



ECOLOGICAL LOGISTICS & RESEARCH LTD.
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Date Received: 25-SEP-15
Report Date: 06-OCT-15 11:36 (MT)
Version: FINAL

Client Phone: 867-668-6386

Certificate of Analysis

Lab Work Order #: L1678817
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	L1678817-1 Water 22-SEP-15 11:30 HLB	L1678817-2 Water 22-SEP-15 11:04 CC1	L1678817-3 Water 22-SEP-15 10:30 CC2	L1678817-4 Water 22-SEP-15 10:14 CC3	L1678817-5 Water 22-SEP-15 09:54 WC
Grouping	Analyte				
WATER					
Physical Tests					
Hardness (as CaCO3) (mg/L)	288	295	454	443	379
pH (pH)	7.81	8.11	7.99	8.01	8.14
Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	5.3
Total Metals					
Aluminum (Al)-Total (mg/L)	0.0518	0.0490	0.0321	0.0638	0.196
Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	0.00053	0.00057	0.00073
Arsenic (As)-Total (mg/L)	0.00080	0.00079	0.00125	0.00131	0.00121
Barium (Ba)-Total (mg/L)	0.057	0.058	0.054	0.055	0.061
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)	0.0000391	0.0000419	0.0000652	0.0000565	0.0000203
Calcium (Ca)-Total (mg/L)	64.6	65.8	86.0	82.7	68.1
Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0012
Cobalt (Co)-Total (mg/L)	0.00045	0.00037	0.00081	0.00077	0.00035
Copper (Cu)-Total (mg/L)	0.0028	0.0027	0.0021	0.0022	0.0022
Iron (Fe)-Total (mg/L)	0.279	0.273	0.370	0.406	0.574
Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lithium (Li)-Total (mg/L)	0.0034	0.0035	0.0113	0.0101	0.0046
Magnesium (Mg)-Total (mg/L)	30.6	31.7	58.2	57.5	50.8
Manganese (Mn)-Total (mg/L)	0.249	0.181	0.179	0.173	0.100
Mercury (Hg)-Total (mg/L)	0.0000056	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	0.0013	0.0013	0.0017	0.0016	0.0012
Nickel (Ni)-Total (mg/L)	0.0048	0.0051	0.0174	0.0168	0.0093
Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Selenium (Se)-Total (mg/L)	0.00162	0.00163	0.00157	0.00141	0.00104
Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Sodium (Na)-Total (mg/L)	2.9	3.0	4.5	4.5	4.5
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	<0.010	0.011
Uranium (U)-Total (mg/L)	0.00203	0.00209	0.00236	0.00255	0.00313
Vanadium (V)-Total (mg/L)	0.00075	0.00069	0.00065	0.00084	0.00127
Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

* 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	Antimony (Sb)-Total	DLB	L1678817-1, -2, -3, -4, -5
Matrix Spike	Nickel (Ni)-Total	MS-B	L1678817-1, -2, -3, -4, -5
Matrix Spike	Uranium (U)-Total	MS-B	L1678817-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
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.			
HGT-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-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode			
It is recommended that this analysis be conducted in the field.			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode			
It is recommended that this analysis be conducted in the field.			
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:

Reference Information

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.

