



ECOLOGICAL LOGISTICS & RESEARCH LTD.
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Date Received: 28-AUG-15
Report Date: 09-SEP-15 11:31 (MT)
Version: FINAL

Client Phone: 867-668-6386

Certificate of Analysis

Lab Work Order #: L1665125
Project P.O. #: NOT SUBMITTED
Job Reference: 15-210
C of C Numbers: 1
Legal Site Desc:



Jamie Lo, B.Sc.
Account Manager

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ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1665125-1 Water 26-AUG-15 09:51 HL	L1665125-2 Water 26-AUG-15 09:19 CC1	L1665125-3 Water 26-AUG-15 08:56 CC2	L1665125-4 Water 26-AUG-15 08:28 CC3	L1665125-5 Water 26-AUG-15 08:37 WC	
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	261	261	308	288	262
	pH (pH)	7.81	8.09	8.05	8.06	7.98
	Total Suspended Solids (mg/L)	<3.0	4.0	<3.0	31.3	69.3
Total Metals	Aluminum (Al)-Total (mg/L)	0.129	0.123	0.133	0.628	1.81
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00052
	Arsenic (As)-Total (mg/L)	0.00085	0.00083	0.00109	0.00133	0.00224
	Barium (Ba)-Total (mg/L)	0.059	0.059	0.056	0.072	0.119
	Beryllium (Be)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.0000424	0.0000381	0.0000467	0.0000892	0.000209
	Calcium (Ca)-Total (mg/L)	57.9	58.0	64.6	57.7	48.6
	Chromium (Cr)-Total (mg/L)	<0.0010	0.0010	0.0014	0.0024	0.0065
	Cobalt (Co)-Total (mg/L)	0.00041	0.00037	0.00055	0.00081	0.00170
	Copper (Cu)-Total (mg/L)	<0.0035 ^{DLB}	<0.0035 ^{DLB}	<0.0035 ^{DLB}	<0.0045 ^{DLB}	0.0082
	Iron (Fe)-Total (mg/L)	0.409	0.439	0.452	1.22	3.47
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00074	0.00225
	Lithium (Li)-Total (mg/L)	0.0032	0.0032	0.0045	0.0041	0.0040
	Magnesium (Mg)-Total (mg/L)	28.2	28.1	35.7	35.0	34.2
	Manganese (Mn)-Total (mg/L)	0.126	0.0994	0.121	0.121	0.143
	Mercury (Hg)-Total (mg/L)	0.0000062	0.0000069	<0.0000050	0.0000152	0.0000150
	Molybdenum (Mo)-Total (mg/L)	0.0012	0.0013	0.0014	0.0014	0.0014
	Nickel (Ni)-Total (mg/L)	0.0044	0.0044	0.0096	0.0099	0.0127
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.00118	0.00123	0.00133	0.00131	0.00105
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	0.000028	0.000076
	Sodium (Na)-Total (mg/L)	2.5	2.4	2.8	3.0	3.4
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	0.020	0.039
	Uranium (U)-Total (mg/L)	0.00164	0.00167	0.00180	0.00190	0.00208
	Vanadium (V)-Total (mg/L)	0.00079	0.00067	0.00081	0.00207	0.00559
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050	<0.0050	0.0057	0.0163

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Copper (Cu)-Total	DLB	L1665125-1, -2, -3, -4, -5
Method Blank	Copper (Cu)-Total	MB-LOR	L1665125-1, -2, -3, -4, -5
Matrix Spike	Manganese (Mn)-Total	MS-B	L1665125-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit was raised due to detection of analyte at comparable level in Method Blank.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
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**
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
MET-T-CCMS-VA	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.			
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
PH-MAN-WR	Water	pH by Meter	APHA 4500-H+
pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 – 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.			
TSS-MAN-WR	Water	Total Suspended Solids by Gravimetric	APHA 2540 D
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids are determined by filtering a sample through a glass fibre filter and drying the 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
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Chain of Custody Numbers:

1

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.

