# Certificate of Analysis

Lab Work Order #: L1695201

Project P.O. #: NOT SUBMITTED

Job Reference: C of C Numbers: Legal Site Desc:

Rick Zolkiewski General Manager

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PAGE 2 of 4 30-NOV-15 13:31 (MT)

Version: FINAL

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1695201-1 WATER 27-OCT-15 11:10 LUP-102-151027		
Grouping	Analyte			
WATER				
Physical Tests	Hardness (as CaCO3) (mg/L)	190		
	Total Suspended Solids (mg/L)	<3.0		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	3.6		
	Ammonia, Total (as N) (mg/L)	0.102		
	Sulfate (SO4) (mg/L)	227		
Cyanides	Cyanide, Total (mg/L)	<0.0050		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0241		
	Antimony (Sb)-Total (mg/L)	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00614		
	Barium (Ba)-Total (mg/L)	0.0150		
	Beryllium (Be)-Total (mg/L)	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050		
	Boron (B)-Total (mg/L)	0.066		
	Cadmium (Cd)-Total (mg/L)	0.000221		
	Calcium (Ca)-Total (mg/L)	63.6		
	Cesium (Cs)-Total (mg/L)	0.000087		
	Chromium (Cr)-Total (mg/L)	<0.00010		
	Cobalt (Co)-Total (mg/L)	0.0335		
	Copper (Cu)-Total (mg/L)	0.00192		
	Iron (Fe)-Total (mg/L)	0.081		
	Lead (Pb)-Total (mg/L)	0.000084		
	Lithium (Li)-Total (mg/L)	0.0265		
	Magnesium (Mg)-Total (mg/L)	7.47		
	Manganese (Mn)-Total (mg/L)	0.826		
	Mercury (Hg)-Total (mg/L)	<0.000050		
	Molybdenum (Mo)-Total (mg/L)	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.0745		
	Phosphorus (P)-Total (mg/L)	<0.050		
	Potassium (K)-Total (mg/L)	4.87		
	Rubidium (Rb)-Total (mg/L)	0.00240		
	Selenium (Se)-Total (mg/L)	<0.000050		
	Silicon (Si)-Total (mg/L)	1.93		
	Silver (Ag)-Total (mg/L)	<0.000010		
	Sodium (Na)-Total (mg/L)	45.1		
	Strontium (Sr)-Total (mg/L)	0.280		
	Sulfur (S)-Total (mg/L)	78.3		
	Tellurium (Te)-Total (mg/L)	<0.00020		

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

L1695201 CONTD....

Version:

PAGE 3 of 4 30-NOV-15 13:31 (MT)

**FINAL** 

### ALS ENVIRONMENTAL ANALYTICAL REPORT

L1695201-1 Sample ID WATER Description 27-OCT-15 Sampled Date 11:10 Sampled Time LUP-102-151027 Client ID Grouping **Analyte WATER Total Metals** Thallium (TI)-Total (mg/L) < 0.000010 Thorium (Th)-Total (mg/L) <0.00010 Tin (Sn)-Total (mg/L) < 0.00010 Titanium (Ti)-Total (mg/L) < 0.00030 Tungsten (W)-Total (mg/L) <0.00010 Uranium (U)-Total (mg/L) 0.000015 Vanadium (V)-Total (mg/L) < 0.00050 Zinc (Zn)-Total (mg/L) 0.249 Zirconium (Zr)-Total (mg/L) < 0.00030 Ra-226 (Bq/L) Radiological 0.015 Parameters

<sup>\*</sup> Please refer to the Reference Information section for an explanation of any qualifiers detected.

# L1695201 CONTD.... PAGE 4 of 4 30-NOV-15 13:31 (MT)

FINΔI

Version:

### **Reference Information**

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Sulfate (SO4)	MS-B	L1695201-1

### **Qualifiers for Individual Parameters Listed:**

Qualifier Description

MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-ED Water Hardness (from Total Ca and Mg) APHA 2340 B-Calculation

HG-T-CVAA-ED Water Total Mercury in Water by CVAAS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-ED Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.

RA226-MMER-FC Water Ra226 by Alpha Scint, MDC=0.01 Bq/L EPA 903.1 SO4-IC-N-ED Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

### **Chain of Custody Numbers:**

### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Ft. Collins, Colorado LIMS Version: 6,794 Page 1 of 1

Tuesday, November 24, 2015

Rick Zolkiewski ALS Environmental 314 Old Airport Road Unit 116 Yellowknife, NT X1A 3T3

Re: ALS Workorder: 1511215

Project Name:

Project Number: L1695201

Dear Mr. Zolkiewski:

One water sample was received from ALS Environmental, on 11/11/2015. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely.

Amy R. Wolf Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins						
ALS ENVIORING	Tital – Fort Collins					
Accreditation Body	License or Certification Number					
Alaska (AK)	UST-086					
Alaska (AK)	CO01099					
Arizona (AZ)	AZ0742					
California (CA)	06251CA					
Colorado (CO)	CO01099					
Connecticut (CT)	PH-0232					
Florida (FL)	E87914					
Idaho (ID)	CO01099					
Kansas (KS)	E-10381					
Kentucky (KY)	90137					
L-A-B (DoD ELAP/ISO 170250)	L2257					
Louisiana (LA)	05057					
Maryland (MD)	285					
Missouri (MO)	175					
Nebraska(NE)	NE-OS-24-13					
Nevada (NV)	CO000782008A					
New York (NY)	12036					
North Dakota (ND)	R-057					
Oklahoma (OK)	1301					
Pennsylvania (PA)	68-03116					
Tennessee (TN)	2976					
Texas (TX)	T104704241					
Utah (UT)	CO01099					
Washington (WA)	C1280					



# 1511215

### Radium-226:

The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

# Sample Number(s) Cross-Reference Table

**OrderNum:** 1511215

Client Name: ALS Environmental

**Client Project Name:** 

Client Project Number: L1695201 Client PO Number: L1695201

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1695201-1	1511215-1		WATER	27-Oct-15	





1511215

### **Subcontract Request Form**

### **Subcontract To:**

### ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE FORT COLLINS, CO 80524

Please see enclosed 1 san	nple(s) in <u>1</u> Container(s)	)		
SAMPLE NUMBER ANALYTI	ICAL REQUIRED	DATE SA	AMPLED DUE DATE	Priority Flag
L1695201-1 LUP-102-151027		10/27/	2015	
Ra226 by	Alpha Scint, MDC=0.01 Bq/L (RA226-	-MMER-FC 1)	11/20/2015	
Subcontract Info Contact:	Sean Whitaker (867) 873-5593			
Analysis and reporting info contact:	Rick Zolkiewski 314 OLD AIRPORT ROAD Unit 116 YELLOWKNIFE,NT X1A 3T3			
	Phone: (867) 873-5593	Email: Rick	k.Zolkiewski@als	global.com
Please email confirmation of rece	ipt to: Rick.Zolkiewsk	i@alsglobal	.com	
Shipped By:	Date Shipped:			
Received By:	Date Received:	11-11-1	5/0950	
/erified By:	Date Verified:		<i></i>	
	Temperature:			



# ALS Environmental - Fort Collins CONDITION OF SAMPLE UPON RECEIPT FORM

	Client: Als Yellowhile Workorder No: 15112	15	
		nte: 11-11-1	<del>-</del> 5
1.	Does this project require any special handling in addition to standard ALS procedures?	YES	_ (NO)
	Are custody seals on shipping containers intact?	YES YES	NO
3.	Are Custody seals on sample containers intact?	YES	NO
4.	Is there a COC (Chain-of-Custody) present or other representative documents?	(YES)	NO
5.	Are the COC and bottle labels complete and legible?	(YES)	NO
6.	Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)	YES	NO
7.	Were airbills / shipping documents present and/or removable?	OFF (YES)	NO
8.	Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	YES)	NO
9.	Are all aqueous non-preserved samples pH 4-9?	YES	NO
10.	Is there sufficient sample for the requested analyses?	(YES)	NO
11.	Were all samples placed in the proper containers for the requested analyses?	YES	NO
12.	Are all samples within holding times for the requested analyses?	(YES)	NO
13.	Were all sample containers received intact? (not broken or leaking, etc.)	(YES)	NO
14.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: < green pea > green pea	YES	NO
15.	S. Do any water samples contain sediment?  Amount of sediment: dusting moderateheavy	A YES	NO
16	Were the samples shipped on ice?	YES	NO
17	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4 ONL	1 1 7 17 78	NO
	Cooler #:		
	Temperature (°C): $4,4$		
	No. of custody seals on cooler:		
	DOT Survey/ Acceptance External µR/hr reading:		
İ	Background μR/hr reading:		
	Were external μR/hr readings ≤ two times background and within DOT acceptance criteria? YES/NO/NA (If no, see Form 0	008.)	
A	Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT		
_			
If	f applicable, was the client contacted? YES / NO / NA Contact: Dat	e/Time:	
	Project Manager Signature / Date:		

\*IR Gun #2: Oakton, SN 29922500201-0066 \*IR Gun #4: Oakton, SN 2372220101-0002



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### SAMPLE SUMMARY REPORT

Client: ALS Environmental Date: 24-Nov-15

 Project:
 L1695201
 Work Order:
 1511215

 Sample ID:
 L1695201-1
 Lab ID:
 1511215-1

 Legal Location:
 Matrix:
 WATER

Collection Date: 10/27/2015 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Ema	anation - Method 903.1	PAI	783	Pre	p Date: <b>11/13/2015</b>	PrepBy: <b>ECP</b>
Ra-226	0.015 (+/- 0.0084)		0.0091	BQ/I	NA	11/23/2015 13:57
Carr: BARIUM	85.8		40-110	%REC	DL = NA	11/23/2015 13:57

AR Page 1 of 2 **8 of 10** 

### SAMPLE SUMMARY REPORT

Client: ALS Environmental Date: 24-Nov-15

 Project:
 L1695201
 Work Order:
 1511215

 Sample ID:
 L1695201-1
 Lab ID:
 1511215-1

Sample ID: L1695201-1 Lab ID: 1511215-Legal Location: Matrix: WATER

Collection Date: 10/27/2015 Percent Moisture:

Analyses Result Qual Limit Units Factor Date Analyzed

### **Explanation of Qualifiers**

### Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

\* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested

MDC.

### Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

\* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

### Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

- B Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E Analyte concentration exceeds the upper level of the calibration range.
- J Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A A tentatively identified compound is a suspected aldol-condensation product.
- X The analyte was diluted below an accurate quantitation level.
- \* The spike recovery is equal to or outside the control criteria used.
- + The relative percent difference (RPD) equals or exceeds the control criteria.
- G A pattern resembling gasoline was detected in this sample.
- D A pattern resembling diesel was detected in this sample.
- M A pattern resembling motor oil was detected in this sample.
- C A pattern resembling crude oil was detected in this sample.
- 4 A pattern resembling JP-4 was detected in this sample.
- 5 A pattern resembling JP-5 was detected in this sample.
- H Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8 - diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS Environmental -- FC

LIMS Version: 6.794

AR Page 2 of 2 9 of 10

Client: ALS Environmental

**Work Order:** 1511215 **Project:** L1695201 **Date:** 11/24/2015 10:2

# QC BATCH REPORT

Batch ID: R	RE151113-1-1	Instrument ID Alp	oha Scin		Method: R	adium-226	by Rador	Emanation				
LCS	Sample ID: RE151113	-1			Uı	nits: <b>BQ/I</b>		Analys	is Date:	1/23/20	15 13:57	7
Client ID:		Run II	D: <b>RE151113</b> -	1A			Pi	rep Date: <b>11/1</b>	3/2015	DF:	NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226		1.82 (+/- 0.453)	0.0132	1.704		107	67-120					P,M3
Carr: BARI	UM	15200		16110		94.2	40-110					
LCSD	Sample ID: RE151113	-1			Uı	nits: <b>BQ/I</b>		Analys	is Date: '	1/23/20	15 13:57	7
Client ID:		Run II	D: <b>RE151113</b> -	1A			Pi	rep Date: 11/1	3/2015	DF:	NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226		1.97 (+/- 0.490)	0.0133	1.704		115	67-120		1.82	0.2	2.1	P,M3
Carr: BARI	UM	15700		16110		97.5	40-110		15200			
МВ	Sample ID: RE151113	-1			Uı	nits: <b>BQ/I</b>		Analys	is Date: '	1/23/20	15 13:57	7
Client ID:		Run II	D: <b>RE151113-</b>	1A			P	rep Date: <b>11/1</b>	3/2015	DF:	NA	
Analyte		Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226		ND	0.0063									U
Carr: BARI	UM	15800		16110		97.9	40-110					

QC Page: 1 of 1



### Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

# Affix ALS barcode label here

COC Number: 14 -

Page \_\_\_1 of \_\_\_1

	www.alsglobal.com															-	3-1-2		
Report To				Report Format	/ Distribution											s not avail	able for all t	ests)	
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Contact:	K. Lewis		Quality Control (	QC) Report with Rep	And the second second second second	□ No	Р	Pri	ority (2-4 l	bus. da	ys if rece	eived by	3pm) 50	% surch	arge - co	ntact ALS	o confirm	AT	
Address:	76 Richmond Street East, Su	ite 330	Criteria on Rep	ort - provide details below	if box checked		E										ALS to con	firm IAI	
	Toronto, ON M5C 1P1		Select Distribution	n: 🔀 EN	MAIL MAIL	FAX	E2						contact A	LS to co	onfirm TA	T and surc	narge	_	
Phone:	778-386-7340		Email 1 or Fax	klewis@elginmining	.com		Specif	fy Date	Require	d for	E2,E o						_		
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ALS Lab Wo	rk Order # (lab use only)	L1695201	ALS Contact:	Rick Zoliewski	Sampler:	C.de Repentigny	Metals	anid	Hardness,	בה		a					1 1	- 1	
ALS Sample #	Sampl	e Identification and/or Coordinates		Date	Time	100.000.200	Me	Total Cyanide	표	fotal Mercury	Radium	Ammonia							
(lab use only)	100.77	description will appear on the report)		(dd-mmm-yy)	(hh:mm)	Sample Type	Total	Tota	TSS,	Tota	Rad	Amr	-						
	Lup-102-151027			27-oct-15	11:10	Water	R	R	R	R	R	R							6
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	from a Regulated DW System	7					Ice	packs	Yes		No		Cus	tody s	eal inta	t Ye	S	No	
☐ Ye	s No						Coc	ling Ini	tiated										
re samples for hi	uman drinking water use?								COOLER	TEMP	ERATUR	ES °C			FINAL	COOLER	TEMPERAT	URES *	2
☐ Ye	s						7	4										-	
10	SHIPMENT RELEASE (C	lient use)	INITIAL	SHIPMENT RECER	TION (lab use or	nly)	1				FINAL	SHIP	MENT I	RECE	TION	lab use	only)		
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LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 06-NOV-15

Report Date: 18-NOV-15 12:41 (MT)

Version: FINAL

Client Phone: 778-386-7340

# Certificate of Analysis

Lab Work Order #: L1699300

Project P.O. #:

**NOT SUBMITTED** 

Job Reference: C of C Numbers:

Legal Site Desc:

Rick Zolkiewski General Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 75 Con Road, PO. Box 2801, Yellowknife, NT, X1A 2R2 Canada | Phone: +1 867 873 5593 | Fax: +1 867 920 4238 ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

Environmental 🔈

www.alsglobal.com

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PAGE 2 of 4 18-NOV-15 12:41 (MT)

### Version: FINAL

ALG LINNING INCLINE ANALTHORE INCLINE	ALS	<b>ENVIRONMENTAL</b>	ANALYTICAL	REPORT
---------------------------------------	-----	----------------------	------------	--------

	Sample ID Description Sampled Date Sampled Time Client ID	L1699300-1 WATER 03-NOV-15 12:05 LUP-22-151103	L1699300-2 WATER 03-NOV-15 13:05 LUP-24-151103	L1699300-3 WATER 03-NOV-15 13:10 LUP-37-151103	L1699300-4 WATER 03-NOV-15 14:20 LUP-25-151103	
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	71.8	5.73	5.68	5.23	
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	4.1	3.0	3.2	3.4	
	Ammonia, Total (as N) (mg/L)	<0.050	<0.050	<0.050	<0.050	
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
Total Metals	Aluminum (AI)-Total (mg/L)	0.0286	0.0075	0.0070	0.0070	
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00063	0.00023	0.00026	0.00022	
	Barium (Ba)-Total (mg/L)	0.0120	0.00258	0.00263	0.00248	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	0.020	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	0.0000792	<0.0000050	<0.000050	<0.000050	
	Calcium (Ca)-Total (mg/L)	23.2	1.33	1.31	1.19	
	Cesium (Cs)-Total (mg/L)	0.000036	<0.000010	<0.000010	<0.000010	
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Total (mg/L)	0.00867	0.00015	0.00013	0.00011	
	Copper (Cu)-Total (mg/L)	0.00087	0.00069	0.00074	0.00119	
	Iron (Fe)-Total (mg/L)	0.097	<0.010	<0.010	<0.010	
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Total (mg/L)	0.0096	<0.0010	<0.0010	<0.0010	
	Magnesium (Mg)-Total (mg/L)	3.38	0.584	0.587	0.548	
	Manganese (Mn)-Total (mg/L)	0.224	0.00407	0.00375	0.00294	
	Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Nickel (Ni)-Total (mg/L)	0.0248	0.00131	0.00130	0.00110	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	1.71	0.407	0.414	0.389	
	Rubidium (Rb)-Total (mg/L)	0.00188	0.00107	0.00107	0.00108	
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Total (mg/L)	0.835	0.100	0.083	0.089	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	15.0	0.822	0.734	0.660	
	Strontium (Sr)-Total (mg/L)	0.0928	0.00692	0.00685	0.00631	
	Sulfur (S)-Total (mg/L)	25.5	1.23	1.12	1.01	
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (TI)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

L1699300 CONTD....

PAGE 3 of 4 18-NOV-15 12:41 (MT)

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1699300-1 WATER 03-NOV-15 12:05 LUP-22-151103	L1699300-2 WATER 03-NOV-15 13:05 LUP-24-151103	L1699300-3 WATER 03-NOV-15 13:10 LUP-37-151103	L1699300-4 WATER 03-NOV-15 14:20 LUP-25-151103	
Grouping	Analyte						
WATER							
Total Metals	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)		0.000019	0.000020	0.000020	0.000019	
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)		0.0709	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	

L1699300 CONTD....

PAGE 4 of 4

18-NOV-15 12:41 (MT)

Version: FINAL

### **Reference Information**

### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**	
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration	
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002	

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-EDWaterHardness (from Total Ca and Mg)APHA 2340 B-CalculationMET-T-CCMS-EDWaterTotal Metals in Water by CRC ICPMSEPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the

automated phenate colourimetric method.

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

### **Chain of Custody Numbers:**

### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

# Chain of Custody (COC) / Analytical Request Form

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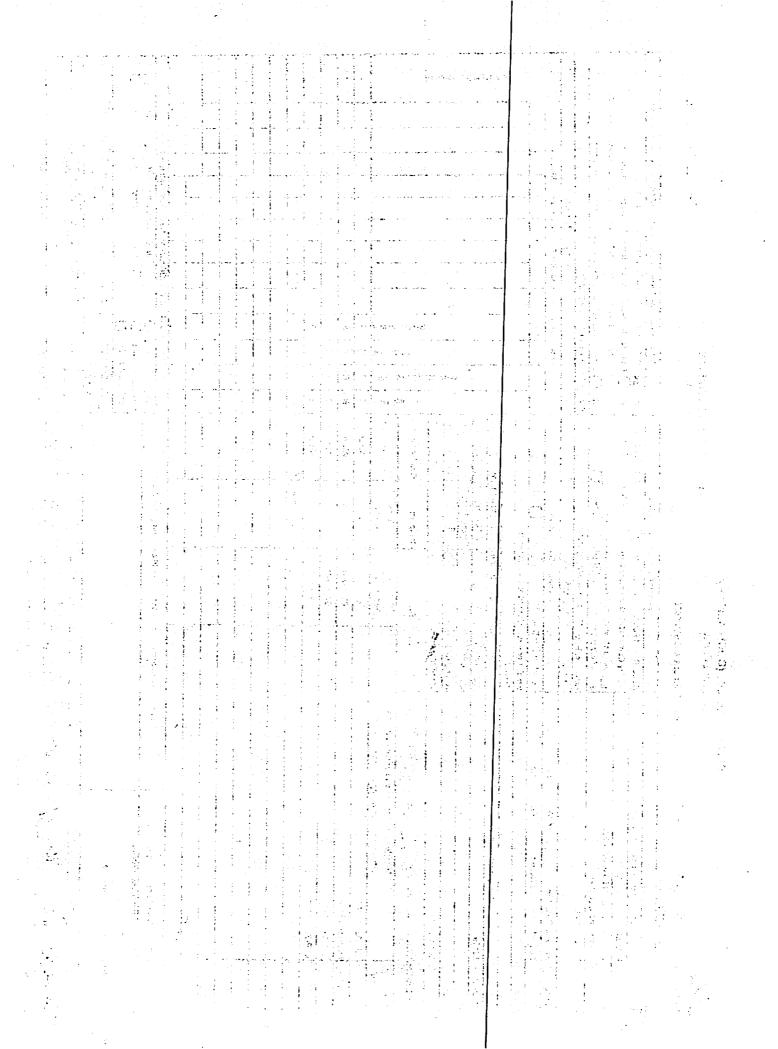
Page 1 of

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	ALS	

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	LUP-24-151103		03-nov-15	13:05	Water	æ	œ	œ			4
	LUP-37-151103		03-nov-15	13:10	Water	α	α	α			4
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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION
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I if any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.





LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 06-NOV-15

Report Date: 16-NOV-15 11:17 (MT)

Version: FINAL

Client Phone: 778-386-7340

# Certificate of Analysis

Lab Work Order #: L1699310

Project P.O. #:

**NOT SUBMITTED** 

Job Reference: C of C Numbers:

Legal Site Desc:

Rick Zolkiewski General Manager

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L1699310 CONTD.... PAGE 2 of 4

# ALS ENVIRONMENTAL ANALYTICAL REPORT

16-NOV-15 11:17 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L1699310-1 WATER 29-OCT-15 14:10 LUP-10-151029		
Grouping	Analyte			
WATER				
Physical Tests	Hardness (as CaCO3) (mg/L)	203		
	Total Suspended Solids (mg/L)	<3.0		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	5.7		
Cyanides	Cyanide, Total (mg/L)	<0.0050		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0374		
	Antimony (Sb)-Total (mg/L)	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00780		
	Barium (Ba)-Total (mg/L)	0.0153		
	Beryllium (Be)-Total (mg/L)	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050		
	Boron (B)-Total (mg/L)	0.057		
	Cadmium (Cd)-Total (mg/L)	0.000233		
	Calcium (Ca)-Total (mg/L)	67.9		
	Cesium (Cs)-Total (mg/L)	0.000089		
	Chromium (Cr)-Total (mg/L)	<0.00010		
	Cobalt (Co)-Total (mg/L)	0.0334		
	Copper (Cu)-Total (mg/L)	0.00199		
	Iron (Fe)-Total (mg/L)	0.112		
	Lead (Pb)-Total (mg/L)	0.000066		
	Lithium (Li)-Total (mg/L)	0.0271		
	Magnesium (Mg)-Total (mg/L)	8.08		
	Manganese (Mn)-Total (mg/L)	0.895		
	Molybdenum (Mo)-Total (mg/L)	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.0747		
	Phosphorus (P)-Total (mg/L)	<0.050		
	Potassium (K)-Total (mg/L)	4.78		
	Rubidium (Rb)-Total (mg/L)	0.00230		
	Selenium (Se)-Total (mg/L)	0.000062		
	Silicon (Si)-Total (mg/L)	2.00		
	Silver (Ag)-Total (mg/L)	<0.000010		
	Sodium (Na)-Total (mg/L)	41.4		
	Strontium (Sr)-Total (mg/L)	0.284		
	Sulfur (S)-Total (mg/L)	78.8		
	Tellurium (Te)-Total (mg/L)	<0.00020		
	Thallium (TI)-Total (mg/L)	<0.000010		
	Thorium (Th)-Total (mg/L)	<0.00010		
	Tin (Sn)-Total (mg/L)	<0.00010		

L1699310 CONTD.... PAGE 3 of 4

ALS ENVIRONMENTAL ANALYTICAL REPORT

16-NOV-15 11:17 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L1699310-1 WATER 29-OCT-15 14:10 LUP-10-151029		
Grouping	Analyte				
WATER					
Total Metals	Titanium (Ti)-Total (mg/L)		0.00058		
	Tungsten (W)-Total (mg/L)		<0.00010		
	Uranium (U)-Total (mg/L)		0.000018		
	Vanadium (V)-Total (mg/L)		<0.00050		
	Zinc (Zn)-Total (mg/L)		0.243		
	Zirconium (Zr)-Total (mg/L)		<0.00030		

L1699310 CONTD....

PAGE 4 of 4

16-NOV-15 11:17 (MT)

Version: FINAL

### **Reference Information**

### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**	
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration	
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002	

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-EDWaterHardness (from Total Ca and Mg)APHA 2340 B-CalculationMET-T-CCMS-EDWaterTotal Metals in Water by CRC ICPMSEPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

### Chain of Custody Numbers:

### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

# Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here

COC Number: 14 -

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Contact	K. Lewis	Quality Control (QC) Report with Report	Report with Rep	ort · Yes	ON L	P Priori	Priority (2.4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT	
Address:	76 Richmond Street East, Suite 330	Criteria on Report - provide details below if box checked	ovide details below if to	if box checked	3	$\equiv 0$	Emergency (1-2 bus, days if received by 3pm) 100% surcharge - contact ALS to confirm TAT	<b>-</b>
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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION
Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorited DW COC form.

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LUPIN MINES INCORPORATED

ATTN: Karen Lewis 76 Richmond Street

Suite 330

Toronto ON M5C 1P1

Date Received: 18-DEC-15

Report Date: 31-DEC-15 20:16 (MT)

Version: FINAL

Client Phone: 778-386-7340

# Certificate of Analysis

Lab Work Order #: L1716424

Project P.O. #: NOT SUBMITTED

Job Reference: C of C Numbers: Legal Site Desc:

Rick Zolkiewski General Manager

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L1716424 CONTD.... PAGE 2 of 4

31-DEC-15 20:16 (MT)

**FINAL** Version:

	Sample ID Description Sampled Date Sampled Time Client ID	L1716424-1 WATER 17-DEC-15 14:30 LUP-22-151217	L1716424-2 WATER 18-DEC-15 10:43 LUP-24-151217	L1716424-3 WATER 18-DEC-15 10:43 LUP-37-151217	L1716424-4 WATER 18-DEC-15 11:01 LUP-25-151217	
Grouping	Analyte	-				
WATER						
Physical Tests	Conductivity (EC) (uS/cm)	94.5	55.8	55.8	18.7	
	Hardness (as CaCO3) (mg/L)	26.1	15.2	15.8	5.93	
	pH (pH)	6.44	6.34	6.29	6.29	
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	5.0	3.7	3.4	3.4	
	Ammonia, Total (as N) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Nitrate and Nitrite (as N) (mg/L)		0.055	0.052		
	Nitrate (as N) (mg/L)		0.055	0.052		
	Nitrite (as N) (mg/L)		<0.010	<0.010		
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
Total Metals	Aluminum (Al)-Total (mg/L)	0.0225	0.0111	0.0116	0.0094	
	Antimony (Sb)-Total (mg/L)	0.00076	<0.00010	<0.00010	0.00010	
	Arsenic (As)-Total (mg/L)	0.00047	0.00031	0.00030	0.00024	
	Barium (Ba)-Total (mg/L)	0.00743	0.00470	0.00512	0.00294	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	0.013	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Total (mg/L)	0.0000769	0.0000210	0.0000199	0.0000150	
	Calcium (Ca)-Total (mg/L)	7.76	4.39	4.61	1.39	
	Cesium (Cs)-Total (mg/L)	0.000029	0.000014	0.000014	<0.000010	
	Chromium (Cr)-Total (mg/L)	0.00024	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Total (mg/L)	0.00078	0.00035	0.00036	<0.00010	
	Copper (Cu)-Total (mg/L)	0.00294	0.00122	0.00124	0.00100	
	Iron (Fe)-Total (mg/L)	0.070	0.015	0.016	<0.010	
	Lead (Pb)-Total (mg/L)	0.000350	<0.000050	0.000053	0.000060	
	Lithium (Li)-Total (mg/L)	0.0038	0.0023	0.0024	0.0010	
	Magnesium (Mg)-Total (mg/L)	1.64	1.03	1.05	0.600	

0.0327

< 0.000050

0.00911

< 0.050

1.52

0.00179

< 0.000050

0.463

0.000013

4.89

Manganese (Mn)-Total (mg/L)

Molybdenum (Mo)-Total (mg/L)

Phosphorus (P)-Total (mg/L)

Potassium (K)-Total (mg/L)

Rubidium (Rb)-Total (mg/L)

Selenium (Se)-Total (mg/L)

Silicon (Si)-Total (mg/L)

Silver (Ag)-Total (mg/L)

Sodium (Na)-Total (mg/L)

Nickel (Ni)-Total (mg/L)

0.0137

< 0.000050

0.00461

< 0.050

0.679

0.00145

< 0.000050

0.238

< 0.000010

2.93

0.0138

< 0.000050

0.00462

< 0.050

0.695

0.00141

< 0.000050

0.234

< 0.000010

3.04

0.00207

< 0.000050

0.00126

< 0.050

0.462

0.00127

< 0.000050

0.117

< 0.000010

0.836

ALS ENVIRONMENTAL ANALYTICAL REPORT

L1716424 CONTD....

PAGE 3 of 4 31-DEC-15 20:16 (MT)

Version: FINAL

# ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1716424-1 WATER 17-DEC-15 14:30 LUP-22-151217	L1716424-2 WATER 18-DEC-15 10:43 LUP-24-151217	L1716424-3 WATER 18-DEC-15 10:43 LUP-37-151217	L1716424-4 WATER 18-DEC-15 11:01 LUP-25-151217	
Grouping	Analyte						
WATER							
Total Metals	Strontium (Sr)-Total (mg/L)		0.0356	0.0203	0.0219	0.00744	
	Sulfur (S)-Total (mg/L)		8.40	4.76	4.95	1.12	
	Tellurium (Te)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (TI)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)		0.00024	0.00054	0.00055	0.00025	
	Titanium (Ti)-Total (mg/L)		0.00049	<0.00030	<0.00030	<0.00030	
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Total (mg/L)		0.000023	0.000019	0.000019	0.000023	
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)		0.0264	0.0114	0.0116	<0.0030	
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	

# L1716424 CONTD.... PAGE 4 of 4 31-DEC-15 20:16 (MT) Version: FINAL

### **Reference Information**

### **Test Method References:**

root motriou reciore			
ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-ED	Water	Alkalinity, T	APHA 2320 B-Auto-Pot. Titration
CN-T-CFA-VA	Water	Total Cyanide in water by CFA	ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

ETL-HARDNESS-TOT-EDWaterHardness (from Total Ca and Mg)APHA 2340 B-CalculationMET-T-CCMS-EDWaterTotal Metals in Water by CRC ICPMSEPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the

automated phenate colourimetric method.

NO2+NO3-CALC-EDWaterNitrate+NitriteCALCULATIONNO2-IC-N-EDWaterNitrite in Water by ICEPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-ED Water Nitrate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH/EC-ED Water pH and Conductivity APHA 4500-H, 2510

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is

recommended for pH where highly accurate results are needed)

SOLIDS-TOTSUS-ED Water Total Suspended Solids APHA 2540 D-Gravimetric

Gravimetric determination of solids in waters by filtration and drying filter at 104 degrees Celsius.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

 Laboratory Definition Code
 Laboratory Location

 ED
 ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

### **Chain of Custody Numbers:**

### **GLOSSARY OF REPORT TERMS**

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

# Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here

(lab use only)

101 Page

COC Number: 14 -

Environmenta www.alsglobal.com

. 0 Number of Containers E D Emergency (1-2 bus, days if received by 3pm) 100% surcharge - contact ALS to confirm TAT Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) ☐ Priority (2-4 bus, days if received by 3pm) 50% surcharge - contact ALS to confirm TAT FINAL COOLER TEMPERATURES "C ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below FINAL SHIPMENT RECEPTION (lab use only) I'me D Regular (Standard TAT if received by 3 pm - business days) Analysis Request L1716424-COFC Specify Date Required for E2,E or P. 1 INITIAL COOLER TEMPERATURES °C œ oc NITE (NO3) œ œ œ œ (PHN) BINORINA œ œ œ œ. cial Metals Cooling Initiated Received by PH, TSS, Alkalinity, Hardness œ œ œ œ ice packs rozen E2 ۵ OC. œ œ C Total Cyanide C.deRepentigr Sample Type 8 ☐ EDD (DIGITAL) Water Water Water Water Please use sample LUP-24-1511 to create a duplicate sample called LUP-37-1511 CCME FWAL and MMER criteria apply. D FAX 15/15 D FAX Ime Oil and Gas Required Fields (client use) \* Yes INITIAL SHIPMENT RECEPTION (lab use only) Special Instructions / Specify Criteria to add on report (client Use) hee 15/15 Routing Code: Report Format / Distribution Alberta time D MAIL 4:30 0:43 Cost Center. 11:0 Criteria on Report - provide details below if box checked (hh.mm Sampler: E BICE Invoice Distribution Quality Control (QC) Report with Report Samples need to be separated into individual bottles and preserved. Email 1 or Fax klewis@elginmining.com Date Email 1 or Fax klewis@elginmining.com Select Invoice Distribution: 

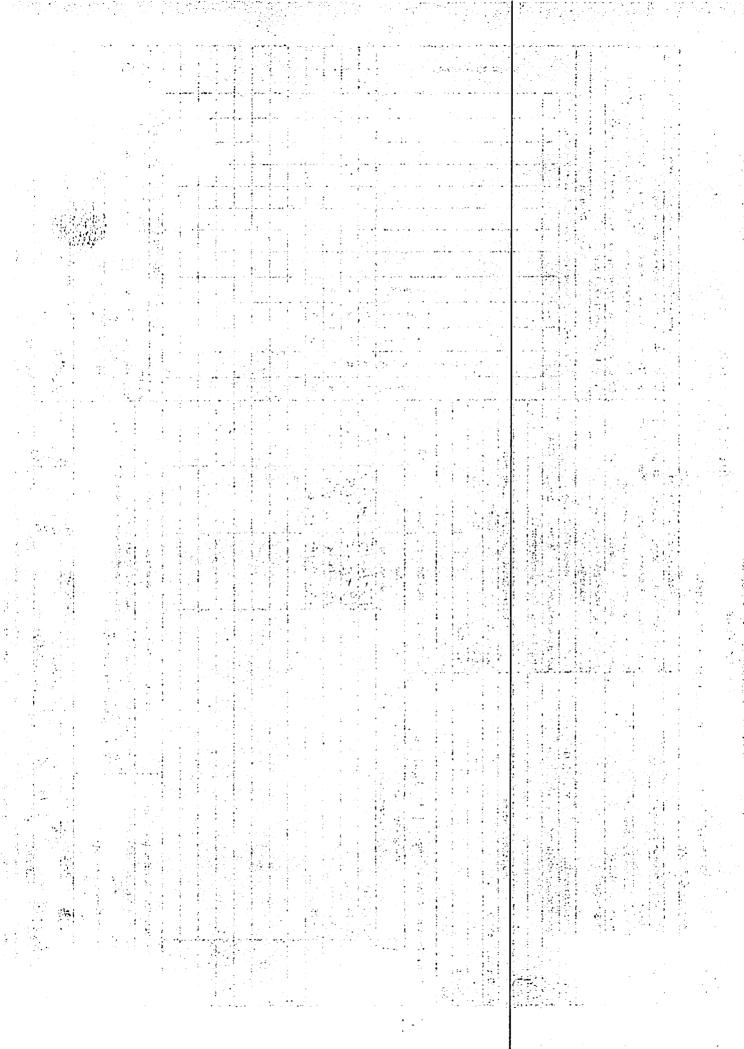
EMAIL E BMAIL Rick Zoliewski D PDF abowie@srk.com 81210 7-13-15 8-11-15 (dd-mmm-bb) 8-19-14 Date Select Report Format. Select Distribution. ALS Contact: Activity Code Approver ID: GL Account: ocation Email 2 Email 2 Received by Sample Identification and/or Coordinates (This description will appear on the report) 171643 2 2 Time Lupin Mines Incorporated c/o Elgin Mining Inc. ₹ Yes ∠ Yes 18-19-15 SHIPMENT RELEASE (client use) 76 Richmond Street East, Suite 330 Project Information Drinking Water (DW) Samples 1 (client use) Are samples taken from a Regulated DW System? Date Copy of Invoice with Report ALS Lab Work Order # (lab use only) Are samples for human drinking water use? Toronto, ON MSC 1P1 Same as Report To No. LUP-37-1511 UP-22-1511 .UP-24-1511 UP-25-1511 778-386-7340 Lupin Mine Relgased by 53119 Yes Yes ALS Sample # (lab use only) ALS Quote #: Invoice To Report To Company Company PO / AFE: Address Contact Contact Phone: Job # SD

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

Failure to complete at portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy . If any water samples are taken from a Regulated Drinking Water (DW). System please submit using an Authorized DW COC form.

YELLOW - CLIENT COPY

WHITE - LABORATORY COPY





Lupin Mines ATTN: K. Lewis 76 Richmond St. East, Suite 330 Toronto, ON M5C 1P1 Report Date: September 3, 2015

Work Order: 15648 - 649

## **Data Report**

Species: Rainbow trout (Oncorhynchus mykiss)

Protocol: EPS 1/RM/13 (Second Ed. with 2007 amendments)

Species: Daphnia magna

Protocol: EPS 1/RM/14 (Second Ed. 2000)

**Table 1.** Results for the 96-h rainbow trout acute toxicity tests.

Sample ID	Collection Date and Time	Survival in the undiluted sample (%)
Lup-Station (pH 7.0)	Aug 19, 2015 @ 1000h	100
Lup-Station (pH 7.5)	Aug 19, 2015 @ 1000h	100
Lup-Station (pH 8.5)	Aug 19, 2015 @ 1000h	100

**Table 2.** Results for the 48-h *Daphnia magna* acute toxicity tests.

Sample ID	Collection Date and Time	Survival in the undiluted sample (%)
Lup-Station (pH 7.0)	Aug 19, 2015 @ 1000h	93
Lup-Station (pH 7.5)	Aug 19, 2015 @ 1000h	93
Lup-Station (pH 8.5)	Aug 19, 2015 @ 1000h	70

The Lup-Station sample was tested for toxicity using three pH-test treatments (pH 7.0, pH 7.5 and pH 8.5). The sample had an initial pH of 4.7, which was adjusted to the three pH values (7.0, 7.5 and 8.5) using a 1.0 M Ca (OH)<sub>2</sub> (lime) solution provided and requested by client to use in this particular study. Corresponding pH-controls (pH 7.0, pH 7.5 and pH 8.5) were also

Work Order: 15648-649

prepared and tested concurrently with the sample treatments. These control pH-treatments were prepared similarly using either 1.0~M Ca  $(OH)_2$  lime solution or 0.1M HCl to increase or decrease the pH of the control water.

Significant pH drift was observed during the rainbow trout testing and, therefore, the pH was re-adjusted with the lime solution at each 24-h interval. The *D. magna* did not require further pH-adjustments during the exposure period. The initial and final pH measurements during testing are shown in Tables 3 and 4 for the rainbow trout and *D. magna* toxicity tests, respectively.

**Table 3.** Measured pH values during the 96-h rainbow trout testing.

Sample ID	0hr	24	hr	48	hr	72	96hr	
	Initial	Initial	Initial Final		Final	Initial	Final	Final
Lup-Station (pH 7.0)	7.1	6.4	7.1	6.6	7.0	6.6	6.9	6.9
Lup-Station (pH 7.5)	7.7	6.5	7.5	6.7	7.6	6.7	7.7	7.0
Lup-Station (pH 8.5)	8.6	6.6	8.5	7.0	8.6	6.9	8.5	7.1
Control (pH 7.0)	6.9	6.8	6.8	7.2	7.0	7.0	7.1	7.1
Control (pH 7.5)	7.6	7.2	7.4	7.2	7.5	7.2	7.5	7.2
Control (pH 8.5)	8.6	7.1	8.4	7.3	8.4	7.3	8.6	7.4

**Table 4.** Measured pH values during the 48-h *D. magna* testing.

Sample ID	0hr	48hr
	Initial	Final
Lup-Station (pH 7.0)	7.0	6.6
Lup-Station (pH 7.5)	7.4	6.8
Lup-Station (pH 8.5)	8.6	7.2
Control (pH 7.0)	7.0	7.2
Control (pH 7.5)	7.5	7.8
Control (pH 8.5)	8.5	8.2

Work Order: 15648-649

The tests met performance criteria and there were no deviations from the test methods. The results presented herein relate only to the sample and associated test-treatments evaluated in this study.

Josh Baker, M.Sc. Environmental Chemist

Josh Baker

Reviewed By: Edmund Canaria, R.P. Bio. Senior Reviewer

## **Rainbow Trout Summary Sheet**

Client:	SRK	Start Date/Time: Aug 22/15@1145h
Work Order No.:	15649	Test Species: Oncorhynchus mykiss
Sample Information	on: LUP-STATION 102-1¢50819	Test Validity Criteria: ≥ 90% control survival WQ Ranges:
Sample Date: Date Received: Sample Volume: Other:	Aug 19/15 Aug 21/15 2×20L DH adjusted to 7.0	T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5
Dilution Water:	F 0	
Type: Hardness (mg/L Ca Alkalinity (mg/L Ca		p Water
Test Organism In	formation:	
Batch No.: Source: No. Fish/Volume (I Loading Density (g Mean Length ± SD Mean Weight ± SD	1/L): 0,24 0 (mm): 33±3	Range: 30-39 Range: 0.37-0.48
Zinc Reference T	oxicant Results:	
Reference Toxicar Stock Solution ID: Date Initiated: 96-h LC50 (95% C	15Zn 04 Aug 17/15	3) mg/L Zn
		09.4 (41.7-115.6) ng/L Zn
Reference Toxicar	2.41-0/ <sub>6</sub>	
Test Results:		hours in the 100% (v/v) undiluted a pH of 7.0.
Reviewed by:	_ W	Date reviewed: Sept-315

## **Rainbow Trout Summary Sheet**

Client:	SRK	Start Date/Time: Aug 22/15@1145h
Work Order No.:	15649	Test Species: Oncorhynchus mykiss
Sample Information Sample ID: Sample Date: Date Received: Sample Volume: Other: Dilution Water:	n: <u>Lup-STATION 102-1050819</u> <u>Aug 19/15</u> <u>Aug 21/15</u> <u>2+20c</u> pH adjusted to 7.5	Test Validity Criteria: ≥ 90% control survival  WQ Ranges:  T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5
Type: Hardness (mg/L Car Alkalinity (mg/L Car Test Organism Inf	CO <sub>3</sub> ): 10	p Water
Batch No.: Source: No. Fish/Volume (L Loading Density (g. Mean Length ± SD Mean Weight ± SD	/L): <u>0.42</u> (mm): <u>38</u> ±2	Range: 34-41 Range: 0.38-0.61
Zinc Reference To	oxicant Results:	·
Reference Toxican Stock Solution ID: Date Initiated: 96-h LC50 (95% C	15Zn 04 Aug 17/15	.3) mg/L Zn
Reference Toxican		59.4 (41.7-115.6) ng/L Zn
Test Results:	100 % survival at 96 sample adjusted to a 1	houss at 100 % (v/v) undiluted  H of 7.5.
Reviewed by:	- EN	Date reviewed: Sept 3/15

## Rainbow Trout Summary Sheet

Client:	SRK	Start Date/Time: Aug 22/15@1145h
Work Order No.:	15649	Test Species: Oncorhynchus mykiss
Sample Information Sample ID: Sample Date: Date Received: Sample Volume: Other: Dilution Water:	Dup-STATION 102-1050819  Aug 19/15  Aug 21/15  2×20L  pHadjusted to 8.5	Test Validity Criteria: ≥ 90% control survival WQ Ranges: T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5
Type: Hardness (mg/L Ca Alkalinity (mg/L Ca		Water
Test Organism In	formation:	
Batch No.: Source: No. Fish/Volume (I Loading Density (g Mean Length ± SD Mean Weight ± SD	1/L): 0.31 0 (mm): 33 ± 2	Range: <u>29-35</u> Range: <u>0.34-6.56</u>
Zinc Reference T	oxicant Results:	
Reference Toxicar Stock Solution ID: Date Initiated: 96-h LC50 (95% C	15Zn 04 Aug 17/15	3) mg/L Zn
Reference Toxical	nt Mean and Historical Range: 6	9.4 (41.7-115.6) mg/L Zn
Test Results:	100% survival at 96 1 Sample adjusted to a v	nours in the 100% (v/w) undiluted
Reviewed by:	- Ele	Date reviewed: Sept - 3/15

Version 1.4; Issued May 29, 2015.

Nautilus Environmental Company Inc.

## 96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project	#:			sel	'ek							Number Fish/Volume:										10/1	2 L		
Sample I.D.				Lu	0- 3	Stat	chisin i						7-d % Mortality: /50 0 1. i										-		
W.O. #			3						Total Pre-aeration Time (mins):										-						
RBT Batch #:			072015					Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N):									-								
Date Collecte	d/Tim	ie:		Aun		15 Q	2 10	00 h	1														~		
Date Setup/Ti	me:			And.	22/			1145	5h		_	Undiluted Sample WQ													
Sample Setup	By:			0	1/	An	<b>フ</b>					Parameters			Initial WQ			Adjustment 30 min V					VQ		
												Т	emp	°C		15,0			0			Per			
D.O. meter:				Do-								<u></u>	рН		A	101			2		+	line			
pH meter:				PM	<u>- 1</u>								ე. (m	<del></del>		10.1	··		<u>Á</u>		N	Q p	aranter	\$	
Cond. Meter:				<u>C</u> .	- 2							Con	d. (µ	3/cm)	<u> </u>	583	3	<u> </u>			<u> </u>	, , , , , , , , , , , , , , , , , , ,		]	
	·			<u> </u>							(0.0		T5:					1					Γ		1
Concentration			#	Surviv	ors				Temp	eratui	re (°C	)	וכו ן	oiveo	Oxyg	gen (n	ng/L)			рН			Cond (µS	ĺ	
(0//.)	.4			Τ	1 40	70	1 00	<del> </del>	T 64	40	70	00	<del>  _</del>	T 64	40	T = 2	1 00		T	1 40	T 70	-	<u> </u>	T	
(% v/v)	1	2	4	24	48 (0	72	96	0	24	48	72	96	0 6	24	9,1	72 G a	96	0 1 C	24	48	72	96	0	96	
Control 1				10	<del> </del>	10	10	125	1	15,0				9.4	<u> </u>		96		6.8			7.1	33	39	<u> </u>
100				10	10	10	10	120	7	15.0			7	<del> </del>			9.8	-		7.0	6.1	6.9	585	603	
Control (2)				10	10	10	10		15.0					9.4		9.8	4		7.4	7.5	7.5	7.2	34	44	
100 3				10	10	10	10		15.0											76	<del>ጉ</del> ት	0.4	587	607	
Control (3)				10	10	10	ા															7.4	37	60	
(00 (3)				10	10	10	10	50	14.5	15.0	15.0	14.6	99	9.5	93	98	9-6	j.	છ.ડ	8.6	8.5	7.1	589	-6413 S	613
						·																			
Initials				SSD	SD	SSD	124	m	SSD	SSD	SSD	SSD	A	550	SSD	<b>GZ2</b>	KL	A-	SSD	JAB	AB	SSD	<del>g-</del> >	SSD	
WQ Ranges: T	(°C)	= 15 :	± 1; [	OO (m	g/L) =	7.0 t	o 10.	3; pH	= 5.5	to 8.	5							***************************************		-					•
Sample Descri	ption/	'Comr	nents	s:			lei	n	, br	٥٠٧١٢	7 6	pt	Pa	മട	nt c	0 8	30.tk	20_0	æ£ :	tan	k f	<u>`or e</u>	ach	100%	
Fish Descriptio	n at 9	96 h	Fish	<u> (00)</u>	k ok	ay					Nu	mber	of St	resse	d Fisl	n at 9	6 h	ø							
Other Observa	tions:	O p	oH a	djusto	dt	b み	ot	0,2 6	10	OM TN (	904	(	2)	рН а	djust	ed +	b 7	sto	0.2 W	10	2 M	<u> (a(oH)</u>	23 pH	adjusted	16 85 W/
Reviewed by:			Gl						'							Date	Revie	wed:	/	S	pp?	3/1	<u> </u>		CaOR

## Daphnia magna Summary Sheet

Client: Work Order No.:	SRK 15648	Start Date/Time: Awort 24, 2015 @ 6930 h Test Species: Daphnia magna Set up by: WL
Sample Date: Date Received: Sample Volume:	n: UP-STATION 102-150819 August 19, 2015 August 21, 2015 2×16 208Justed to 7.0	Test Validity Criteria: ≥ 90% mean control survival (no more than 2 mortalities in any control replicate)  WQ Ranges: T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5
Test Organism Inf	ormation:	
Broodstock No.: Age of young (Day Avg No. young per Mortality (%) in pre Days to first brood:	0): <24 h brood in previous 7 d: 3 2	SISNES
NaCl Reference To	oxicant Results:	
Reference Toxican Stock Solution ID: Date Initiated: 48-h LC50 (95% C	150,1202 Awyst 18,2015 L): 37 (3,2-4,2)	g/LNaCL
Reference Toxican	nt Mean and Historical Range: 4.+( nt CV (%):	(3.5 -5,4) g/L NaCL
	929 0 000 1 1101	- Ala 10-81 (1) All Lad on the
Test Results:		a pt of 7.0
Reviewed by:	- W	Date reviewed: Sept-3/15

## Daphnia magna Summary Sheet

Client: Work Order No.;	SRK 15648	Start Date/Time: Awjust 24, 2015 @ 6930 h Test Species: Daphnia magna Set up by: WL
Sample Information Sample ID:  Sample Date: Date Received: Sample Volume: - pl-	1: UP-STATION 102-150219 AUGUST 19, 2015 AUGUST 21, 2015 2×16 adjusted to 7.5	Test Validity Criteria:  ≥ 90% mean control survival (no more than 2 mortalities in any control replicate)  WQ Ranges:  T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5
Test Organism Info	ormation:	
Broodstock No.: Age of young (Day 0 Avg No. young per b Mortality (%) in prev Days to first brood:	0): <24 h prood in previous 7 d: 3 2	515A+B
NaCl Reference To	xicant Results:	
Reference Toxicant Stock Solution ID: Date Initiated: 48-h LC50 (95% CL	1501002 Augst 18,2015	g/LNaCL
Reference Toxicant Reference Toxicant	Mean and Historical Range: 4.チ (ごCV (%):	3.5 -5,4) g/L NaCL
Test Results:	939- Survival at 48h Sample adjusted to	To the 100°6 (v/v) indiluted sample, a pH of 7.5
Reviewed by:		Date reviewed: Sat 3/11

## Daphnia magna Summary Sheet

Client:         3RK           Work Order No.:         15648	Start Date/Time: Awust 24, 2015 @ 6930 h Test Species: Daphnia magna Set up by: WL
Sample Information:  Sample ID: LUP - STATION 102-150819 Sample Date: August 19, 2015 Date Received: August 21, 2015 Sample Volume: 2×1L  -pt adjusted to 8.5	Test Validity Criteria: ≥ 90% mean control survival (no more than 2 mortalities in any control replicate)  WQ Ranges: T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5
Test Organism Information:	
Broodstock No.:  Age of young (Day 0):  Avg No. young per brood in previous 7 d:  Mortality (%) in previous 7 d:  Days to first brood:	SISATB
NaCl Reference Toxicant Results:	
Reference Toxicant ID:       DMTC 20         Stock Solution ID:       ISNA 0 2         Date Initiated:       Awyst 18, 2015         48-h LC50 (95% CL):       3T (3.2 - 4.2)	g/LNaCL_
Reference Toxicant Mean and Historical Range: 4.4 (Reference Toxicant CV (%):	3.5-5,4) g/L NaCL
Test Results: 7090 Survival at 48h Sample adjusted to	In the 100% (vIV) indiluted sample.
Reviewed by:	Date reviewed: Sent-3/15

## Freshwater Acute 48 Hour Toxicity Test Data Sheet

Client: Sample ID: Work Order No.:	Lu	SEK P S	tah =	n 182-19	5 ० <del>८</del> (	a <sub>i</sub>	No. C	Organis	ms/vo t Oraa	olume: ˌ anism:	10/2 D.mac	00mL ina	24/ And		0930h
Thermometer:	temp	-5	DO me	eter: <u>DO-3</u>	12	pH r	neter:	PH							3/2
Concentration	1	umber Organi		No. Immobilized	Ter	nperat (°C)	•		lved o (mg/L)	xygen )	1				uctivity /cm)
(do v/u)		24	48	48	0	24	48	0	24	48	0	24	48	0	48
Control	Α	10	10		19.5	205	195	8.5	N. S.	8.4	7.0		7.2	362	318
(oH Tach)	В	10	9	Ŏ											
,,,	С	10	0	0							1,434	Silanj	53138	v:	
	D												Ådir vila	<u>. 1. 64 4</u>	<u> </u>
100	Α	10	<u>p</u>	0	20.00	205	195	87		8.2	70		6.6	58S	612
(pt 7 ad)	В	10	8	0						N. A		4.4.51		April 1995	
<i>y</i>	С	iÔ	10	0						<u> </u>			ļ		3.5
	D	<u> </u>					<u> </u>					نسيد		357	
Control	A	10	10	0	195	205	195	18		8.3	7.5		78	356	372
(pH 75 adi)	В	10	10	0				ļ		ļ			ļ		
	C	io_	10	0	ļ		ļ	ļ		ļ	عنشم	- // :			
	D	<u> </u>			ļ							2323		200	
100	A	8	8	Ю	1000	200	198	80		82	7.4		6.8	588	1007
(pH 7.5 ad)		10	10	0	<u> </u>		ļ.,,	-		1	Q17 502	1 / W			-
	С	10	10	70	<b> </b>	<u></u>	ļ			1	1222				
	D			ļ		2		0.4		ļ <u></u>		الهوريا	300	on the same	
Control	A	10h"		0	119.5	10,5	19/2	86	1	18.4	8.5		10/2	36 W	313
(pH 8.3 ads)		10	9	0	<del> </del>		ļ	ļ	ļ					357	<u> </u>
	<u> </u>	10	-7-	3	ļ		<b>-</b>	<del> </del>		ļ			<del> </del>		-
io	D	1.65	1 0			m 45	15 2	10.0	ļ	0 -	0.5	24. 4	12.2	200	-0/
100	A	<u>io</u>	10	0	10.0	16.3	3 ( <b>1</b> -52)	8.7	1	10, 1	86	_	1.4	389	596
(pt B. Tady)	<del>  B</del>	16	0	21204		ļ	-	ļ		<u> </u>	-	1.7.2.43	<del> </del>	-	-
	C	10	W#45		<del> </del>	ļ	<del> </del>			ļ	+	<u> </u>	-		
Tacketician	D	BANACI	1 ALAL	Mari	230 83	The of	11100	3.3	-	nuc		1,27	yni	M	nu
Technician Ir WQ Ranges: T (	nitials °C) = 20	# 2; DC	) (mg/l	) at 20°C = 3.6	to 9.1	pH =	6 to 8	5.5		- Nac	MAL	1	4,000	- UNIV	
	Hardnes	·*	Alkalinit	12*	٦			initi	-1.\\(\O	Т ,	\djustme			Adjusted	WO 7
Conc.	i lardines.		/L as C		1	Temp	(°C)		1.5	<del>                                     </del>	vajustini	3111	<del> </del>	Adjusted	<u> </u>
Control (MHW)	Sea		T	Alkalinth	1	DO (m			3.8	10	नि		- 2	ध्ये (°०/	responding
Highest conc.	data		3	ralues	7	рН	3/		ر بن سبر		dlos	ted \		lus a	_
Hardness adjusted						Cond	(μS/cm	) 44CZ			<u> </u>			Par e	
Sample Descript	tion:	_ cle	ar, h	dishif pe	House	eMorta	ality: H	leartbe	83 at che	ecked ı	under a	a micr	oscope	·	Ye2
Comments:	contro	1-pH	1+	confrol pt	1 7/5	ad	(juste	d w1	18.1 0.1	n HC	1	ne r	48f h	104	oH)2
<u>ئ</u> Batch#: <u> </u>	Delays ISA+13	∂ ∧ _ 7-d pre	مهجیدی # vious	\\$ ^^ young/brood:	32	_ Previo	ous 7-d	Mortalit	۳ <b>۰۰۰</b> :y (%)	i	0	_ Day o	f 1st Bro	ood: <b>Q</b>	
Reviewed by:		E	H			_ Da	ate rev	riewed	·	ς	ept.	31	K	· .···.	

Client: Lupin Minus

w.o.#: 15648

## **Hardness and Alkalinity Datasheet**

			Alkalinity	1-3.			Hardnes	S	
Sample ID  MHW - pH 75  MHW - pH 75  MHW - pH - 8.5	Sample Date	Sample Volume (mL)		(mL) of 0.02N HCL/H <sub>2</sub> SO <sub>4</sub> used to pH 4.2 3.1 0444- 4.0	Total Alkalinity (mg/LCaCO <sub>3</sub> ) 70 12 92	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL) 5.0	100	Technician 'Yy C
Lup-Station loz	Augz4115	<i>5</i> 9	<del>4.3</del> 0.5	0,6	8	50	8.3	166	YUL
Lup-station 102 - pH 7.5		50	0.6	7.0	(A	50	8.2	164	Yuc
LUP-Station 102 -pt/85	A44.24115	50	0.9	1.0	16	59	9.0	(%0	446
		Notes:			e <sup>t</sup> .				
Reviewed by:	1	U			Date Reviewe	ed:	Sept.	3/17	

## Nautilus Environmental

Chain of Custody (electronic)

British Columbia: 8664 Commerce Court, Burnaby, BC, V5A 4N7

Aug 19,2015

Page 1 of 1

Sample Collection By:	A.Bowie									AN	ALYS	ES RI	EQUI	RED				
	Report to				Invoice to:					P/F		7		ĮΨ				Receipt Temperature (°C)
Company	Lupin Mine	es Incorpora	ted c/o Elgi	in Mining Co.	same as repo	ort		out		( <del>)</del>		67	Æ	(A)				e e
Address		nd St. East,					65	-	P/F	Ħ	1/4	or	9	į				헄
City/Prov/Postal Code	Toronto, C	N M5C 1P1					D.Magna	ò	(7-	卢	(7-	Rrainbow Trout	10	Rainbow Trout				adt
Contact	K.Lewis						M.	ain	D.Magna	Š	D.Magna	ğ	gna	Š				e e
Phone	778-386-7	340					됩	T R	Μa	i i	Ma	ä	Ma	l iii				ă
Email	klewis@el	ginmining.co	om _				J K	<u> </u>	5 D.	7.5 Rainbow Trout	.5 D.	<u> </u>	7.0 D Magna	N. W.				e e
SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	# OF CONTAINERS	COMMENTS	Natural	Natural pH Rainbow Trout	pH 7.5 I	pH 7.5	pH 8.	pH 8.5	)7 Hd	) Z Hd				Be
LUP-STATION102-150819	19/08/15	10:00 am	Water	1 L	6	Total water provided for 3 pH												8.9
LUP-STATION102-150819	19/08/15	10:00 am	Water	20 L	2	tests (natural, 7.5 and 8.5), pH	0	0	1	1	1	1		1				89
LUP-STATION102-150819	19/08/15	10:00 am	Water	10 L	2	to be adjsuted in lab. This adjustment will take very little			,	`	·							89
		Calciur	n Hydroxide	(Lime)	1 bag	lime. As quoted by Armando.												200
						Revision: Please adjust the								<u> </u>				
						natural pH sample to 7.0		ļ		<u></u>					<u> </u>			
							w	D#	= 15	64	8-6	18 t	VD.	Mac	me ?	P/F.	-	
												PHO	cy	isled	to	7.0,	7.5	\ <b>o</b> *.∘
								ļ	15	564	9-	16 t	K	bl i	1/F		-2 -	
										l	L	144 6	polji	dsted	10	7.0,	4,5	Ŏ
PROJECT INFORMAT	ION	SA	MPLE REC			RED BY (CLIENT)			REL	IQUIN	SHE	BY (	(COU	RIER)	)			
Client: Lupin Mines Inc. c/o	Elgin	Total # Co	ntainers:	120	Signature:				Sign	ature	:							
P.O. No.:		Good Con	dition?	Y	Print: Andre	a Bowie			Print	t:								
Shipped Via:		Matches S	chedule?	Y		RK Consulting (Canada) Inc.				pany								
				<u> </u>	Time/Date:					/Date								
SPECIAL INSTRUCTIONS/C Please see Armando regardir			ent and prep	paration.	RECEIVED E	BY (COURIER)				EIVEI ature			JRAI	ORY)				
Thanks! Arlene spoke with Krysta Aug					Print:					t: N			0744	nto.				
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## Nautilus Environmental

## Chain of Custody (electronic)

X British Columbia: 8664 Commerce Court, Burnaby, BC, V5A 4N7

Aug 19,2015

Page 1 of

ample Collection By:	A.Bowie							,		ANA	LYSI	ES RE	QUIRI	ED			
	Report to:				Invoice to:												
Company	Lupin Mine	s Incorpora	ted c/o Elgi	n Mining Co.	same as repo	rt		out									H.
Address	76 Richmo	nd St. East,	Suite 330				] e	-		Ħ		Trout		1		- [	
City/Prov/Postal Code	Toronto, C	N M5C 1P1					D.Magna	ρος	_	빌		,  -		- 1		1	ŀ
Contact	K.Lewis						Ĭ Š.	aju	gus	Š	gus	Rrainbow		1			
Phone	778-386-7	340					H H	H H	Ma	aink	Ma	rain					
Email	klewis@el	ginmining.co	<u>om</u>				a le	al p	5 D.	22	8.5 D.Magna	5 Ri					
SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	# OF CONTAINERS	COMMENTS	Natural	Natural pH Rainbow Trout	pH 7.5 D.Magna	pH 7.5 Rainbow Trout	pH 8.	pH 8.					-
LUP-STATION102-150819	19/08/15	10:00 am	Water	1 L	6	Total water provided for 3 pH											
LUP-STATION102-150819	19/08/15	10:00 am	Water	20 L	2	tests (natural, 7.5 and 8.5),			1	1	4	4			Ī		
LUP-STATION102-150819		10:00 am	Water	10 L	2	pH to be adjsuted in lab. This adjustment will take very little	1	1	' '	'	1	1					
_			n Hydroxide	(Lime)	1 bag	lime. As quoted by Armando.											
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								<del>                                     </del>									
	<del>                                     </del>						1	-								_	
							ļ						<del>                                     </del>	$\neg$			
PROJECT INFORMA	TION	SA	MPLE REC	EIPT	RELIQUINSH	IED BY (CLIENT)	1	1	RELI	OUIN	SHEC	BY	COUR	IER)			
Client: Lupin Mines Inc. c/e		Total # Co			Signature:					ature:			(00011				
P.O. No.:		Good Con			Print: Andre	- Davida			Print								
		0000 0011	uition r														
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ODEOIN INOTOLIOTICIO		<u> </u>			Time/Date:					/Date	···	() A = -					
SPECIAL INSTRUCTIONS/ Please see Armando regard					RECEIVED E	Y (COURIER)			REC	FIVEC	BY	LAB	ORATO	KY)			
Thanks!	ng sample t	ri aujustme	ent and prep	aration.	Signature:				Sign	ature:							
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COC	updat	ed.			Company:				Com	pany:							
	i/				Time/Date:				Time	/Date							



ATTN: Karyn Lewis; Andrea Bowie SRK Consulting 76 Richmond Street E, Suite 300 Toronto, Ontario Canada M5C 1P1 

 Received:
 2015/09/25

 Report Date:
 2015/10/13

 Version:
 FINAL

## **HydroQual Test Report**

Client: SRK100 Reference: 15-1294

Billing: C/O A Bowie @ SRK

Magg

Senior Verifier



## **Result Summary**

Client: SRK100

Reference: 15-1294-01-TRD

Client: SRK Consulting; operation Lupin Mine

Sample: LUP-10-150924

Collection: collected on 2015/09/24 at 0915 by CDCR Receipt: received on 2015/09/25 at 1130 by JP

Containers: received 2 x 20 L containers at 8 °C, in good condition

with no seals and no initials

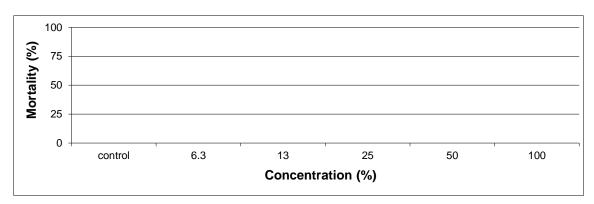
Description: type: water, collection method: grab

Test: started on 2015/09/28; ended on 2015/10/02

Result:

	Endpoint (96-hour)	Value (%)	Confidence Limits (95%) lower upper	Method Calculated
Acute: (mortality)	LC50 LC25	>100 >100		could not be calculated could not be calculated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population



The test data and results are authorized and verified correct.





#### **Test Conditions**

Client: SRK100

Reference: 15-1294-01-TRD

Method: Biological Test Method: Reference Method for Determining Acute Lethality of

Effluents to Rainbow Trout, 2000. Environment Canada, EPS 1/RM/13.

Second Edition (amended May 2007).

Test type: Trout 96-h Static Acute Test (WTR-ME-041)

Species: Oncorhynchus mykiss

Organism source: Miracle Springs (Batch 20150826TR)

**Acclimation:** 33 days (must be ≥2 weeks)

Stock mortality: 0% (seven days preceding testing)

Sample initial chemistry: pH: 5.6; EC: 654 (µS/cm @ 25°C); DO: 10.1 (mg/L); temperature: 11 °C

hardness (mg CaC03/L): 114; colour: colourless; odour: odourless

**Sample holding time:** 4 days (must be  $\leq$  5 days)

Sample storage: 4 ± 2°C in darkness

Test vessel: The test was conducted in 22 L plastic pails with polyethylene liners

**Test volume:** 20 Litres (depth of solution in each test vessel ≥15cm)

Sample pre-treatment: All test solutions and controls were pre-aerated for 120 minutes at 6.5 ±1 mL/min/L

Dissolved oxygen in 100 % sample was 9.2 mg/L after pre-aeration. The sample was not filtered or pH adjusted prior to or during testing.

**Loading density:** 0.144 g/Litre (must be  $\leq$  0.5 g/Litre)

Control/dilution water: Dechlorinated City of Calgary water acclimated to test conditions

**Test concentrations:** 5 effluent concentrations (6.3, 12.5, 25, 50, 100% (v/v) plus a negative control)

Test replicates: One replicate per treatment; 10 fish per replicate

Feeding: Fish are not fed 24 hours before test initiation and no feeding during test

Measurements: pH, conductivity, dissolved oxygen and temperature measured at test initiation and

test termination

**Aeration:** All treatments aerated at 6.5 ±1 mL/min/L by oil-free compressed air

passed through airline tubes connected to disposable air stones

Lighting: Overhead full spectrum fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 15 ± 1°C

Endpoint: Mortality, 96-h LC50 (with 95% confidence limits)
Test validity: The control had 100% survival (must ≥ 90%)

The control had 100% survival (must ≥ 90%)
The control had 0 percent (%) stressed behaviour (must ≤ 10%)

**Reference toxicant:** 96-h test with Potassium Chloride (KCI) initiated September 21, 2015; current results

(96-h LC50 and 95% confidence limits) = 0.60 (0.50-0.65) log (g/L KCl)

historical results: (96-h LC50 and 95% confidence limits) = 0.56 (0.49-0.64) log (g/L KCl)

Note: Outlined sections are protocol deviations explained on the comment page; v/v, volume per volume



### **Test Data**

Client: SRK100

Reference: 15-1294-01-TRD

Test L	_og:
--------	------

Date	Day	Time	Technician
2015/09/28	0	1530	CQ
2015/09/29	1	0925	HKS
2015/09/30	2	0800	DS
2015/10/01	3	0900	DS/JN
2015/10/02	4	0905	HKS/JN

#### Chemistry:

Conc. (%)	control	6.3	13	25	50	100

Day				pH (units)		
0	7.8	7.8	7.7	7.7	7.6	7.3
4	8.1	8.1	8.1	8.0	7.9	7.4

			Conduct	ivity (µS/cm	@ 25°C)	
0	475	490	502	523	583	651
4	474	446	455	473	511	590

			Dissol	ved Oxygen	(mg/L)	_
0	8.7	8.9	9.0	9.0	9.1	9.2
4	8.0	8 0	9.0	8 9	8 9	9.0

			Te	mperature (	°C)	
0	15	15	15	15	15	15
4	15	15	15	15	15	15

#### Number Alive (In brackets number stressed):

	Conc. (%)	control	6.3	13	25	50	100
--	-----------	---------	-----	----	----	----	-----

Day	,
Ω	

2 3

10	10	10	10	10	10
10	10	10	10	10	10
10	10	10	10	10	10
10	10	10	10	10	10
10	10	10	10	10	10

	Mortality (%)							
4	0	0	0	0	0	0		

4 0 0 0 0 0 0			;	Stressed (%)	)	
	0	0	0	0	0	0



Reference: 15-1294-01-TRD

Client: SRK100

### **Biology Summary Tables:**

Control	Length	Wet
Fish	(cm)	Weight(g)
1	3.2	0.5
2	3.0	0.3
3	3.0	0.3
4	2.9	0.2
5	3.0	0.3
6	2.3	0.1
7	2.7	0.2
8	3.3	0.4
9	3.1	0.3
10	2.6	0.2

average	2.9	0.3
sd	0.3	0.1
cv(%)	10.3	36.1

Notes: nd, not done; na, not applicable; sd, standard deviation; cv(%), coefficient of variation

### **Test Data**

Conc. (%)	Group Wet Weight (g)
control	2.9
6.3	3.2
13	3.5
25	3.3
50	2.6
100	3.5

## **Comments/Statistics**

#### **Test Result Comments:**

None

#### **Data Analysis:**

Endpoints for mortality could not be calculated. No effect occurred.

#### **Protocol Deviations:**

None



### **Result Summary**

Client: SRK100

Reference: 15-1294-01-DAD

Client: SRK Consulting; operation Lupin Mine

Sample: LUP-10-150924

Collection: collected on 2015/09/24 at 0915 by CDCR Receipt: received on 2015/09/25 at 1130 by JP

Containers: received 2 x 20 L containers at 8 °C, in good condition

with no seals and no initials

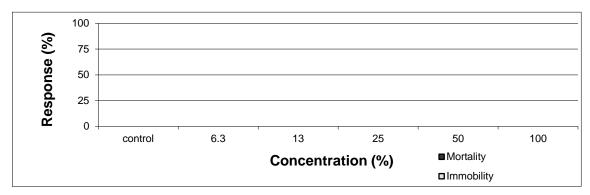
Description: type: water, collection method: grab

Test: started on 2015/09/25; ended on 2015/09/27

Result:

_	Endpoint (48-hour)	Value (%)	Confidence Limits (95%) lower upper	Method Calculated
Acute: (mortality)	LC50 LC25	>100 >100		could not be calculated could not be calculated
Acute: (immobility)	EC50 EC25	>100 >100		could not be calculated could not be calculated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population



The test data and results are authorized and verified correct.

Senior Verifier



#### **Test Conditions**

Client: SRK100

Reference: 15-1294-01-DAD

Method: Biological Test method: Reference Method for Determining Acute Lethality of

Effluents to Daphnia magna, 2000. Environ. Can., EPS 1/RM/14.

Second Edition.

**Test type:** *Daphnia* 48-h Static Acute Test (WTR-ME-015)

**Species:** Daphnia magna **Age:** < 24 hours old

Organism source: in-house culture

Stock mortality: 0%

Culture brood data: 9 days to first brood

17 neonates per average brood

Sample initial chemistry: pH: 5.6; EC: 654 (µS/cm @ 25°C); DO: 10.1 (mg/L); temperature: 11 °C

hardness (mg CaC03/L): 114; colour: colourless; odour: odourless

**Sample holding time:** 1 day (must be  $\leq$  5 days)

Sample storage: 4 ± 2°C in darkness

Test vessel: 385 mL plastic vessels

Test volume: 150 mL

Sample pre-treatment: The sample was not filtered or pH adjusted prior to or during testing

The sample was pre-aerated for 20 minutes (rate of  $37.5 \pm 12.5$  mL/min.L-1) The hardness of the sample was not adjusted (mg CaCO3/L) prior to or during

testing

**Loading density:** One daphnid/15 mL (must ≤ 1 organism/15 mL)

Control/dilution water: Moderately hard reconstituted water supplemented with vitamin B12 (2 µg/L),

Na2SeO3 (5 µg/L)

The hardness of the control/dilution water was 68 mg CaCO<sub>3</sub>/L

**Test concentrations:** 5 effluent concentrations (6.3, 12.5, 25, 50, 100% (v/v) plus a negative control)

Test replicates: One replicate per treatment, 10 daphnids per replicate

Feeding: None Aeration: None

Measurements: pH, conductivity, dissolved oxygen and temperature at test initiation and

termination

**Lighting:** Cool white fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 20 ± 2°C

Note: Outlined sections are protocol deviations explained on the comment page



#### **Test Conditions**

Client: SRK100

Reference: 15-1294-01-DAD

Endpoint: Mortality, 48-h LC50 (95% confidence limits)

Immobility, 48-h EC50 (95% confidence limits)

**Test validity:** The control had 100% survival (must ≥ 90%)

Control had 0 percent (%) abnormal behaviour (must ≤ 10%, immobility)

Reference toxicant: 48-h test with NaCl initiated September 21, 2015; current results

(48-h LC50 and 95% confidence limits) = 0.75 (0.73-0.76) log (g/L NaCl)

historical results: (48-h LC50 and 95% confidence limits) = 0.76 (0.69-0.83) log (g/L NaCl)

Note: Outlined sections are protocol deviations explained on the comment page



#### **Test Data**

Client: SRK100

Reference: 15-1294-01-DAD

Test Log:

Date	Day	Time	Technician
2015/09/25	0	1630	ML/HKS
2015/09/26	1	1030	DS
2015/09/27	2	1400	CQ

Chemistry:

Cileillistiy.							
Conc. (%)	control	6.3	13	25	50	100	
Day				pH (units)			
0	8.1	8.0	8.0	7.9	7.8	7.6	
2	8.0	8.0	7.9	7.9	7.7	7.3	
•							
			Conduct	ivity (µS/cm	@ 25°C)		
0	204	220	262	309	409	613	
2	209	237	280	328	435	635	
-							
			Dissol	ved Oxygen	(mg/L)		
0	8.1	8.1	8.1	8.1	8.1	8.1	
2	8.1	8.1	8.0	8.1	8.1	8.0	
•							
			Te	mperature (°	°C)		
0	18	18	18	18	18	18	
2	19	20	20	20	20	20	

**Biology:** 

Conc. (%)

control

6.3

13

Day	Number Alive and Behavior (behavior is in brackets)									
1	10	10	10	10	10	10				
2	10	10	10	10	10	10				
	Notes: F, floating; I, immobile; B, stuck on bubble; D, caught in debris; nd, not done; na, not applicable;									
	Mortality (%)									
2	0	0	0	0	0	0				

50

100

25

_	U	U	U	U	U	U						
	Immobility (%)											
2	0	0	0	0	0	0						



## **Comments/Statistics**

Client:	SRK1	00
---------	------	----

Reference: 15-1294-01-DAD

#### **Test Result Comments:**

None

#### Data Analysis:

Endpoints for mortality could not be calculated. No effect occurred.

Endpoints for immobility could not be calculated. No effect occurred.

#### **Protocol Deviations:**

None

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- 7. No Guarantee of Results: The Client is responsible for informing itself on the limitation of the results and acknowledges that the results are not guaranteed.
- 8. Standard of Care: HydroQual will use reasonable care and diligence as required by the laws of the province or territory where the sample is tested, subject to that level of care and skill ordinarily exercised by other laboratories currently practicing under similar conditions in the same locality, subject to the time limits and financial, physical or other constraints applicable to the Services. No warranty, express or implied, is made.
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- 14. Risk of Loss: HydroQual will use reasonable care to protect samples during storage, however, all samples are stored at the Client's risk and the Client is responsible for obtaining appropriate insurance, if desired. The Client acknowledges that during the performance of the Services samples may be altered, lost, damaged or destroyed and the client forever releases HydroQual from any and all claims the Client may have for any loss or damage to the sample.
- 15. Environmental: the Client must comply with all applicable environmental legislation, including labeling all hazardous samples to comply with Canada's *Workplace Hazardous Materials Information System* and the Alberta *Transfer of Dangerous Goods* regulations, and must provide appropriate material safety data sheets that include the nature of the hazard and a contact name and phone number to call for information. The Client shall defend, indemnify and hold harmless HydroQual for all loss or damages, including any fine or cost of complying with an order of any government authority, resulting from the Client's breach of this paragraph.
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- 17. Hazardous Materials Surcharge: HydroQual may apply an additional surcharge for handling of hazardous samples or samples with Naturally Occurring Radioactive Materials ("NORM"), such as and including without limitation, H<sub>2</sub>S and CN.
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- 21. Re-Tests: HydroQual reserves the right to re-test any samples that remain in HydroQual's possession. Re-tests requested by the Client may be charged to Client and Client agrees to pay for such charges.
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- 23. LIMITATION OF LIABILITY: IN NO EVENT SHALL HYDROQUAL BE RESPONSIBLE FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY OR PUNITIVE DAMAGES, WHETHER FORESEEABLE OR UNFORESEEABLE (INCLUDING CLAIMS FOR LOSS OF PROFITS OR REVENUE OR LOSSES CAUSED BY STOPPAGE OF OTHER WORK OR IMPAIRMENT OF OTHER ASSETS) INCURRED BY THE CLIENT ARISING OUT OF BREACH OR FAILURE OF EXPRESS OF IMPLIED WARRANTY, BREACH OF CONTRACT, BREACH OF WARRANTY, MISREPRESENTATION, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE. IN ANY EVENT, THE LIABILITY OF HYDROQUAL TO THE CLIENT SHALL BE LIMITED TO THE COST OF TESTING THE SAMPLE AS REQUESTED IN THE CHAIN OF CUSTODY UNDER WHICH THE SAMPLE WAS ORIGINALLY DEPOSITED. FOR THE PURPOSES OF THIS PARAGRAPH AND PARAGRAPHS 7, 14, 15, 22, AND 24, AS APPLICABLE, "HYDROQUAL" INCLUDES WITHOUT LIMITATIONS ITS DIRECTORS, OFFICERS, EMPLOYEES AND AFFILIATES AND THE "CLIENT" INCLUDES WITHOUT LIMITATION ANY THIRD PARTY THAT MAY HAVE A CLAIM AGAINST HYDROQUAL THROUGH THE CLIENT.
- 24. Notice of Liability: Notwithstanding paragraph 23, HydroQual shall not be liable to the Client unless the Client provides notice in writing to HydroQual of such loss or damage, together with full particulars thereof, within 30 days of the Client's receipt of the report of the analysis of the sample giving rise to such liability. The provisions of this paragraph allocate the risk between the Client and HydroQual, and the fees to be paid by the Client to HydroQual reflect this allocation of any such risks and the limitations of liability in these General Terms and Conditions.
- 25. Entire Agreement: These General Terms and Conditions, the Chain of Custody and price quotations constitute the entire agreement between the parties and supersede and take precedence over any terms and conditions contained in any documentation provided by the Client. HydroQual's execution of any subsequent documentation from the Client only acknowledges receipt and not acceptance of any terms or conditions therein unless expressly stipulated otherwise by HydroQual. If there is a conflict between these General Terms and Conditions and any other document, these General Terms and Conditions prevail.



ATTN: Karyn Lewis; Andrea Bowie SRK Consulting 76 Richmond Street E, Suite 300 Toronto, Ontario Canada M5C 1P1 

 Received:
 2015/10/29

 Report Date:
 2015/11/16

 Version:
 FINAL

## **HydroQual Test Report**

 Client:
 SRK100

 Reference:
 15-1503

 Billing:
 20150050

Mapez

Senior Verifier



## **Result Summary**

Client: SRK100

Reference: 15-1503-01-TRS

Client: SRK Consulting; operation Lupin Mine

Sample: LUP-102-151027

Collection: collected on 2015/10/27 at 1110 by AJB Receipt: received on 2015/10/29 at 1600 by MC

Containers: received 2 x 20 L jugs, 4 x 1 L bottles at 10 °C, in good

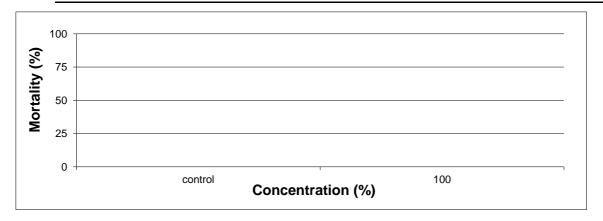
condition with seals and no initials

Description: type: water, collection method: not given

**Test:** started on 2015/10/31; ended on 2015/11/04

#### Result:

Sample	Client Code	Mortality (%)	Comment
control	lab control	0	none
100%	LUP-102-151027	0	



The test data and results are authorized and verified correct.





#### **Test Conditions**

Client: SRK100

Reference: 15-1503-01-TRS

Method: Biological Test Method: Reference Method for Determining Acute Lethality of

Effluents to Rainbow Trout, 2000. Environment Canada, EPS 1/RM/13.

Second Edition (amended 2007).

**Test type:** Trout 96-h Static Acute Test (WTR-ME-041)

**Species:** Oncorhynchus mykiss

Organism source: Sam Livingston (Batch 20151009TR)

**Acclimation:** 22 days (must be > 2 weeks)

Stock mortality: 0.08% (seven days preceding testing)

Sample initial chemistry: pH: 4.9; EC: 680 (µS/cm @ 25°C); DO: 10.2 (mg/L); temperature: 14 °C

hardness (mg CaC03/L): 180; colour: colourless; odour: odourless

**Sample holding time:** 4 days (must be  $\leq$  5 days)

Sample storage: 4 ± 2°C in darkness

Test vessel: The test was conducted in 22 L plastic pails with polyethylene liners

**Test volume:** 20 Litres (depth of solution in each test vessel ≥15cm)

Sample pre-treatment: All test solutions and controls were pre-aerated for 120 minutes at 6.5 ±1 mL/min/l

Dissolved oxygen in full strength sample was 9 mg/L after pre-aeration. The sample was not filtered or pH adjusted prior to or during testing

**Loading density:** 0.195 g/Litre (must be  $\leq 0.5 \text{ g/Litre}$ )

Control water: Dechlorinated City of Calgary water acclimated to test conditions

Test concentrations: Undiluted sample plus a negative control

Test replicates: One replicate per treatment; 10 fish per replicate

**Feeding:** Fish are not fed 24 hours before test initiation and no feeding during test **Measurements:** pH, conductivity, dissolved oxygen and temperature measured at test

initiation and termination

Aeration: All treatments aerated at 6.5 ±1 mL/min/L by oil-free compressed air

passed through airline tubes connected to disposable air stones

**Lighting:** Overhead full spectrum fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 15 ± 1°C

**Endpoint:** Mortality, % mortality at 96-h

**Test validity:** The control had 100% survival (must ≥ 90%)

The control had 0 percent (%) stressed behaviour (must ≤ 10%)

Reference toxicant: 96-h test with Potassium Chloride (KCI) initiated October 26, 2015; current results

(96-h LC50 and 95% confidence limits) = 0.58 (0.50-0.63) log (g/L KCl)

historical results:

(96-h LC50 and 95% confidence limits) = 0.57 (0.50-0.64) log (g/L KCl)

Note: Outlined sections are protocol deviations explained on the comment page; v/v, volume per volume



### **Test Data**

Client: SRK100

Reference: 15-1503-01-TRS

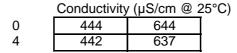
Test Log:

Date	Day	Time	Technician
2015/10/31	0	1600	CQ
2015/11/01	1	0830	HL
2015/11/02	2	0915	DS
2015/11/03	3	0845	ML/HKS
2015/11/04	4	0930	CQ/DS/JN

Conc. (%)

#### Chemistry:

Conc. (%)	Conc. (%) control	
Day		
	pH (units)	
0	7.6	7.3
4	8.1	7.7



100

#### Number Alive (In brackets number stressed):

Day		
0	10	10
1	10	10
2	10	10
3	10	10
4	10	10

control

	Mortality (%)					
4	0 0					

Stressed (%)
4 0 0



### **Test Data**

Sample

control

100

Group Wet

Weight (g)

3.9

Client: SRK100

Reference: 15-1503-01-TRS

#### **Biology Summary Tables:**

Control	Length	Wet
Fish	(cm)	Weight(g)
1	3.7	0.6
2	2.9	0.3
3	3.4	0.5
4	3.6	0.5
5	2.9	0.2
6	2.9	0.2
7	3.2	0.3
8	3.5	0.5
9	3.6	0.5
10	3.0	0.3

average	3.3	0.4
sd	0.3	0.1
cv(%)	10.0	37.2

Notes: nd, not done; na, not applicable; sd, standard deviation; cv(%), coefficient of variation

### **Comments/Statistics**

#### **Test Result Comments:**

None

**Data Analysis:** 

None

**Protocol Deviations:** 

None



### **Result Summary**

Client: SRK100

Reference: 15-1503-01-DAS

Client: SRK Consulting; operation Lupin Mine

Sample: LUP-102-151027

Collection: collected on 2015/10/27 at 1110 by AJB

Receipt: received on 2015/10/29 at 1600 by MC

Containers: received 2 x 20 L jugs, 4 x 1 L bottles at 10 °C,

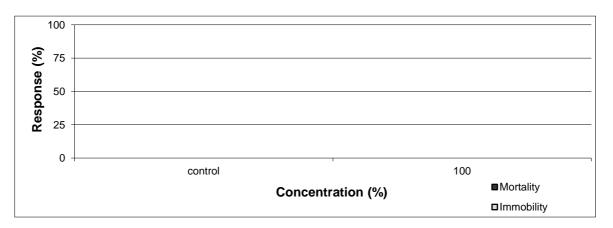
in good condition with seals and no initials **Description:** type: water, collection method: not given

Test: started on 2015/10/30; ended on 2015/11/01

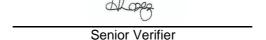
Result:

Sample	Client Code	Average Mortality (%) Immobility (%)		Comment
control	lab control	0	0	none
100	P-102-151027	0	0	

Notes: sd, sample standard deviation; cv, coefficient of variation; nd, not done; na, not applicable;



The test data and results are authorized and verified correct.





#### **Test Conditions**

Client: SRK100

Reference: 15-1503-01-DAS

Method: Biological Test method: Reference Method for Determining Acute Lethality of

Effluents to Daphnia magna, 2000. Environ. Can., EPS 1/RM/14.

Second Edition.

**Test type:** *Daphnia* 48-h Static Acute Test (WTR-ME-015)

Species: Daphnia magna Age: < 24 hours old Organism source: in-house culture

Stock mortality: 0%

Culture brood data: 12 days to first brood

16 neonates per average brood

Sample initial chemistry: pH: 4.9; EC: 680 (µS/cm @ 25°C); DO: 10.2 (mg/L); temperature: 14 °C

hardness (mg CaC03/L): 180; colour: colourless; odour: odourless

**Sample holding time:** 3 days (must be  $\leq 5$  days)

Sample storage: 4 ± 2°C in darkness

Test vessel: 385 mL plastic vessels

Test volume: 150 mL

Sample pre-treatment: The sample was not filtered or pH adjusted prior to or during testing

The sample was pre-aerated for 20 minutes (rate of  $37.5 \pm 12.5$  mL/min.L-1) The hardness of the sample was not adjusted (mg CaCO3/L) prior to or during

testing

**Loading density:** One daphnid/15 mL (must ≤ 1 organism/15 mL)

Control water: Moderately hard reconstituted water supplemented with vitamin B12 (2 µg/L)

and  $Na_2SeO_3$  (5  $\mu$ g/L)

The hardness of the control/dilution water was 87 mg CaCO<sub>3</sub>/L

**Test concentrations:** Undiluted sample plus a negative control

**Test replicates:** Three replicates per treatment, 10 daphnids per replicate

Feeding: None Aeration: None

Measurements: pH, conductivity, dissolved oxygen and temperature at test initiation and

termination

Lighting: Cool white fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 20 ± 2°C

Note: Outlined sections are protocol deviations explained on the comment page



### **Test Conditions**

Client: SRK100

Reference: 15-1503-01-DAS

Endpoint: Mortality, % mortality at 48-h

Immobility, % immobility at 48-h

**Test validity:** The control had 100% survival (must ≥ 90%)

Control had 0% abnormal behaviour (must ≤ 10%), e.g. immobility

Reference toxicant: 48-h test with NaCl initiated October 23, 2015; current results

(48-h LC50 and 95% confidence limits) = 0.78 (0.76-0.81) log (g/L NaCl)

historical results:

(48-h LC50 and 95% confidence limits) =0.77 (0.70-0.84) log (g/L NaCl)

Note: Outlined sections are protocol deviations explained on the comment page



### **Test Data**

Client: SRK100

Reference: 15-1503-01-DAS

Test Log:

Date	Day	Time	Technician
2015/10/30	0	1730	CQ
2015/10/31	1	1020	JK
2015/11/01	2	1100	NM

Chemistry:

Conc (%)	control			100		
replicate	а	b	С	а	b	С

Day	pH (units)						
0	8.1 8.0 8.0 7.9 7.9 8.0						
2	8.1	8.0	8.0	7.7	7.5	7.4	

	Conductivity (µS/cm @ 25°C)							
0	203	206	210	631	660	666		
2	221	246	255	689	715	741		

	Dissolved Oxygen (mg/L)							
0	8.0	8.0	8.1	8.1	8.1	8.2		
2	8.0	7.9	8.0	8.0	8.0	7.9		

	Temperature (°C)							
0	19	19	19	19	19	19		
2	19	19	19	19	19	19		

**Biology:** 

Conc (%)	control			100		
replicate	а	b	С	а	b	С

Day	Number Alive and Behavior (behavior is in brackets)						
1	10	10	10	10	10	10	
2	10	10	10	10 (1F)	10 (1F)	10	

Notes: F, floating; I, immobile; B, stuck on bubble; D, caught in debris

	Mortality (%)						
2	0	0	0	0	0	0	
			Immob	ility (94)			
			IIIIIIIUU	IIILY ( 70)			
2	0	0	0	0	0	0	



# **Daphnia** (Single Concentration) Test Report

Client: SRK100

Reference: 15-1503-01-DAS

## **Comments/Statistics**

Test Result Comments: None		
Data Analysis: None		
Protocol Deviations: None		

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ATTN: Karyn Lewis; Andrea Bowie SRK Consulting 76 Richmond Street E, Suite 300 Toronto, Ontario Canada M5C 1P1 

 Received:
 2015/10/29

 Report Date:
 2015/11/25

 Version:
 FINAL

# **HydroQual Test Report**

Client: SRK100 Reference: 15-1498

Billing: C/O A Bowie @ SRK

Senior Verifier



## **Results Summary**

Client: SRK100

Reference: 15-1498-01-AGD

Figner-Wolfe Test

Client: SRK Consulting; operation Lupin Mine

**Sample:** LUP-10-151027

**Collection:** collected on 2015/10/27 at not given by AJB **Receipt:** received on 2015/10/29 at 1600 by MC

Containers: received 4 x 20 L jugs, 8 x 1 L bottle at 10 °C, in good

condition with seals and no initials

Description: type: water, collection method: not given

**Test:** started on 2015/10/30; ended on 2015/11/02

### Results:

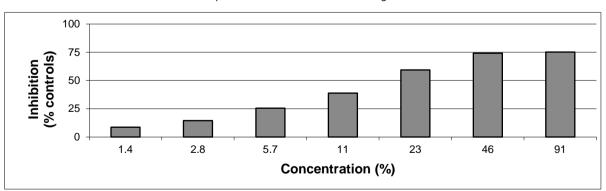
Chronic: Growth

Stimulation

	Endpoint (72-hour)	Value	Confidence Limits (95% lower upper		(95%)	Method Calculated
Chronic:						
Growth	IC25	5.5	1.7	8.6	%	Linear Interpolation
Inhibition	IC50	17	12	20	%	Linear Interpolation
	Notes: ICx, cor	ncentrations	inhibiting grov	vth by 'x' percen	t relative to control	ls; CV, coefficient of variation (%);
	SD, stand	dard deviation	on			
	Stimulation Observed		Test Con	centrations		Method Calculated

Notes: Stimulation refers to increased response at all concentrations or at high concentrations

none



%

The test data and results are authorized and verified correct.

Senior Verifier



### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-AGD

**Method:** Biological Test Method: Growth Inhibition Test Using a Freshwater Alga *Pseudokirchneriella subcapitata (formerly Selenastrum capricornutum)*. Environment Canada, EPS 1/RM/25, 2nd Edition, March 2007

Test type: Algal Growth Inhibition Test (WTR-ME-034)

Species: Pseudokirchneriella subcapitata (formerly Selenastrum capricornutum and

Raphidocelis subcapitata)

Organism source: In-house culture (original source: UTCC 37; strain: LB37)

Culture age: The test was started with 3-day old, exponentially growing cells determined with

an algal growth curve. The algal growth curve was started with an inoculum from the algal stock culture determined over an 8-10 day period. This culture name was TUES-

JULY-20150512AG. Algal cultures are regrown every 2 months from slants

made from a new culture purchased twice annually.

Culture observations: No unusual appearance or treatment of the algae was noted prior to or during the

conduct of the test.

Sample initial chemistry: pH: 5.1; EC: 658 (µS/cm); DO: 10.1 (mg/L); temperature: 15 °C

hardness (mg CaC03/L): 161; colour: colourless; odour: odourless

**Sample holding time:** 3 days (must be  $\leq$  3 days)

Sample storage: 4 ± 2°C in darkness

Test concentrations: 10 effluent concentrations (0.2, 0.4, 0.7, 1.4, 2.8, 5.7, 11, 23, 46, and 91% (v/v), plus a

negative control) (≥6 enumerated; see Test Result Comments)

Test vessel: The test was conducted in 96-well microplates. Two microplates (the test plate and a

backup plate for use only in the case of an invalid test plate) were run. Test concentrations were isolated from each other with microplate sealing film.

**Test replicates:** 5 replicate wells per test concentration (≥3 enumerated)

10 replicate wells per control (8 enumerated).

Test volume: 220 µL final volume in each well with 200 µL of sample;

10µL of enrichment medium and 10µL of algal inoculum.

Inoculum: The initial cell density of the inoculum was 10201 (cells/mL), it was prepared

less than 3 hours before test initiation.

Control/dilution water: Made up with 85% deionized and 15% dechlorinated City of Calgary water spiked

with nutrients as per EPS 1/RM/25

The metal stock with 25% reduced EDTA was used.

Sample Filtration: 100 mL filtered through a 0.45  $\mu m$  pore diameter membrane.

Sample treatment: Sample spiked with nutrients as per EPS 1/RM/25; no other chemicals added.

Measurements: Final cell densities were determined using an electronic particle counter.

Aeration: Not required pH Adjustment: Not required

**Lighting:** The plates were incubated under continuous light: 3720 lux

(cool white fluorescent bulbs) 52.08 μmol/(m²·S)

Test temperature: 24 ± 2°C



### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-AGD

Endpoint: Growth, 72-h IC25 (with 95% confidence limits)

Test endpoint was bracketed by at least 1 test concentration

(except for <1.4% or >91%)

No outliers were observed within the data set.

Test validity: Control growth was a 41-fold increase over the inoculum. (Must be >16-fold)

The CV of the standard control wells was 12.1%. (Must be ≤20%)

Statistics: See Data Analysis section.

Mann-Kendall trend analysis yielded p=0.36, therefore no trend was observed. (Must

have p>0.05 if 10%<CV≤20%)

Reference toxicant: 72-h test with Zinc (ZnSO4\*7H2O) initiated November 3, 2015; current results

(72-h IC25 and 95% confidence limits) = 1.44 (1.36-1.49) log ( $\mu$ g Zn2+/L)

historical results:

(72-h IC25 and 95% confidence limits) = 1.35 (1.13-1.58) log (µg Zn2+/L)

The reference toxicant test was performed under the same conditions as those used

during this test.



**Test Data** 

Client: SRK100

Reference: 15-1498-01-AGD

Test Log:

	Date	Day	Technician	Time	Rotated	Temperature (°C)
2	015/10/30	0	ML	1130	N/A	25
2	015/10/31	1	JK	0820	Yes	25
2	015/11/01	2	HKS	1400	Yes	24
2	015/11/02	3	ML	1330	Yes	25

pH Measurements:

Concentration	Initial	Final
Concentration	Value	Value
100%	6.8	-
control (well D6)	7.2	-
control (well D7)	-	8.4

Initial cell density (cells/mL):

10201

Backup microplate used?

No

Standard Control Well Final Cell Densities (D Row):

Column	Final Cell Density	Cell Yield
Column	(x10 <sup>3</sup> cells/mL)	(x10 <sup>3</sup> cells/mL)
2	544	534
3	425	415
4	401	391
5	395	385
8	395	385
9	395	385
10	425	415
11	437	427
Average	-	417
SD	-	50
CV (%)	-	12.1
_	Fold Growth (x)	41

Test	Well	Final	Cell	<b>Densities</b>	:

Tool tron I man oon ponomoo.										
	Calculated Final Cell Density									
Concentr		(x10 <sup>3</sup> cells/ mL)								
ation (%)			Row							
	B C E F									
0.2	-	-	-	-	-					
0.4	ı	-	-	-	-					
0.7	-	-	-	-	-					
1.4	395	395	383	*	*					
2.8	365	359	377	*	*					
5.7	323	311	329	*	*					
11	275	263	257	*	*					
23	179	179	179	*	*					
46	120	117	118	*	*					
91	114	115	111	*	*					

#### Cell Yield Results:

Cell Telu Nesults.											
Concentration			Cell	Percent	Inhibition	Stimulation					
			Row			Mean	SD	C) / (0/)			
(%)	В	С	Е	F	G	wean	30	CV (%)	Controls	(%)	(%)
0.2	-	-	-	-	-	-	-	-	-	-	-
0.4	-	-	-	-	-	-	-	-	-	-	-
0.7	-	-	-	-	-	-	-	-	-	-	-
1.4	385	385	373	*	*	381	7	2	91	9	-9
2.8	355	349	367	*	*	357	9	3	86	14	-14
5.7	313	301	319	*	*	311	9	3	75	25	-25
11	265	253	247	*	*	255	9	4	61	39	-39
23	169	169	169	*	*	169	0	0	41	59	-59
46	109	106	108	*	*	108	2	1	26	74	-74
91	103	105	101	*	*	103	2	2	25	75	-75

\*see test result comments

### **Test Validity Criteria:**

Control growth was a 41-fold increase over the inoculum. (Must be >16-fold)

The CV of the standard control wells was 12.1%. (Must be ≤20%)

Mann-Kendall trend analysis yielded p=0.36, therefore no trend was observed. (Must have p>0.05 if 10%<CV≤20%)





### **Comments/Statistics**

Client: SRK100

Reference: 15-1498-01-AGD

#### **Test Result Comments:**

Electronic enumeration using a Beckman-Coulter particle counter was performed on the same day as test termination. A minimum of 3 replicates were enumerated for each concentration. Additional replicates were enumerated for concentrations with high variability between replicates.

Only seven concentrations were enumerated as the test endpoints were bracketed within this concentration range (1.4 - 91%).

### **Data Analysis:**

Significant stimulatory effects in growth were not observed in any test concentration as calculated by ANOVA analysis with CETIS v. 1.9.0.8 (Fligner Wolfe).

Regression analysis was attempted on the data, but the assumptions of normality and homoscedasticity of residuals were not met. Therefore, endpoints for growth inhibition were calculated using a Linear Interpolation model using CETIS v. 1.9.0.8

### **Protocol Deviations:**

None



## **Result Summary**

Client: SRK100

Reference: 15-1498-01-CDD

Client: SRK Consulting; operation Lupin Mine

Sample: LUP-10-151027

**Collection:** collected on 2015/10/27 at not given by AJB **Receipt:** received on 2015/10/29 at 1600 by MC

Containers: received 4 x 20 L jugs, 8 x 1 L bottle at 10 °C, in good

condition with seals and no initials

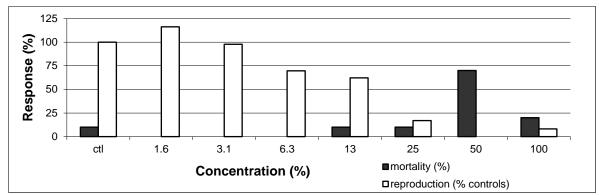
**Description:** type: water, collection method: not given

**Test:** started on 2015/10/30; ended on 2015/11/07

#### Result:

- -	Endpoint (8-day)	Value	Confidence Limits (95%) lower upper		Units	Method Calculated
Acute: (survival)	LC25 LC50	>100 >100			% %	could not be calculated could not be calculated
Chronic: (fecundity)	IC25 IC50	4.7 14	2.3 5.8	13 17	% %	Linear Interpolation Linear Interpolation

Notes: LCx & ICx, concentrations lethal or inhibitory to 'x' percent of the test population; fecundity, reproduction as the number of young produced



The test data and results are authorized and verified correct.



Our liability is limited to the cost of the test requested. The test results only relate to the sample as received, no liability in whole of in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.



### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-CDD

**Method:** Biological Test method: Test of Reproduction and Survival Using the Cladoceran

Ceriodaphnia dubia. Environment Canada, EPS 1/RM/21, 2nd Edition,

February 2007.

Test type: Ceriodaphnia Survival and Reproduction Static Renewal Test (WTR-ME-018)

Species: Ceriodaphnia dubia

Age: <24 hours old; all from same brood source within 12 hours of the same age.

Organism source: in-house cultures; cultures from a single brood organism to provide test organisms.

**Culture health:** Culture mortality was 4% (must be ≤ 20%).

**7-d prior to test initiation:** No ephippia were noted in the cultures at any time.

Average young produced per adult in the first three broods was 21 (must be ≥ 15) Number of young produced by each brood organism in the last complete brood

before use was 13 (must be  $\geq$  8).

Organism observations: No unusual behavior, appearance or treatment of test organisms was noted prior

to or during the test. All first-generation mortality was recorded on the day it was

observed.

Sample initial chemistry: pH: 5.1; EC: 658 (µS/cm); DO: 10.1 (mg/L); temperature: 15 °C

hardness (mg CaC03/L): 161; colour: colourless; odour: odourless

**Sample holding time:** 3 days (must be  $\leq$  3 days); The test was conducted with three subsamples

samples a, b, and c were for days 0 to 2, 3 to 4, and 5 to 7 respectively

Sample storage: 4 ± 2°C in darkness

**Test vessel:** The tests were conducted in 30 mL plastic vessels (2 cm depth).

Test volume: 15 mL of solution (1 cm depth); replenished daily.

Control/dilution water: Moderately hard water supplemented with vitamin B12 (2 µg/L)

and  $Na_2SeO_3$  (5  $\mu$ g/L)

Test concentrations: 7 effluent concentrations (1.6, 3.1, 6.3, 13, 25, 50, 100% (v/v)

plus a negative control)

**Test replicates:** One neonate <24 hours old was loaded per test vessel;

10 replicates/concentration

Feeding: The test organisms were fed daily a mixture of fermented trout chow, yeast,

alfalfa powder, and the green alga Pseudokirchneriella subcapitata (formerly

Selenastrum capricornutum and Raphidocelis subcapitata).

Food expiration date: 2015/11/15, 2015/11/22, 2015/11/28

**Measurements:** pH, conductivity, dissolved oxygen and temperature were measured daily.

Sample pre-treatment: The sample was not filtered, aerated, or pH adjusted prior to or during testing.

The dissolved oxygen concentration (mg/L) was: 7.6

The sample pH was: 7.4

Lighting: Overhead full spectrum fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 25 ± 1°C



### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-CDD

**Endpoints:** Survival, 8-d LC50 (with 95% confidence limits)

Reproduction, 8-d IC25 (with 95% confidence limits)

Test endpoints were bracketed by at least 1 test concentration

(except for <1.6% or >100 %)

No outliers were observed within the data set.

**Test completion:** 80% of the control organisms had ≥ 3 broods on day 8 (must be ≥ 60% within

8 days) Any neonates produced after third brood were not included in the

mean young per adult calculation.

**Test validity:** The control had 90% survival (must ≥ 80%)

Number of young produced by each surviving control adult within the first three

broods was 15 (must be  $\geq$  15).

Reference toxicant: 8-d test with NaCl initiated on October 19, 2015;

(must be evaluated within 14 days before or after test is started or during it)

current results: (8-d LC50 and 95% confidence limits) =

3.33 (3.24-3.42) log (mg/L NaCl)

historical results: (8-d LC50 and 95% confidence limits)=

3.36 (3.27 - 3.45) log (mg/L NaCl)

current results: (8-d IC50 and 95% confidence limits) =

3.13 (3.01-3.23 log (mg/L NaCl)

historical results: (8-d IC50 and 95% confidence limits)=

2.98 (2.74 - 3.23) log (mg/L NaCl)

The reference toxicant test was performed under the same conditions as those used

during this test.



### **Test Data**

Client: SRK100

Reference: 15-1498-01-CDD

### Test Log:

Doto	Dov	Time	Time Technicians	Temperature (°C)		
Date	Day	Time	recrinicians	Control	Sample	
2015/10/30	0	1620	ML	25	25	
2015/10/31	1	1110	JN/EP	25	25	
2015/11/01	2	1400	HKS/JW	25	25	
2015/11/02	3	0800	CQ/EP	25	25	
2015/11/03	4	0800	DS/EP	25	25	
2015/11/04	5	0855	ML/JW	25	25	
2015/11/05	6	0805	DS	25	25	
2015/11/06	7	0950	JN	25	25	
2015/11/07	8	1350	JN/JW	na	na	

### **Chemistry Summary Tables:**

	•
New	Solutions

Conc. %	ctl	1.6	3.1	6.3	13	25	50	100

#### **Old Solutions**

0.0.0	0.0.0.						
ctl	1.6	3.1	6.3	13	25	50	100

### Average Values

								woraç
рΗ	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.3
cond.	224	224	226	243	269	318	426	627
DO	7.6	7.6	7.5	7.5	7.5	7.5	7.5	7.7
temp.	25	25	25	25	25	25	25	25

7.9	7.9	8.0	8.0	7.9	7.9	7.8	7.6
244	241	288	279	301	352	500	764
7.6	7.6	7.5	7.5	7.5	7.4	7.4	7.5
25	25	25	25	25	25	25	25

#### Coefficients of Variation (%)

							0001110	,,,,,,,,,
рН	2	2	2	2	2	2	1	2
cond.	18	9	7	6	7	7	6	7
DO	2	2	3	3	2	3	2	3
temp.	0	0	0	0	0	0	0	0

	( , -	/					
2	2	2	2	2	1	1	2
10	6	10	7	6	6	26	8
2	2	2	2	2	2	2	3
0	0	0	0	0	0	0	0



## **Test Data**

Client: SRK100

Reference: 15-1498-01-CDD

Biology	(numi	ber or	youn	g pro	uucec	<u>.                                    </u>											
Day	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
Replicate	)			(	Contro	ı								13%			
1	0	0	0	0	Χ	Χ	Χ	Χ		0	0	0	0	0	0	0	0
2	0	0	0	0	3	0	6	8		0	0	0	Χ	Χ	Χ	Χ	Х
3	0	0	0	0	6	8	0	12		0	0	0	0	3	0	5	6
4	0	0	0	3	6	0	7	-		0	0	0	0	3	0	6	5
5	0	0	0	0	5	3	0	4		0	0	0	0	0	6	4	0
6	0	0	0	0	6	6	0	4		0	0	0	0	5	4	0	0
7	0	0	0	0	4	0	0	0		0	0	0	0	0	6	0	0
8	0	0	0	4	5	7	-	-		0	0	0	0	4	0	4	6
9	0	0	0	0	4	8	0	4		0	0	0	0	4	2	4	-
10	0	0	0	0	3	0	6	3		0	0	0	0	3	4	0	0
					1.6%									25%			
1	0	0	0	0	0	0	6	0	1 1	0	0	0	0	0	0	0	0
2	0	0	0	0	3	0	6	0		0	0	0	0	Х	X	X	X
3	0	0	0	0	4	0	7	11		0	0	0	0	0	0	0	0
4	0	0	0	0	4	0	8	12		0	0	0	0	3	0	0	2
5	0	0	0	0	3	0	7	9		0	0	0	0	0	4	2	0
6	0	0	0	0	3	0	5	10		0	0	0	0	3	0	0	2
7	0	0	0	0	3	0	8	0		0	0	0	0	0	0	0	0
8	0	0	0	0	4	0	8	11		0	0	0	0	3	0	0	0
9	0	0	0	0	4	0	8	7		0	0	0	0	0	0	0	0
10	0	0	0	0	6	0	0	0		0	0	0	0	0	4	0	0
					3.1%									50%			
1	0	0	0	0	0	3	7	2		0	0	0	0	0	0	0	0
2	0	0	0	0	3	0	8	3		0	0	0	Χ	Χ	Χ	Χ	Х
3	0	0	0	0	3	0	0	0		0	0	0	0	0	0	0	0
4	0	0	0	0	5	10	0	13		0	0	0	0	0	0	0	0
5	0	0	0	0	4	9	0	5		0	0	0	Χ	Χ	Χ	Χ	Х
6	0	0	0	0	4	8	0	3		0	0	0	Χ	Χ	Χ	Χ	Х
7	0	0	0	0	6	0	0	0		0	0	0	Χ	Χ	Χ	Χ	Χ
8	0	0	0	0	5	0	8	4		0	0	0	0	Χ	Χ	Χ	Χ
9	0	0	0	0	3	0	8	8		0	0	0	0	Χ	Χ	Χ	Χ
10	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0

Notes: #, young produced; 0, no young; X, dead; bold #, number of young the test organism had the day it died; —, young produced after third brood



### **Test Data**

Client: SRK100

Reference: 15-1498-01-CDD

Biology (number of young produced):

			,	<u> </u>		,			_								
Day	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
									='								_
Replicate	)				6.3%									100%	1		
1	0	0	0	0	0	4	5	0		0	0	0	0	0	0	0	0
2	0	0	0	0	4	0	7	8		0	0	0	0	Χ	Χ	Χ	Х
3	0	0	0	0	4	0	6	5		0	0	0	0	0	0	0	0
4	0	0	0	0	5	0	0	0		0	0	0	0	0	0	5	0
5	0	0	0	0	3	0	0	0		0	0	0	0	0	0	0	0
6	0	0	0	0	4	3	0	2		0	0	0	0	0	0	0	0
7	0	0	0	0	3	3	5	0		0	0	0	0	Χ	Χ	Χ	Х
8	0	0	0	0	3	0	4	5		0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	6	0		0	0	0	0	0	0	6	0
10	0	0	0	0	0	0	5	0		0	0	0	0	0	0	0	0

Notes: #, young produced; 0, no young; X, dead; bold #, number of young the test organism had the day it died;

### **Biology Summary Tables:**

Didiogy (	Sullill	nary i	ables	)-													
Conc. %	ctl	1.6	3.1	6.3	13	25	50	100		ctl	1.6	3.1	6.3	13	25	50	100
Day		N	lumbe	r of O	rganis	m Aliv	e'e		Day			Daily	Young	g Prod	uction		
0	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0	0
1	9	10	10	10	10	10	10	10	1	0	0	0	0	0	0	0	0
2	9	10	10	10	10	10	10	10	2	0	0	0	0	0	0	0	0
3	9	10	10	10	9	10	6	10	3	0	0	0	0	0	0	0	0
4	9	10	10	10	9	9	4	8	4	7	0	0	0	0	0	0	0
5	9	10	10	10	9	9	4	8	5	42	34	33	26	22	9	0	0
6	9	10	10	10	9	9	4	8	6	32	0	30	10	22	8	0	0
7	9	10	10	10	9	9	4	8	7	19	63	31	38	23	2	0	11
8	9	10	10	10	9	9	3	8	8	35	60	38	20	17	4	0	0
			_			(= ( )											
F					ortalit				Total	135	157	132	94	84	23	0	11
mean	10	0	0	0	10	10	70	20			_						
										Yo			ılt (wit		st three	e broc	ods)
Replicate		Total \		Produ	iced b	y Eac	h Adul	t	mean		16	13	9	8	2	0	1
1	0	6	12	9	0	0	0	0	sd	7.23	7.02	8.34	4.99	5.25	2.54	0	2.33
2	17	9	14	19	0	0	0	0	cv(%)	53.6	44.7	63.2	53.1	62.5	110	0	212
3	26	22	3	15	14	0	0	0									
4	16	24	28	5	14	5	0	5		You	ıng Pr	oducti	on as	a Per	cent o	f Cont	trols
5	12	19	18	3	10	6	0	0		100	116	98	70	62	17	0	8
6	16	18	15	9	9	5	0	0									
7	4	11	6	11	6	0	0	0									
8	16	23	17	12	14	3	0	0									
_				_		_	_										

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or

6

0

0

10

19

6

19

5

<sup>-,</sup> young produced after third brood



## **Test Data**

Client: SRK100

Reference: 15-1498-01-CDD

Chemi	istry:
-------	--------

Cnemisti		New S							Old S	olution	ns						
Conc. %	ctl	1.6	3.1	6.3	13	25	50	100		ctl	1.6	3.1	6.3	13	25	50	100
001101 70			0	0.0	.0		- 00	.00		O.I.		0	0.0	.0		- 00	.00
Day				рŀ	d (unit	s)							рŀ	d (unit	s)		
0	7.7	7.7	7.8	7.8	7.8	7.8	7.7	7.4									
1	8.0	7.9	7.9	7.9	7.8	7.8	7.7	7.4		8.0	8.0	8.0	8.0	7.9	7.8	7.8	7.5
2	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.3		7.9	7.9	8.0	8.0	7.9	7.9	7.8	7.5
3	7.9	7.9	8.0	7.9	7.9	7.9	7.7	7.4		7.9	8.0	8.1	8.0	8.0	7.9	7.8	7.5
4	7.9	7.9	7.9	7.9	7.9	7.8	7.7	7.0		7.8	8.0	8.0	8.0	8.0	7.9	7.9	7.6
5	7.7	7.7	7.7	7.6	7.6	7.6	7.6	7.1		7.7	7.7	7.7	7.7	7.7	7.7	7.6	7.8
6	7.6	7.6	7.6	7.6	7.6	7.6	7.5	7.3		7.7	7.8	7.8	7.8	7.8	7.8	7.6	7.8
7	8.1	8.1	8.0	8.0	8.0	7.9	7.8	7.3		8.1	8.1	8.1	8.1	8.1	8.0	7.9	7.5
8										8.0	8.0	8.0	8.0	7.9	7.9	7.8	7.4
				onduc	_							С	onduc	tivity (	(μS/cn	n)	
0	213	223	224	240	276	304	437	625									
1	212	224	236	249	280	335	445	658		260	238	326	274	299	349	514	836
2	213	232	235	256	282	333	441	658		251	248	292	289	321	372	545	802
3	300	252	245	256	285	341	448	650		259	257	321	289	324	370	513	794
4	272	246	243	261	285	337	448	685		278	263	289	312	317	381	670	772
5	185	204	202	231	232	293	392	562		212	224	244	259	279	340	272	654
6	187	195	205	219	250	286	382	573		216	236	250	261	280	332	541	704
7	207	212	221	233	260	316	413	601		221	227	288	289	297	342	593	781
8										256	234	292	261	287	326	348	770
				solved		-	g/L)		i	1		Diss	solved	Oxyg	en (m	g/L)	
0	7.7	7.7	7.7	7.7	7.6	7.6	7.6	7.6									
1	7.5	7.5	7.4	7.4	7.4	7.4	7.4	7.6		7.7	7.5	7.4	7.4	7.4	7.3	7.3	7.3
2	7.3	7.3	7.3	7.4	7.4	7.4	7.4	7.8		7.5	7.5	7.4	7.4	7.4	7.4	7.3	7.4
3	7.7	7.4	7.2	7.2	7.2	7.2	7.3	7.3		7.5	7.5	7.3	7.3	7.3	7.2	7.2	7.2
4	7.7	7.6	7.4	7.5	7.5	7.5	7.5	7.9		7.7	7.5	7.5	7.5	7.5	7.4	7.4	7.5
5	7.5	7.5	7.6	7.7	7.6	7.8	7.8	8.0		7.9	7.8	7.7	7.7	7.6	7.5	7.4	7.6
6	7.7	7.7	7.7	7.7	7.8	7.7	7.7	7.8		7.8	7.8	7.6	7.6	7.6	7.6	7.6	7.7
7	7.6	7.7	7.7	7.7	7.6	7.7	7.6	7.6		7.6	7.7	7.8	7.8	7.7	7.6	7.7	7.8
8						10 = 1				7.4	7.5	7.4	7.4	7.5	7.4	7.3	7.3
_ 1					eratur		1						Temp	eratur	e (°C)		
0	25	25	25	25	25	25	25	25									
1	25	25	25	25	25	25	25	25		25	25	25	25	25	25	25	25
2	25	25	25	25	25	25	25	25		25	25	25	25	25	25	25	25
3	25	25	25	25	25	25	25	25		25	25	25	25	25	25	25	25
4	25	25	25	25	25	25	25	25		25	25	25	25	25	25	25	25
5	25	25	25	25	25	25	25	25		25	25	25	25	25	25	25	25
6	25	25	25	25	25	25	25	25		25	25	25	25	25	25	25	25
7	25	25	25	25	25	25	25	25		25	25	25	25	25	25	25	25
8										25	25	25	25	25	25	25	25



### **Comments/Statistics**

Client: SRK100

Reference: 15-1498-01-CDD

#### **Test Result Comments:**

None

#### Data Analysis:

Endpoints for mortality could not be calculated. No effect occurred.

Regression analysis was attempted on the data, but the assumptions of normality and homoscedasticity of residuals were not met. Therefore, endpoints for reproduction were calculated □ using a Linear Interpolation model using CETIS v. 1.9.0.8

#### **Protocol Deviations:**

None



# Ceriodaphnia Test Report

## **Quality Assurance Information**

Culture history for adults used in the test for reference 15-1498:

### Number of young produced per brood adult:

(Note: The third brood per adult may be on the day the test is set)

	row/replicate	A2	A2	D7	D9	B9	D4	D5				
	number of young											
	number of adults											
												_
		A2	A2	D7	D9	B9	D4	D5	1		1	
	number of young											
	number of adults											
		4.0	4.0	<b>D</b> -7	D.o.	D.O.	5.4	D.5				
	number of young	A2	A2	D7	D9	B9	D4	D5		1	ı	
	number of adults											
	number of addits									l		
		A2	A2	D7	D9	В9	D4	D5				
	number of young	712	712	3		4	<u>Б</u> -	2				
	number of adults			1		1		1				
		A2	A2	D7	D9	В9	D4	D5				
	number of young	3	4	6	4	8	3	6				
	number of adults	1	1	1	1	1	1	1				
							•	•		•	•	
		A2	A2	D7	D9	B9	D4	D5				
	number of young	6	8	10	3	10	4	17				
	number of adults	1	1	1	1	1	1	1				
DAYLICED		A2	A2	D7	D9	B9	D4	D5				
DAY USED	number of young	8	12	16	9	12	14	17				
2015/10/30	number of adults	1	1	1	1	1	1	1				
		۸.0	4.0	D7	DO	DO.	D4	DE				
totals	number of young	A2 17	A2 24	D7 19	D9 16	B9 22	D4 21	D5 25		1	I	
(# of young in first		17	24	13	10	22	21	23				
3 broods)										<u> </u>		
	produced per orgai	niem ir	the le	et broo	d hofor	0.1100				13	1	
number or young	produced per organ	115111 11	i iiie ia	St D100	u beloi	e use				13	ļ	
Moan number of	surviving young per	adult :	over the	o firet tl	aroo br	oods				21	1	
ivicali liullibel UI S	sarviving young per	auuii	OVEI III	5 111 St ll	"CG DI	oous					l	
Culture mortality	over the last seven	dave								4	1	
Culture mortality (	over the last severi	uays									J	



## **Result Summary**

Client: SRK100

Reference: 15-1498-01-FMD

Client: SRK Consulting; operation Lupin Mine

Sample: LUP-10-151027

**Collection:** collected on 2015/10/27 at not given by AJB **Receipt:** received on 2015/10/29 at 1600 by MC

Containers: received 4 x 20 L jugs, 8 x 1 L bottle at 10 °C, in good

condition with seals and no initials

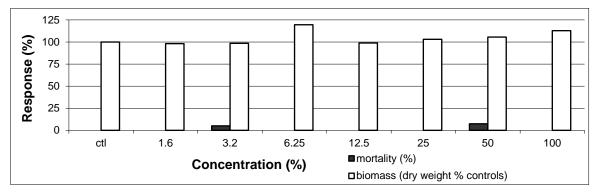
Description: type: water, collection method: not given

Test: started on 2015/10/30; ended on 2015/11/06

Result:

	Endpoint (7-day)	Value	Confidence Limits (95%) lower upper	Units	Method Calculated
Acute: (survival)	LC25 LC50	>100 >100		% %	could not be calculated could not be calculated
Chronic: (growth)	IC25 IC50	>100 >100		% %	could not be calculated could not be calculated

Notes: LCx & ICx, concentrations lethal or inhibitory to 'x' percent of the test population;



The test data and results are authorized and verified correct.



our liability is limited to the cost of the test requested. The test results only relate to the sample as received, no liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.



### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-FMD

**Method:** Biological Test Method: Test of Larval Growth and Survival Using Fathead minnows. Environment Canada, EPS 1/RM/22, Second Edition, February 2011.

**Test type:** Fathead Minnow 7-d Survival and Growth Static Renewal Test (WTR-ME-052)

**Species:** *Pimephales promelas* **Age:** 24 hours post hatch

**Organism source:** Aquatox Inc., Hot Springs, Arkansas (Batch 20151030FM) **Culture conditions:** temperature, 25.1 °C; dissolved oxygen, 95-100 % saturation

**Shipped:** 2015/10/29

**Breeding Stock Mortality:** < 1 % during the week prior to test initiation

Organisms upon receipt: mortality, < 1 %; temperature, 22°C: dissolved oxygen, 13.2 mg/L

No acclimation was necessary. Test organisms maintained at  $25 \pm 1^{\circ}$ C until loaded. The EC guidance document on the importation of test organisms (1999) has been followed. Test organisms were received in good condition, with inflated swim

bladders and normal feeding behaviour.

Organism observation: No unusual behaviour or appearance or treatment of test

organisms was noted prior to shipping, upon arrival, preceding or during the test.

Normal feeding behaviour was noted during the test.

Sample initial chemistry: pH: 5.1; EC: 658 (µS/cm); DO: 10.1 (mg/L); temperature: 15 °C

hardness (mg CaC03/L): 161; colour: colourless; odour: odourless

**Sample holding time:** 3 days (must be ≤ 3 days); The test was conducted with three subsamples

samples a, b, and c were for days 0 to 2, 3 to 4, and 5 to 6 respectively

Sample storage: 4 ± 2°C in darkness

**Test vessel:** Tests were conducted in 500 mL plastic vessels

Test volume: 250 mL of solution (depth of 6.5 cm), replenished daily

Control/dilution water: The control and dilution water was dechlorinated City of Calgary water acclimated

to the test conditions; no chemicals were added to the dilution/control water

A second control was not set up for this test. However, duplicate controls are run in

the reference toxicant for each batch of fish.

**Test concentrations:** 7 effluent concentrations (1.6, 3.2, 6.3, 13, 25, 50, 100% (v/v)

plus a negative control)

**Test replicates:** Ten fish ≤ 24 hours old were loaded per test vessel; 4 replicates/conc.

Feeding: The test organisms were fed twice daily newly-hatched brine shrimp nauplii

The fish are not fed during the final 12 hours of the test

Measurements: pH, conductivity, dissolved oxygen and temperature were measured daily

**Sample pre-treatment:** The sample was not aerated, pH or hardness adjusted prior to or during testing.

No sample filtration, settling, or decanting occurred prior to or during testing

The dissolved oxygen concentration (mg/L) was: 8.3

The sample pH was: 7.6

**Lighting:** Overhead full spectrum fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 25 ± 1°C

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.



Note: Outlined sections are protocol deviations explained on the comment page

### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-FMD

Endpoint: Survival, 7-d LC50 (with 95% confidence limits)

Biomass, 7-d IC25 (with 95% confidence limits)

Test endpoints were bracketed by at least 1 test concentration

(except for <1.6% or >100 %)

No outliers were observed within the data set

**Test validity:** Control had 100% survival (must ≥ 80%)

Control had 0% abnormal behaviour (must < 20%), e.g. atypical swimming, loss of

equilibrium

The average dry weight of the control fish was 0.3 (must ≥ 0.25 mg)

Reference toxicant: 7-d test with NaCl initiated October 30, 2015;

current results: (7-d LC50 and 95% confidence limits) = 2.86 (2.80-2.91) log (mg/L NaCl) current results: (7-d IC25 and 95% confidence limits) =2.67 (2.60-2.69) log (mg/L NaCl) historical results: (7-d LC50 and 95% confidence limits) =2.96 (2.76-3.15) log (mg/L NaCl) historical results: (7-d IC25 and 95% confidence limits) =2.71 (2.54-2.88) log (mg/L NaCl)

The reference toxicant test was performed under the same conditions as those used during this test.



## **Test Data**

Client: SRK100

Reference: 15-1498-01-FMD

### Test Log:

Data	Day	Time	Tachniciana	Temperature Before Use(°C)				
Date	Day	Time	Technicians	Control	Sample			
2015/10/30	0	1600	JW/JN/JK/DS	25	25			
2015/10/31	1	1455	JN	25	25			
2015/11/01	2	1130	HL/NM/JW	25	25			
2015/11/02	3	1355	CQ	25	25			
2015/11/03	4	1000	DS/EP	25	25			
2015/11/04	5	1230	JK	25	25			
2015/11/05	6	1100	JK/EP	25	25			
2015/11/06	7	1330	CQ/JW	na	na			

Combined Mortality and Atypical Swimming Behavior (%):

			• • • • • • • • • • • • • • • • • • • •	,	( / • / •			
Day	ctl	1.6	3.2	6.3	12.5	25	50	100
0	0%	0%	0%	0%	0%	0%	0%	0%
1	0%	0%	0%	0%	0%	0%	0%	0%
2	0%	0%	3%	0%	0%	0%	3%	0%
3	0%	3%	2%	0%	0%	3%	8%	0%
4	0%	0%	5%	0%	0%	3%	8%	0%
5	0%	0%	5%	0%	0%	3%	8%	0%
6	0%	0%	5%	0%	0%	0%	8%	0%
7	0%	0%	5%	0%	0%	0%	8%	0%

Chemistry	Sumr	mary <sup>†</sup>	Tables	s:												
			New 9	Solutio	ons						Old S	olutio	าร			
Conc. (%)	ctl	1.6	3.2	6.25	12.5	25	50	100	ctl	1.6	3.2	6.25	12.5	25	50	100
•																
	Average Values															
рН	8.2	8.2	8.2	8.2	8.2	8.1	8.0	7.6	8.0	8.0	8.0	8.0	8.0	7.9	7.8	7.2
cond.	434	447	452	460	473	508	555	664	440	444	456	463	479	504	558	664
DO	7.7	7.6	7.6	7.6	7.6	7.7	7.8	7.9	7.2	7.1	7.0	6.9	6.9	6.9	6.9	6.9
temp	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
						C	oeffici	ents of	<sup>[</sup> Varia	tion (9	%)					
рН	2	2	2	2	2	2	1	4	2	1	2	1	2	1	1	3
cond.	5	5	4	4	4	7	3	2	4	6	2	2	2	3	2	2
DO	1	1	1	2	1	1	3	4	3	2	2	3	4	4	4	4
temp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



### **Test Data**

Client: SRK100 Reference: 15-1498-01-FMD

Biology (n	umbe	r alive	e):				Biology (% mortality):									
Conc. (%)	ctl	1.6	3.2	6.25	12.5	25	50	100	ctl	1.6	3.2	6.25	12.5	25	50	100
Replicate	4.0	4.0		Day 1		- 40	4.0	4.0				Day 1				
a	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0
b	10	10 10	10 10	10 10	10 10	10	10 10	10 10	0	0	0	0	0	0	0	0
c d	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0
u	10	10	10	10	10	10	10	10	U	U	U	U	U	U	U	U
				Day 2								Day 2				
а	10	10	10	10	10	10	10	10	0	0	0	Ó	0	0	0	0
b	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0
С	10	10	9	10	10	10	10	10	0	0	10	0	0	0	0	0
d	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0
				Day								David				
а	10	10	10	Day 3 10	10	10	10	10	0	0	0	Day 3 0	0	0	0	0
b	10	10	9	10	10	10	9	10	0	0	10	0	0	0	10	0
C	10	10	9	10	10	10	10	10	0	0	10	0	0	0	0	0
d	10	10	10	10	10	10	8	10	0	0	0	0	0	0	20	0
		1		Day 4			1		_	ı		Day 4				
a	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0
b	10	10	9	10	10	10	9	10	0	0	10	0	0	0	10	0
C	10	10	9	10	10	10	10	10	0	0	10	0	0	0	0	0
d	10	10	10	10	10	10	8	10	0	0	0	0	0	0	20	0
				Day 5	;							Day 5				
а	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0
b	10	10	9	10	10	10	9	10	0	0	10	0	0	0	10	0
С	10	10	9	10	10	10	10	10	0	0	10	0	0	0	0	0
d	10	10	10	10	10	10	8	10	0	0	0	0	0	0	20	0
				D - 0								D . 0				
2	10	10	10	Day 6 10	10	10	10	10	0	0	0	Day 6 0	0	0	0	0
a b	10	10	9	10	10	10	9	10	0	0	10	0	0	0	10	0
C	10	10	9	10	10	10	10	10	0	0	10	0	0	0	0	0
d	10	10	10	10	10	10	8	10	0	0	0	0	0	0	20	0
-																
			_	Day 7					-			Day 7				
a	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0
b	10	10	9	10	10	10	9	10	0	0	10	0	0	0	10	0
С	10	10	9	10	10	10	10	10	0	0	10	0	0	0	0	0
d	10	10	10	10	10	10	8	10	0	0	0	0	0	0	20	0



Client: SRK100

Reference: 15-1498-01-FMD

Conc. (%) ctl 1.6 3.2 6.25 12.5 25 50 100 ctl 1.6 3.2 6.25 12	25 0		
	2.5 2	25 50	100
Replicate Day 1 Day 1		ī	
		0 0	0
		0 0	0
		0 0	0
d 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 0	0
Day 2 Day 2			
	0	0 0	0
		0 0	0
c 0 0 0 0 0 0 0 0 0 0 0 0	0	0 0	0
d 0 0 0 0 0 0 1 0 0 0 0 0	0	0 10	0
Day 3 Day 3 a 0 0 0 0 0 1 0 0 0 0 0 0	0 1	10 0	0
	-	0 0	0
	-	0 0	0
		0 0	0
	<u> </u>	0 0	J
Day 4 Day 4			
		10 0	0
		0 0	0
		0 0	0
d 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 0	0
Day 5 Day 5			
	0	0 0	0
		0 0	0
		10 0	0
		0 0	0
	•	•	
Day 6 Day 6			
		0 0	0
		0 0	0
		0 0	0
d 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 0	0
Day 7 Day 7			
	0	0 0	0
		0 0	0
c 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 0	0
d 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 0	0



### **Test Data**

Client: SRK100

Reference: 15-1498-01-FMD

**Unpreserved Dry Weights (mg)** 

Conc. (%)	ctl	1.6	3.2	6.25	12.5	25	50	100	
	3.1	2.5	3.3	3.8	2.9	3.1	3.2	3.8	
	3.2	3.3	2.9	3.6	3.0	3.1	3.3	3.4	
	2.9	3.1	2.6	3.5	2.8	2.8	3.2	3.2	
	2.7	2.9	3.1	3.4	3.2	3.3	3.0	3.1	

**Biology Summary Tables:** 

Biology ou	a	. <b>,</b> . u.	J. 00.													
Conc. (%)	ctl	1.6	3.2	6.25	12.5	25	50	100	ctl	1.6	3.2	6.25	12.5	25	50	100
			Мо	rtality	(%)				Biomass Data (mg per fish)							
а	0	0	0	0	0	0	0	0	0.31	0.25	0.33	0.38	0.29	0.31	0.32	0.38
b	0	0	10	0	0	0	10	0	0.32	0.33	0.29	0.36	0.30	0.31	0.33	0.34
С	0	0	10	0	0	0	0	0	0.29	0.31	0.26	0.35	0.28	0.28	0.32	0.32
d	0	0	0	0	0	0	20	0	0.27	0.29	0.31	0.34	0.32	0.33	0.30	0.31
_																
mean	0	0	5	0	0	0	8	0	0.30	0.29	0.29	0.36	0.30	0.31	0.32	0.34
sd	0	0	6	0	0	0	10	0	0.02	0.03	0.03	0.02	0.02	0.02	0.01	0.03
cv(%)	0	0	115	0	0	0	128	0	8	12	11	5	6	6	4	9

Biomass as a Percent of Controls

Trivilage Bry Weight of Carviving Control Field.   C.Co.   Too   Co.   T.Zo   Co.   Too   T.Co	Average Dry Weight of Surviving Control Fish:	0.30	100	98	98	120	99	103	106	113
--	---	------	-----	----	----	-----	----	-----	-----	-----



**Test Data** 

Client: SRK100

Reference: 15-1498-01-FMD

Ch	ρm	iet	rv-
O	<b>U</b>		<b>y</b> .

···········	New Solutions Old Solutions															
Conc. (%)	ctl	1.6	3	6.25	12.5	25	50	100	ctl	1.6	3	6.25	12.5	25	50	100
Day				H (unit							pl	I (unit	s)			
0	8.0	8.1	8.1	8.1	8.1	8.0	8.0	7.6								
1	8.0	8.0	8.0	8.0	8.0	8.0	7.9	7.6	8.0	8.0	8.0	8.0	8.0	7.9	7.8	7.5
2	8.3	8.3	8.3	8.3	8.3	8.3	8.2	7.8	8.1	8.1	8.2	8.1	8.1	8.0	7.9	7.1
3	8.2	8.2	8.2	8.2	8.2	8.2	8.1	7.7	7.9	8.0	8.0	8.0	7.8	7.9	7.7	7.2
4	8.3	8.3	8.3	8.3	8.3	8.2	8.1	7.8	8.1	8.1	8.1	8.1	8.0	8.0	7.8	7.3
5	8.0	8.0	8.0	8.0	8.0	8.0	7.9	7.6	7.9	7.9	7.9	7.9	7.9	7.8	7.7	7.3
6	8.3	8.3	8.3	8.3	8.2	8.0	8.0	7.0	8.2	8.2	8.2	8.1	8.2	8.0	7.9	7.2
7									7.8	7.9	7.9	7.8	7.8	7.8	7.6	6.9
8																
					(μS/cn					С	onduc	tivity (	μS/cn	<u>n)</u>		
0	416	438	444	453	472	505	575	675								
1	454	465	472	480	492	516	566	667	423	445	449	455	473	510	572	666
2	429	445	449	456	468	490	552	666	466	385	470	479	489	524	575	677
3	400	421	428	436	453	481	543	665	427	455	453	462	476	504	552	669
4	471	473	476	487	494	579	566	674	445	453	449	458	470	506	560	674
5	438	461	464	471	483	509	552	650	430	456	456	463	474	501	545	650
6	427	425	428	434	446	473	528	649	461	466	468	473	492	506	555	653
7									425	445	444	449	478	480	546	658
8																
_ 1					en (m					Diss	solved	Oxyg	en (m	g/L)		
0	7.5	7.5	7.6	7.6	7.6	7.7	8.2	8.3								
1	7.7	7.6	7.6	7.6	7.6	7.6	7.7	7.8	7.5	7.2	7.1	6.9	6.9	6.9	6.9	6.9
2	7.5	7.5	7.5	7.5	7.7	7.6	7.6	7.6	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
3	7.7	7.6	7.6	7.5	7.5	7.6	7.6	7.8	7.0	6.9	6.8	6.7	6.5	6.4	6.5	6.5
4	7.7	7.7	7.7	7.7	7.7	7.8	7.8	7.7	7.3	7.3	7.3	7.3	7.2	7.3	7.3	7.3
5	7.8	7.8	7.7	7.8	7.7	7.7	7.8	8.2	7.4	7.1	7.0	6.8	6.6	6.7	6.7	6.8
6	7.7	7.7	7.5	7.5	7.5	7.6	7.6	8.2	7.5	7.0	6.9	6.9	6.8	6.9	6.9	6.8
7									7.0	7.0	7.0	7.0	7.1	7.0	6.9	7.0
8			<b>-</b>		(00)						<b>-</b>		. (00)			
0	0.5			eratur		0.5	0.5	05			remp	eratur	e (°C)			
0	25	25	25	25	25	25	25	25		0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
2	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
3	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
4	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
5	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
6	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
7									25	25	25	25	25	25	25	25
8																



## **Comments/Statistics**

Reference: 15-1498-01-FMD

#### **Test Result Comments:**

None

### Data Analysis:

Endpoints for mortality could not be calculated. No effect occurred.

Endpoints for biomass could not be calculated. No effect occurred.

### **Protocol Deviations:**

None



## **Result Summary**

Client: SRK100

Reference: 15-1498-01-LMD

Client: SRK Consulting; operation Lupin Mine

Sample: LUP-10-151027

**Collection:** collected on 2015/10/27 at not given by AJB **Receipt:** received on 2015/10/29 at 1600 by MC

Containers: received 4 x 20 L jugs, 8 x 1 L bottle at 10 °C, in good

condition with seals and no initials

**Description:** type: water, collection method: not given

Test: started on 2015/10/29; ended on 2015/11/05

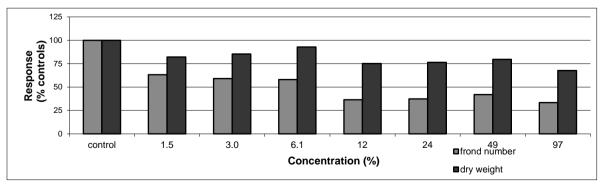
Result:

Chronic:	Endpoint (7-day)	Value	Confidence lower	Limits (95%) upper	Units	Method Calculated
Frond Number	IC25	<1.5	<1.5	<1.5	%	3P Log-Logistic
Inhibition	IC50	7.9	4.6	13.5	%	3P Log-Logistic
Dry Weight	IC25	57	n/a	n/a	%	Linear Interpolation
Inhibiton	IC50	>97	n/a	n/a	%	Linear Interpolation

Notes: ICx, concentrations lethal or inhibitory to 'x' percent of the test population;

Chronic:	Observed	lest Concentrations		Method Calculated
Frond Number Stimulation	no	none	%	Dunnet Multiple Comparison Test
Dry Weight Stimulation	no	none	%	Dunnet Multiple Comparison Test

Notes: Stimulation refers to increased response at all concentrations or at high concentrations



The test data and results are authorized and verified correct.

Senior Verifier

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.



### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-LMD

Method: Biological Test Method: Test for Measuring the Inhibition of Growth Using

the Freshwater Macrophyte, Lemna minor. Environment Canada,

EPS 1/RM/37 2nd Edition, January 2007

Test type: Lemna 7-d Inhibition of Growth Static Test (WTR-ME-030)

Species: Lemna minor

**Organism source:** in-house culture, ≥ 3 weeks in age (original source: UTCC 492, clone 7730)

Culture health: The fronds were acclimated in test media (>2cm) for 24 hours prior to test initiation.

The test culture was axenic prior to testing.

There was an 19 fold increase in frond number of culture over last 7 days.

Test loaded with 3 frond daughter plants, all with light green fronds and short roots.

Culture age: The test was started with 10 day old fronds.

Culture media: modified Hoagland's E+ medium

Organism observation: No unusual behaviour, appearance or treatment of test organisms was noted prior to

or during the test.

Sample initial chemistry: pH: 5.1; EC: 658 (µS/cm); DO: 10.1 (mg/L); temperature: 15 °C

hardness (mg CaC03/L): 161; colour: colourless; odour: odourless

**Sample holding time:** 2 days (must be  $\leq$  3 days)

Sample storage: 4 ± 2°C in darkness

Test vessel: The test was a static test conducted in 200 mL polyethylene plastic

containers with clear lids. Test vessel size is adequate to ensure no overlapping of

fronds occurs.

Test volume: The test volume was 150 mL, depth of > 4 cm

Test concentrations: 7 effluent concentrations (1.5, 3.0, 6.1, 12.1, 24, 49, 97% (v/v) plus a negative control)

**Test replicates:** There were four replicates per treatment with two 3 frond daughter plants

per replicate; replicates are randomly rotated daily.

Control/dilution water: Test media (modified APHA medium) made up with deionized City of Calgary water

water spiked with nutrients as per Environment Canada EPS 1/RM/37, 2007. made by adding 60 mL of each of the three stock solutions to 5.82 L of DRO

The media aerated for 2 hours and was pH adjusted to 8.3 ± 0.1 with 6N HCl or NaOH.

The test media was not filtered.

Elutriate preparation: 2015/10/29

Sample pre-treatment: 1455 mL of sample spiked with 15 mL of each of the three APHA stock solutions,

no other chemicals added. The sample was not pH adjusted or filtered prior to testing.

**Aeration:** The sample was pre-aerated for 20 minutes at a rate of 100 bubbles/minute with

oil free filtered compressed air from a 1 mL glass pipette attached to an air pump.



### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-LMD

Lighting: The cups were incubated under continuous full-spectrum light. The light levels

were measured at the sample surface, at three locations on the testing bench,

during testing: left: 4970 lux  $\approx$  80  $\mu$ mol/m<sup>2</sup>•S centre: 4160 lux  $\approx$  67  $\mu$ mol/m<sup>2</sup>•S

centre: 4160 lux  $\approx$  67  $\mu$ mol/m<sup>2</sup>•S right: 4650 lux  $\approx$  74  $\mu$ mol/m<sup>2</sup>•S

Measurements:

pH, conductivity, dissolved oxygen and temperature at test initiation and termination;

temperature in the control, low, middle and high concentrations are recorded daily.

Test temperature: 25 ± 2°C

Endpoint: Growth (based on increase in frond number), 7-d IC25 (with 95% confidence limits)

Growth (based on dry weight), 7-d IC25 (with 95% confidence limits) Test endpoints were bracketed by at least 1 test concentration.

(except for <1.5% or >97 %)

No outliers were observed within the data set

Test validity: The mean number of fronds in the controls have increased 9 times

(must be ≥ 8 time increase). The average number attained at test termination

was 56 (must be ≥48 fronds per test vessel).

Reference toxicant: 7-d test with Potassium Chloride (KCI) initiated November 6, 2015;

current results:

(Frond Number; 7-d IC25 and 95% confidence limits) = 3.28 (2.89-3.46) log(mg KCl/L)

Historical results:

(Frond Number, 7-d IC25 and 95% confidence limits) = 3.28 (3.10-3.46) log(mg KCl/L)

current results:

(Dry Weight; 7-d IC25 and 95% confidence limits) = 3.83 (3.74-3.93) log (mg KCl/L)

Historical results:

(Dry Weight; 7-d IC25 and 95% confidence limits) = 3.56 (3.22-3.90) log (mg KCl/L)

The reference toxicant test was performed under the same conditions as those used

during this test.



### **Test Data**

Client: SRK100

Reference: 15-1498-01-LMD

Test Log:

rest Log.									
Date	Day Time Technicians Rota				Temperature (°C)				
Date	Day	Tille	recifficialis	Notate	Control	3.0%	24%	97%	
2015/10/29	0	1715	CQ/JP	na	25	25	25	25	
2015/10/30	1	0815	JK	yes	24	24	24	24	
2015/10/31	2	0820	JK	yes	24	24	24	24	
2015/11/01	3	0800	HKS	yes	24	24	24	24	
2015/11/02	4	0830	JK	yes	24	24	24	24	
2015/11/03	5	0820	JK	yes	24	24	24	24	
2015/11/04	6	0820	JK	yes	24	24	24	24	
2015/11/05	7	1330	HKS/EP/CQ	na	25	25	25	25	

Chemistry:									
Conc.(%)	control	1.5	3.0	6.1	12	24	49	97	
				Day 0					
рН	8.3	8.4	8.5	8.5	8.4	8.4	8.3	7.8	
cond.	971	978	976	993	1029	1062	1164	1393	
DO	7.6	7.6	7.6	7.6	7.6	7.7	7.7	8	
temp.	25	25	25	25	25	25	25	25	
								-	
				Day 7					
рН	8.5	8.5	8.5	8.4	8.4	8.4	8.4	8.3	
cond.	1097	1397	1545	1517	1672	1614	1702	1848	
DO	8.7	8.7	8.3	8.1	8	7.9	7.9	7.9	
temp.	26	26	26	26	26	26	26	26	
AL				1 ( // // )		, (00)			

Notes: pH, units; cond., conductivity (µS/cm); DO, dissolved oxygen (mg/L); temp., temperature (°C)

#### Frond Appearance:

i iona Appearance.		
Concentration (%)	Day 0	Day 7
control	green, short roots, healthy	medium green, long roots, healthy
1.5	green, short roots, healthy	medium green, long roots, healthy
3.0	green, short roots, healthy	medium green, long roots, healthy
6.1	green, short roots, healthy	medium green, long roots, healthy
12.1	green, short roots, healthy	light green, long roots, some necorsis
24	green, short roots, healthy	light green, long roots, some necorsis
49	green, short roots, healthy	light green, long roots, some necorsis
97	green, short roots, healthy	light green, long roots, some necorsis

Notes: chl, chlorotic; nec, necrotic; asf, abnormally sized fronds; gib, gibbosity; cd, colony destroyed; rd, roots destroyed; lb, loss of bouyancy; ag, algae



				Client: SRK100 Reference: 15-1498-01-LMD					
F			16	est Data			Reference	: 15-1498-0	)1-LMD
Frond numb	er: control	1.5	3.0	6.1	12.1	24	49	97	Ī
COIIC.(%)	CONTROL	1.5	3.0	0.1	12.1	24	49	97	j
Replicate				Day 0					
a	6	6	6	6	6	6	6	6	[
b	6	6	6	6	6	6	6	6	ĺ
С	6	6	6	6	6	6	6	6	
d	6	6	6	6	6	6	6	6	ĺ
	•	•	-	5 7	- <del>-</del>		•	-	,
_		22	27	Day 7	1 22	24	T 20	0.4	ľ
a	55	33	37	32	22	34	29	24	
b	62 59	39 36	36 33	33 34	21 24	25 19	30 25	26 17	
c d	46	41	35	40	29	20	23	23	
u l	40	41	33	40	29	20		23	i
average	56	37	35	35	24	25	27	23	[
fold increase		6	6	6	4	4	4	4	
									1
Increase in F	1								•
а	49	27	31	26	16	28	23	18	
b	56	33	30	27	15	19	24	20	
С	53	30	27	28	18	13	19	11	
d	40	35	29	34	23	14	17	17	Ĺ
average	50	31	29	29	18	19	21	17	Ī
average sd	7	4	2	4	4	7	3	4	ļ
CV	14	11	6	13	20	37	16	23	! 
% ctls	100	63	59	58	36	37	42	33	ľ
% stim	0	-37	-41	-42	-64	-63	-58	-67	<u> </u>
70 <b>3</b>	Ū	<u> </u>			<u> </u>		1 00	<u> </u>	ı
Total Dry We			1		, ,		•	T	1
Conc.(%)	control	1.5	3.0	6.1	12.1	24	49	97	
Replicate					Day 7				
a	5.4	3.5	4.5	4.4	3.1	5.0	4.2	4.1	ĺ
b	5.9	4.4	4.7	4.8	3.8	4.1	5.0	3.6	ľ
c	6.1	4.5	4.2	4.5	5.1	3.8	3.4	3.0	<u> </u>
d	4.0	4.9	4.7	6.1	4.0	3.5	4.4	3.7	
~				J.,		3.0			1
,			· · · ·		Day 7		· · ·		7
average	5.3	4.4	4.5	4.9	4.0	4.1	4.2	3.6	
sd	0.9	0.6	0.2	0.8	0.8	0.6	0.7	0.4	
CV	18	13	5	15	21	16	15	12	
%ctls	100	82	85	93	75	76	80	68	

Notes: cv, coefficient of variation; %ctls, percent of controls; sd, standard deviation, % stim, percent stimulation

-15

-18

-25

-24

-20

-32

-7

% stim



### **Comments/Statistics**

Client: SRK100

Reference: 15-1498-01-LMD

#### **Test Result Comments:**

None

### **Data Analysis:**

Endpoints for frond number were calculated using a non-linear regression model (3P Log-Logistic) with CETIS v. 1.9.0.8

Regression analysis was attempted on the data, but the assumptions of normality and homoscedasticity of residuals were not met. Therefore, endpoints for biomass were calculated using a Linear Interpolation ☐ model using CETIS v. 1.9.0.8

Significant stimulatory effects in frond number were not observed in any test concentration as calculated by ANOVA analysis with CETIS v. 1.9.0.8. (Dunnet Multiple Comparison).

Significant stimulatory effects in dry weight were not observed in any test concentration as calculated by ANOVA analysis with CETIS v. 1.9.0.8 (Dunnet Multiple Comparison).

#### **Protocol Deviations:**

None



## **Result Summary**

Client: SRK100

Reference: 15-1498-01-TRD

Client: SRK Consulting; operation Lupin Mine

Sample: LUP-10-151027

**Collection:** collected on 2015/10/27 at not given by AJB **Receipt:** received on 2015/10/29 at 1600 by MC

Containers: received 4 x 20 L jugs, 8 x 1 L bottle at 10 °C, in good

condition with seals and no initials

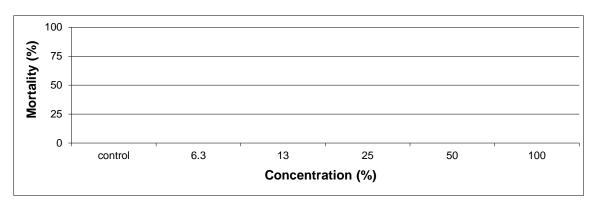
Description: type: water, collection method: not given

Test: started on 2015/10/31; ended on 2015/11/04

Result:

	Endpoint (96-hour)	Value (%)	Confidence Limits (95%) lower upper	Method Calculated
Acute: (mortality)	LC50 LC25	>100 >100		could not be calculated could not be calculated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population



The test data and results are authorized and verified correct.

Senior Verifier

our liability is limited to the cost of the test requested. The test results only relate to the sample as received, no liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.



### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-TRD

Method: Biological Test Method: Reference Method for Determining Acute Lethality of

Effluents to Rainbow Trout, 2000. Environment Canada, EPS 1/RM/13.

Second Edition (amended May 2007).

Test type: Trout 96-h Static Acute Test (WTR-ME-041)

Species: Oncorhynchus mykiss

**Organism source:** Sam Livingston (Batch 20151009TR)

**Acclimation:** 22 days (must be ≥2 weeks)

Stock mortality: 0.08% (seven days preceding testing)

Sample initial chemistry: pH: 5.1; EC: 658 (µS/cm @ 25°C); DO: 10.1 (mg/L); temperature: 15 °C

hardness (mg CaC03/L): 161; colour: colourless; odour: odourless

**Sample holding time:** 4 days (must be  $\leq$  5 days)

Sample storage: 4 ± 2°C in darkness

Test vessel: The test was conducted in 22 L plastic pails with polyethylene liners

**Test volume:** 20 Litres (depth of solution in each test vessel ≥15cm)

Sample pre-treatment: All test solutions and controls were pre-aerated for 120 minutes at 6.5 ±1 mL/min/L

Dissolved oxygen in 100 % sample was 8.9 mg/L after pre-aeration. The sample was not filtered or pH adjusted prior to or during testing.

**Loading density:** 0.193 g/Litre (must be  $\leq$  0.5 g/Litre)

Control/dilution water: Dechlorinated City of Calgary water acclimated to test conditions

**Test concentrations:** 5 effluent concentrations (6.3, 12.5, 25, 50, 100% (v/v) plus a negative control)

Test replicates: One replicate per treatment; 10 fish per replicate

Feeding: Fish are not fed 24 hours before test initiation and no feeding during test

Measurements: pH, conductivity, dissolved oxygen and temperature measured at test initiation and

test termination

**Aeration:** All treatments aerated at 6.5 ±1 mL/min/L by oil-free compressed air

passed through airline tubes connected to disposable air stones

Lighting: Overhead full spectrum fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 15 ± 1°C

**Endpoint:** Mortality, 96-h LC50 (with 95% confidence limits) **Test validity:** The control had 100% survival (must ≥ 90%)

The control had 0 percent (%) stressed behaviour (must ≤ 10%)

Reference toxicant: 96-h test with Potassium Chloride (KCI) initiated October 26, 2015; current results

(96-h LC50 and 95% confidence limits) = 0.58 (0.50-0.63) log (g/L KCl)

historical results:

 $(96-h LC50 \text{ and } 95\% \text{ confidence limits}) = 0.57 (0.50-0.64) \log (g/L KCI)$ 

Note: Outlined sections are protocol deviations explained on the comment page; v/v, volume per volume



### **Test Data**

Client: SRK100

Reference: 15-1498-01-TRD

Test	Log
------	-----

Date	Day	Time	Technician
2015/10/31	0	1600	CQ
2015/11/01	1	0830	HL
2015/11/02	2	0945	DS
2015/11/03	3	0830	ML/HKS
2015/11/04	4	0950	DS/CQ/JW

### Chemistry:

Conc. (%)	control	6.3	13	25	50	100

Day	pH (units)								
0	7.3	7.3	7.4	7.3	7.3	7.1			
4	7.8	7.8	7.8	7.7	7.6	7.2			

	Conductivity (µS/cm @ 25°C)								
0	439	457	465	491	530	643			
4	423	452	451	478	516	623			

			Dissol	ved Oxygen	(mg/L)	
0	8.6	8.7	8.7	8.6	8.6	8.9
1	8.3	8.5	8.6	Q 7	<b>Q</b> 7	8.6

			Te	mperature (	°C)	
0	15	15	16	16	16	15
4	15	15	15	15	15	15

### Number Alive (In brackets number stressed):

Conc. (%)	control	6.3	13	25	50	100

Day						
0	10	10	10	10	10	10
1	10	10	10	10	10	10
2	10	10	10	10	10	10
3	10	10	10	10	10	10
4	10	10	10	10	10	10

	Mortality (%)						
4	0	0	0	0	0	0	

	Stressed (%)						
4	0	0	0	0	0	0	



Reference: 15-1498-01-TRD

Client: SRK100

### **Biology Summary Tables:**

Control	Length	Wet
Fish	(cm)	Weight(g)
1	4.1	0.8
2	3.5	0.5
3	3.6	0.6
4	3.1	0.3
5	3.1	0.3
6	2.9	0.3
7	3.0	0.3
8	3.1	0.3
9	2.9	0.3
10	2.8	0.2

average	3.2	0.4
sd	0.4	0.2
cv(%)	12.6	46.9

Notes: nd, not done; na, not applicable; sd, standard deviation; cv(%), coefficient of variation

## **Test Data**

Conc. (%)	Group Wet Weight (g)
control	3.9
6.3	3.1
13	2.9
25	3.0
50	3.4
100	3.9

## Comments/Statistics

#### **Test Result Comments:**

None

### **Data Analysis:**

Endpoints for mortality could not be calculated. No effect occurred.

#### **Protocol Deviations:**

None



## **Result Summary**

Client: SRK100

Reference: 15-1498-01-DAD

Client: SRK Consulting; operation Lupin Mine

Sample: LUP-10-151027

**Collection:** collected on 2015/10/27 at not given by AJB **Receipt:** received on 2015/10/29 at 1600 by MC

Containers: received 4 x 20 L jugs, 8 x 1 L bottle at 10 °C, in good

condition with seals and no initials

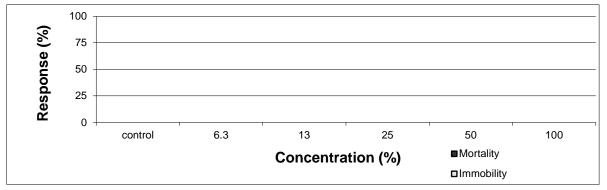
Description: type: water, collection method: not given

Test: started on 2015/10/30; ended on 2015/11/01

R	es	ul	t٠

_	Endpoint	Value	Confidence Limits (95%)	Method Calculated
_	(48-hour)	(%)	lower upper	
Acute:	LC50	>100		could not be calculated
(mortality)	LC25	>100		could not be calculated
Acute:	EC50	>100		could not be calculated
(immobility)	EC25	>100		could not be calculated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population



The test data and results are authorized and verified correct.

Senior Verifier



### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-DAD

Method: Biological Test method: Reference Method for Determining Acute Lethality of

Effluents to Daphnia magna, 2000. Environ. Can., EPS 1/RM/14.

Second Edition.

Test type: Daphnia 48-h Static Acute Test (WTR-ME-015)

Species: Daphnia magna Age: < 24 hours old Organism source: in-house culture

Stock mortality: 0%

Culture brood data: 12 days to first brood

16 neonates per average brood

Sample initial chemistry: pH: 5.1; EC: 658 (µS/cm @ 25°C); DO: 10.1 (mg/L); temperature: 15 °C

hardness (mg CaC03/L): 161; colour: colourless; odour: odourless

**Sample holding time:** 3 days (must be  $\leq$  5 days)

Sample storage: 4 ± 2°C in darkness

Test vessel: 385 mL plastic vessels

Test volume: 150 mL

Sample pre-treatment: The sample was not filtered or pH adjusted prior to or during testing

The sample was pre-aerated for 20 minutes (rate of  $37.5 \pm 12.5$  mL/min.L-1) The hardness of the sample was not adjusted (mg CaCO3/L) prior to or during

testing

**Loading density:** One daphnid/15 mL (must ≤ 1 organism/15 mL)

Control/dilution water: Moderately hard water supplemented with vitamin B12 (2 µg/L)

and Na<sub>2</sub>SeO<sub>3</sub> (5 µg/L)

The hardness of the control/dilution water was 87 mg CaCO<sub>3</sub>/L

**Test concentrations:** 5 effluent concentrations (6.3, 12.5, 25, 50, 100% (v/v) plus a negative control)

Test replicates: One replicate per treatment, 10 daphnids per replicate

Feeding: None Aeration: None

Measurements: pH, conductivity, dissolved oxygen and temperature at test initiation and

termination

Lighting: Cool white fluorescent lights

Photoperiod: 16h light:8h dark

Test temperature: 20 ± 2°C



### **Test Conditions**

Client: SRK100

Reference: 15-1498-01-DAD

Endpoint: Mortality, 48-h LC50 (95% confidence limits)

Immobility, 48-h EC50 (95% confidence limits)

**Test validity:** The control had 100% survival (must ≥ 90%)

Control had 0 percent (%) abnormal behaviour (must ≤ 10%, immobility)

Reference toxicant: 48-h test with NaCl initiated November 4, 2015; current results

(48-h LC50 and 95% confidence limits) = 0.80 (0.78-0.82) log (g/L NaCl)

historical results:

(48-h LC50 and 95% confidence limits) =0.77 (0.70-0.84) log (g/L NaCl)



### **Test Data**

Client: SRK100

Reference: 15-1498-01-DAD

Test		•
1631	LUG	

. oot <b>_o</b> g.			
Date	Day	Time	Technician
2015/10/30	2015/10/30 0		CQ
2015/10/31	1	1015	JK
2015/11/01	2	1015	NM

Chemistry:

Chemistry.							 
Conc. (%)	control	6.3	13	25	50	100	
Dov				nH (unita)			
Day			•	pH (units)	1	•	•
0	8.1	8.0	8.0	7.9	7.8	7.8	
2	7.9	7.8	7.8	7.8	7.7	7.5	
_			Conduct	tivity (µS/cm	@ 25°C)		
0	206	236	264	320	430	631	
2	217	259	302	356	466	696	
_							
			Dissol	ved Oxygen	(mg/L)		
0	7.9	8.0	8.0	8.0	8.0	8.1	
2	7.9	7.9	7.8	7.9	8.0	7.9	
_							
			Τe	emperature (°	°C)		
0	19	19	19	19	19	19	
2	19	19	19	19	19	19	

### **Biology:**

Conc. (%)	control	6.3	13	25	50	100		
<del></del>		=		<del>-</del>		-		
Day			Number A	live and Beh	avior (behav	vior is in brac	ckets)	

Day		Number Alive and Behavior (behavior is in brackets)								
1	10	10	10	10	10	10				
2	10	10	10	10	10	10				

Notes: F, floating; I, immobile; B, stuck on bubble; D, caught in debris; nd, not done; na, not applicable;

		,		-, -,			,,	,				
	Mortality (%)											
2		0	0	0	0	0	0					
	Immobility (%)											
2		0	0	0	0	0	0					



### **Comments/Statistics**

Client: SRK100

Reference: 15-1498-01-DAD

### **Test Result Comments:**

None

### Data Analysis:

Endpoints for mortality could not be calculated. No effect occurred.

Endpoints for immobility could not be calculated. No effect occurred.

### **Protocol Deviations:**

None

#### **GENERAL TERMS AND CONDITIONS:**

These terms and conditions are incorporated into and form part of the Chain of Custody between HydroQual Laboratories Ltd. ("HydroQual") and the party named in the Chain of Custody (the "Client").

- 1. **Definitions:** Capitalized terms shall have the definition ascribed as such in these General Terms and Conditions and the Chain of Custody.
- 2. The Services: HydroQual will provide the Services to the Client as listed and described in the Chain of Custody.
- 3. Prices: HydroQual may review and change all prices, fees, surcharges or other charges as set out in proposals and/or price quotations if there are changes to HydroQual's cost beyond HydroQual's control, including changes in legislative requirements, Client variations of sample numbers and Client requests for changes to standard reporting requirements. Notwithstanding condition 3, all quotations are reviewed and updated on a yearly basis.
- 4. Payment Terms: The Client shall pay HydroQual within 30 days of the invoice date as provided by HydroQual. HydroQual may, for reasonable business reasons, require the Client to arrange for payment in advance.
- 5. Quotation Numbers: The Client shall provide the proposal and/or price quotation number to HydroQual (where applicable) to ensure correct pricing.
- 6. Taxes: Applicable taxes are not included in prices, surcharges and additional fees and will be added at the time of invoicing.
- 7. No Guarantee of Results: The Client is responsible for informing itself on the limitation of the results and acknowledges that the results are not guaranteed.
- 8. Standard of Care: HydroQual will use reasonable care and diligence as required by the laws of the province or territory where the sample is tested, subject to that level of care and skill ordinarily exercised by other laboratories currently practicing under similar conditions in the same locality, subject to the time limits and financial, physical or other constraints applicable to the Services. No warranty, express or implied, is made.
- 9. Storage: Where possible, HydroQual will store samples until a final report is issued to the Client, after which time HydroQual may discard the sample.
- 10. Holds: If the Client requests a sample be placed on hold, HydroQual will store the sample for the mutually agreed upon written time and price, after which HydroQual will invoice the Client and discard the sample.
- 11. Archives: If the Client requests a sample be archived, HydroQual will store the sample for a mutually agreed upon written time frame and price, after which HydroQual will invoice the Client and discard the sample.
- 12. Handling Protocol: Legal sample handling protocol must be arranged, and provided in writing, before samples are collected. HydroQual will provide a price quotation for legal sample protocol. Samples processed under legal protocol are stored indefinitely, subject to a storage charge as advised by HydroQual.
- 13. Samples: The quality, condition, content and source of samples stored and tested are not known to HydroQual except as declared and described on the Chain of Custody completed and submitted by the Client and accompanying the sample.
- 14. Risk of Loss: HydroQual will use reasonable care to protect samples during storage, however, all samples are stored at the Client's risk and the Client is responsible for obtaining appropriate insurance, if desired. The Client acknowledges that during the performance of the Services samples may be altered, lost, damaged or destroyed and the client forever releases HydroQual from any and all claims the Client may have for any loss or damage to the sample.
- 15. Environmental: the Client must comply with all applicable environmental legislation, including labeling all hazardous samples to comply with Canada's *Workplace Hazardous Materials Information System* and the Alberta *Transfer of Dangerous Goods* regulations, and must provide appropriate material safety data sheets that include the nature of the hazard and a contact name and phone number to call for information. The Client shall defend, indemnify and hold harmless HydroQual for all loss or damages, including any fine or cost of complying with an order of any government authority, resulting from the Client's breach of this paragraph.
- 16. Hazardous Materials Disposal: HydroQual may return, at the Client's cost, hazardous material to the Client for disposal.
- 17. Hazardous Materials Surcharge: HydroQual may apply an additional surcharge for handling of hazardous samples or samples with Naturally Occurring Radioactive Materials ("NORM"), such as and including without limitation, H<sub>2</sub>S and CN.
- 18. Sample Containers: HydroQual may ship sample containers to the Client's location by the most cost effective means using HydroQual's preferred courier suppliers, within the specified project timeline. Shipping will be charged back to the Client.
- 19. Additional Charges: HydroQual may charge the Client:
  - (a) for pick-up and delivery services when provided subject in each instance to a minimum charge of \$50.00; and,
  - (b) for rush service (processing samples and/or reporting).
- 20. Large Bottle Orders: The Client shall provide HydroQual with not less than 24 hours' notice for large bottle orders.
- 21. Re-Tests: HydroQual reserves the right to re-test any samples that remain in HydroQual's possession. Re-tests requested by the Client may be charged to Client and Client agrees to pay for such charges.
- 22. Waiver: The Client is responsible for making any assessment regarding the suitability of the Services and the intended results for the Client's purposes and waives any and all claims against HydroQual that the Client may have against HydroQual as a result of the interpretation of the results provided to the Client. The Client shall defend, indemnify and save harmless HydroQual for any and all claims made by any third party against HydroQual in respect of all losses however arising from the performance of the Services or the use of any report provided in the performance of the Services.
- 23. LIMITATION OF LIABILITY: IN NO EVENT SHALL HYDROQUAL BE RESPONSIBLE FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY OR PUNITIVE DAMAGES, WHETHER FORESEEABLE OR UNFORESEEABLE (INCLUDING CLAIMS FOR LOSS OF PROFITS OR REVENUE OR LOSSES CAUSED BY STOPPAGE OF OTHER WORK OR IMPAIRMENT OF OTHER ASSETS) INCURRED BY THE CLIENT ARISING OUT OF BREACH OR FAILURE OF EXPRESS OF IMPLIED WARRANTY, BREACH OF CONTRACT, BREACH OF WARRANTY, MISREPRESENTATION, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE. IN ANY EVENT, THE LIABILITY OF HYDROQUAL TO THE CLIENT SHALL BE LIMITED TO THE COST OF TESTING THE SAMPLE AS REQUESTED IN THE CHAIN OF CUSTODY UNDER WHICH THE SAMPLE WAS ORIGINALLY DEPOSITED. FOR THE PURPOSES OF THIS PARAGRAPH AND PARAGRAPHS 7, 14, 15, 22, AND 24, AS APPLICABLE, "HYDROQUAL" INCLUDES WITHOUT LIMITATIONS ITS DIRECTORS, OFFICERS, EMPLOYEES AND AFFILIATES AND THE "CLIENT" INCLUDES WITHOUT LIMITATION ANY THIRD PARTY THAT MAY HAVE A CLAIM AGAINST HYDROQUAL THROUGH THE CLIENT.
- 24. Notice of Liability: Notwithstanding paragraph 23, HydroQual shall not be liable to the Client unless the Client provides notice in writing to HydroQual of such loss or damage, together with full particulars thereof, within 30 days of the Client's receipt of the report of the analysis of the sample giving rise to such liability. The provisions of this paragraph allocate the risk between the Client and HydroQual, and the fees to be paid by the Client to HydroQual reflect this allocation of any such risks and the limitations of liability in these General Terms and Conditions.
- 25. Entire Agreement: These General Terms and Conditions, the Chain of Custody and price quotations constitute the entire agreement between the parties and supersede and take precedence over any terms and conditions contained in any documentation provided by the Client. HydroQual's execution of any subsequent documentation from the Client only acknowledges receipt and not acceptance of any terms or conditions therein unless expressly stipulated otherwise by HydroQual. If there is a conflict between these General Terms and Conditions and any other document, these General Terms and Conditions prevail.