



HEMMERA ENVIROCHEM INC.
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Date Received: 17-SEP-14
Report Date: 29-SEP-14 15:53 (MT)
Version: FINAL

Client Phone: 867-456-4865

Certificate of Analysis

Lab Work Order #: L1519343
Project P.O. #: NOT SUBMITTED
Job Reference: 1343-005.02
C of C Numbers: 1-17092014
Legal Site Desc:

Brent Mack
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1519343-1 Water 16-SEP-14 08:36 MW14-14	L1519343-2 Water 16-SEP-14 12:10 P03-01-2	L1519343-3 Water 16-SEP-14 10:55 P03-01-8	L1519343-4 Water 16-SEP-14 14:55 TH86-2	L1519343-5 Water 16-SEP-14 13:47 TH86-5
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	2800	415	34400	245	827
	Hardness (as CaCO3) (mg/L)	1780	209	5340	134	447
	pH (pH)	7.32	7.89	3.16	7.65	7.12
	Total Suspended Solids (mg/L)	104	5.8	150	5.6	68.7
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	66.5	5.5	49800	4.1	47.3
	Alkalinity, Total (as CaCO3) (mg/L)	84.7	221	<2.0	114	473
	Chloride (Cl) (mg/L)	<10 ^{DLA}	<0.50	29	<0.50	<2.5 ^{DLA}
	Sulfate (SO4) (mg/L)	2070	19.4	56500	20.2	11.1
	Anion Sum (meq/L)	44.7	4.82	1180	2.70	9.69
	Cation Sum (meq/L)	36.6	4.71	1750	2.81	10.3
	Cation - Anion Balance (%)	-10.1	-1.1	19.7	2.0	3.3
Total Metals	Aluminum (Al)-Total (mg/L)	0.269	<0.0030	<0.60 ^{DLA}	0.0124	0.240
	Antimony (Sb)-Total (mg/L)	<0.00020 ^{DLA}	<0.00010	<0.020 ^{DLA}	0.00011	0.00688
	Arsenic (As)-Total (mg/L)	0.00044	0.0140	<0.020 ^{DLA}	0.00089	0.112
	Barium (Ba)-Total (mg/L)	0.0567	0.0949	<0.010 ^{DLA}	0.0681	0.187
	Beryllium (Be)-Total (mg/L)	<0.00020 ^{DLA}	<0.00010	<0.020 ^{DLA}	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.0010 ^{DLA}	<0.00050	<0.10 ^{DLA}	<0.00050	<0.00050
	Boron (B)-Total (mg/L)	<0.020 ^{DLA}	<0.010	<2.0 ^{DLA}	<0.010	0.010
	Cadmium (Cd)-Total (mg/L)	0.00105	<0.000010	<0.0020 ^{DLA}	0.000029	0.000053
	Calcium (Ca)-Total (mg/L)	271	62.7	453	40.6	130
	Chromium (Cr)-Total (mg/L)	0.00081	<0.00010	<0.020 ^{DLA}	0.00152	0.206
	Cobalt (Co)-Total (mg/L)	0.0206	0.00788	<0.020 ^{DLA}	0.00013	0.0110
	Copper (Cu)-Total (mg/L)	0.0015	<0.00050	<0.10 ^{DLA}	0.00507	0.503
	Iron (Fe)-Total (mg/L)	0.387	3.07	29800	3.27	35.7
	Lead (Pb)-Total (mg/L)	0.00093	<0.000050	<0.010 ^{DLA}	0.000125	0.00211
	Lithium (Li)-Total (mg/L)	0.0069	0.0156	0.53	0.00269	0.0550
	Magnesium (Mg)-Total (mg/L)	259	13.1	1020	7.57	24.6
	Manganese (Mn)-Total (mg/L)	5.54	0.127	245	0.0151	0.602
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Total (mg/L)	0.00139	0.00339	0.016	0.00147	0.0742
	Nickel (Ni)-Total (mg/L)	0.0562	<0.00050	<0.10 ^{DLA}	0.00218	0.128
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<2.5 ^{DLA}	<0.050	<0.050
	Potassium (K)-Total (mg/L)	3.16	2.33	120	1.27	2.56
	Selenium (Se)-Total (mg/L)	<0.00020 ^{DLA}	<0.00010	<0.020 ^{DLA}	0.00033	<0.00010
	Silicon (Si)-Total (mg/L)	9.73	7.81	<2.5 ^{DLA}	4.40	10.1
	Silver (Ag)-Total (mg/L)	0.000023	<0.000010	<0.0020 ^{DLA}	<0.000010	0.000240
	Sodium (Na)-Total (mg/L)	8.15	7.32	231	2.34	21.9

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1519343-6	L1519343-7	L1519343-8	L1519343-9	L1519343-10
		Description	Water	Water	Water	Water	Water
		Sampled Date	15-SEP-14	15-SEP-14	15-SEP-14	15-SEP-14	17-SEP-14
		Sampled Time	17:30	15:42	18:32	15:42	08:30
		Client ID	MW14-04D	MW14-05	P09-LCD4	DUP11	MW14-04S
Grouping	Analyte						
WATER							
Physical Tests	Conductivity (uS/cm)		2810	3660	859	3660	4270
	Hardness (as CaCO3) (mg/L)		2050	2830	333	2690	3110
	pH (pH)		7.37	7.18	7.94	7.16	7.43
	Total Suspended Solids (mg/L)		29.2	27.6	126	26.4	22.8
Anions and Nutrients	Acidity (as CaCO3) (mg/L)		59.3	63.8	7.7	62.8	92.9
	Alkalinity, Total (as CaCO3) (mg/L)		752	551	358	568	998
	Chloride (Cl) (mg/L)		<10 ^{DLA}	18	<2.5 ^{DLA}	17	14
	Sulfate (SO4) (mg/L)		1440	2390	78.9	2260	2710
	Anion Sum (meq/L)		45.0	61.4	8.79	58.9	76.8
	Cation Sum (meq/L)		42.0	57.8	9.92	54.9	63.1
	Cation - Anion Balance (%)		-3.4	-3.0	6.0	-3.5	-9.8
Total Metals	Aluminum (Al)-Total (mg/L)		0.974	0.468	1.03	0.480	0.0270
	Antimony (Sb)-Total (mg/L)		<0.00020 ^{DLA}	<0.00020 ^{DLA}	0.00091	<0.00020 ^{DLA}	<0.00020 ^{DLA}
	Arsenic (As)-Total (mg/L)		0.00109	0.00279	0.00728	0.00300	0.00035
	Barium (Ba)-Total (mg/L)		0.0416	0.0657	0.109	0.0669	0.0313
	Beryllium (Be)-Total (mg/L)		<0.00020 ^{DLA}	<0.00020 ^{DLA}	<0.00010	<0.00020 ^{DLA}	<0.00020 ^{DLA}
	Bismuth (Bi)-Total (mg/L)		<0.0010 ^{DLA}	<0.0010 ^{DLA}	<0.00050	<0.0010 ^{DLA}	<0.0010 ^{DLA}
	Boron (B)-Total (mg/L)		<0.020 ^{DLA}	<0.020 ^{DLA}	0.016	<0.020 ^{DLA}	<0.020 ^{DLA}
	Cadmium (Cd)-Total (mg/L)		0.000136	0.000070	0.000162	0.000071	0.000211
	Calcium (Ca)-Total (mg/L)		340	266	89.4	273	590
	Chromium (Cr)-Total (mg/L)		0.00623	0.00350	0.00321	0.00369	<0.00020 ^{DLA}
	Cobalt (Co)-Total (mg/L)		0.00244	0.00352	0.00140	0.00365	0.00124
	Copper (Cu)-Total (mg/L)		0.0027	0.0014	0.00695	0.0012	0.0022
	Iron (Fe)-Total (mg/L)		5.19	9.74	1.48	9.70	0.053
	Lead (Pb)-Total (mg/L)		0.00102	0.00614	0.0184	0.00682	0.00035
	Lithium (Li)-Total (mg/L)		0.0589	0.0655	0.00789	0.0673	0.0812
	Magnesium (Mg)-Total (mg/L)		258	513	25.0	502	478
	Manganese (Mn)-Total (mg/L)		0.603	1.16	0.470	1.22	0.747
	Mercury (Hg)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Total (mg/L)		0.00156	0.00071	0.00517	0.00075	0.00127
	Nickel (Ni)-Total (mg/L)		0.0128	0.0156	0.00881	0.0165	0.0113
	Phosphorus (P)-Total (mg/L)		<0.050	0.057	<0.050	0.055	<0.050
	Potassium (K)-Total (mg/L)		10.6	9.32	2.06	9.56	14.2
	Selenium (Se)-Total (mg/L)		0.00022	<0.00020 ^{DLA}	0.00019	<0.00020 ^{DLA}	0.00057
	Silicon (Si)-Total (mg/L)		10.7	8.77	6.01	9.06	11.0
	Silver (Ag)-Total (mg/L)		<0.000020 ^{DLA}	0.000043	0.000033	0.000036	0.000028
	Sodium (Na)-Total (mg/L)		11.4	10.2	76.1	11.0	13.2

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1519343-1 Water 16-SEP-14 08:36 MW14-14	L1519343-2 Water 16-SEP-14 12:10 P03-01-2	L1519343-3 Water 16-SEP-14 10:55 P03-01-8	L1519343-4 Water 16-SEP-14 14:55 TH86-2	L1519343-5 Water 16-SEP-14 13:47 TH86-5	
Grouping	Analyte					
WATER						
Total Metals	Strontium (Sr)-Total (mg/L)	1.28	0.424	1.96	0.186	0.899
	Sulfur (S)-Total (mg/L)	583	7.05	19500	6.97	12.3
	Thallium (Tl)-Total (mg/L)	<0.000020 ^{DLA}	<0.000010	<0.0020 ^{DLA}	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	0.00059	<0.00010	<0.020 ^{DLA}	0.00024	0.0278
	Titanium (Ti)-Total (mg/L)	<0.020 ^{DLA}	<0.010	<2.0 ^{DLA}	<0.010	0.021
	Uranium (U)-Total (mg/L)	0.000548	0.000526	<0.0020 ^{DLA}	0.00283	0.0122
	Vanadium (V)-Total (mg/L)	<0.0020 ^{DLA}	<0.0010	<0.20 ^{DLA}	<0.0010	0.0021
	Zinc (Zn)-Total (mg/L)	15.3	0.0155	1030	0.0053	0.0201
	Zirconium (Zr)-Total (mg/L)	<0.0016 ^{DLA}	<0.00080	<0.16 ^{DLA}	<0.00080	<0.00080
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0177	0.0023	0.45	0.0012	0.0017
	Antimony (Sb)-Dissolved (mg/L)	<0.00020 ^{DLA}	<0.00010	<0.020 ^{DLA}	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00027	0.0141	<0.020 ^{DLA}	0.00016	0.0155
	Barium (Ba)-Dissolved (mg/L)	0.0641	0.0925	<0.010 ^{DLA}	0.0657	0.191
	Beryllium (Be)-Dissolved (mg/L)	<0.00020 ^{DLA}	<0.00010	<0.020 ^{DLA}	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.0010 ^{DLA}	<0.00050	<0.10 ^{DLA}	<0.00050	<0.00050
	Boron (B)-Dissolved (mg/L)	<0.020 ^{DLA}	<0.010	<2.0 ^{DLA}	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.000884	<0.000010	<0.0020 ^{DLA}	0.000011	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	294	62.5	447	41.1	137
	Chromium (Cr)-Dissolved (mg/L)	<0.00020 ^{DLA}	<0.00010	<0.020 ^{DLA}	<0.00010	0.00056
	Cobalt (Co)-Dissolved (mg/L)	0.0180	0.00767	<0.020 ^{DLA}	<0.00010	0.00035
	Copper (Cu)-Dissolved (mg/L)	0.00094	<0.00020	<0.040 ^{DLA}	0.00037	<0.00020
	Iron (Fe)-Dissolved (mg/L)	0.029	3.02	29700	0.161	6.89
	Lead (Pb)-Dissolved (mg/L)	<0.00010 ^{DLA}	<0.000050	<0.010 ^{DLA}	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0060	0.0153	0.54	0.00264	0.0567
	Magnesium (Mg)-Dissolved (mg/L)	254	12.9	1030	7.61	25.6
	Manganese (Mn)-Dissolved (mg/L)	5.17	0.124	251	0.00642	0.499
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Dissolved (mg/L)	0.00148	0.00314	0.015	0.00103	0.00340
	Nickel (Ni)-Dissolved (mg/L)	0.0456	<0.00050	<0.10 ^{DLA}	0.00076	0.00269
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<2.5 ^{DLA}	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	3.17	2.25	121	1.26	2.61
	Selenium (Se)-Dissolved (mg/L)	<0.00020 ^{DLA}	<0.00010	<0.020 ^{DLA}	0.00030	<0.00010
	Silicon (Si)-Dissolved (mg/L)	9.74	7.68	<2.5 ^{DLA}	4.24	9.96
	Silver (Ag)-Dissolved (mg/L)	<0.000020 ^{DLA}	<0.000010	<0.0020 ^{DLA}	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	7.92	7.07	253	2.23	22.2

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1519343-6 Water 15-SEP-14 17:30 MW14-04D	L1519343-7 Water 15-SEP-14 15:42 MW14-05	L1519343-8 Water 15-SEP-14 18:32 P09-LCD4	L1519343-9 Water 15-SEP-14 15:42 DUP11	L1519343-10 Water 17-SEP-14 08:30 MW14-04S
Grouping	Analyte					
WATER						
Total Metals	Strontium (Sr)-Total (mg/L)	1.49	1.28	0.438	1.33	2.55
	Sulfur (S)-Total (mg/L)	438	760	46.0	774	818
	Thallium (Tl)-Total (mg/L)	0.000053 ^{DLA}	<0.000020 ^{DLA}	0.000024	<0.000020 ^{DLA}	0.000056 ^{DLA}
	Tin (Sn)-Total (mg/L)	<0.00020 ^{DLA}	<0.00020 ^{DLA}	0.00031	<0.00020 ^{DLA}	<0.00020 ^{DLA}
	Titanium (Ti)-Total (mg/L)	0.071	0.022	0.024	0.024	<0.020 ^{DLA}
	Uranium (U)-Total (mg/L)	0.121	0.140	0.00337	0.150	0.234 ^{DLA}
	Vanadium (V)-Total (mg/L)	0.0023	<0.0020 ^{DLA}	0.0025	<0.0020 ^{DLA}	<0.0020 ^{DLA}
	Zinc (Zn)-Total (mg/L)	0.188	0.211	0.0221	0.219	0.0281 ^{DLA}
	Zirconium (Zr)-Total (mg/L)	<0.0016 ^{DLA}	<0.0016 ^{DLA}	0.00091	<0.0016 ^{DLA}	<0.0016 ^{DLA}
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0037	0.0129	0.0027	0.0108	0.0045 ^{DLA}
	Antimony (Sb)-Dissolved (mg/L)	<0.00020 ^{DLA}	<0.00020 ^{DLA}	0.00073	<0.00020 ^{DLA}	<0.00020 ^{DLA}
	Arsenic (As)-Dissolved (mg/L)	0.00077	0.00133	0.00479	0.00135	0.00029
	Barium (Ba)-Dissolved (mg/L)	0.0312	0.0587	0.0789	0.0577	0.0315 ^{DLA}
	Beryllium (Be)-Dissolved (mg/L)	<0.00020 ^{DLA}	<0.00020 ^{DLA}	<0.00010	<0.00020 ^{DLA}	<0.00020 ^{DLA}
	Bismuth (Bi)-Dissolved (mg/L)	<0.0010 ^{DLA}	<0.0010 ^{DLA}	<0.00050	<0.0010 ^{DLA}	<0.0010 ^{DLA}
	Boron (B)-Dissolved (mg/L)	<0.020 ^{DLA}	<0.020 ^{DLA}	0.014	<0.020 ^{DLA}	<0.020 ^{DLA}
	Cadmium (Cd)-Dissolved (mg/L)	0.000060	<0.000020 ^{DLA}	0.000147	<0.000020 ^{DLA}	0.000193
	Calcium (Ca)-Dissolved (mg/L)	354	277	92.1	270	554 ^{DLA}
	Chromium (Cr)-Dissolved (mg/L)	0.00174	0.00097	0.00016	0.00100	<0.00020 ^{DLA}
	Cobalt (Co)-Dissolved (mg/L)	0.00159	0.00308	0.00049	0.00300	0.00120
	Copper (Cu)-Dissolved (mg/L)	0.00046	<0.00040 ^{DLA}	0.00445	<0.00040 ^{DLA}	0.00199
	Iron (Fe)-Dissolved (mg/L)	2.57	9.04	<0.010	8.67	<0.010 ^{DLA}
	Lead (Pb)-Dissolved (mg/L)	<0.00010 ^{DLA}	<0.00010 ^{DLA}	0.000817	<0.00010 ^{DLA}	<0.00010 ^{DLA}
	Lithium (Li)-Dissolved (mg/L)	0.0597	0.0632	0.00717	0.0651	0.0751
	Magnesium (Mg)-Dissolved (mg/L)	284	520	24.9	490	421
	Manganese (Mn)-Dissolved (mg/L)	0.577	1.15	0.391	1.15	0.747
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Dissolved (mg/L)	0.00138	0.00053	0.00502	0.00052	0.00119
	Nickel (Ni)-Dissolved (mg/L)	0.0097	0.0132	0.00598	0.0132	0.0108
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	10.8	9.74	1.97	9.50	14.3
	Selenium (Se)-Dissolved (mg/L)	<0.00020 ^{DLA}	<0.00020 ^{DLA}	0.00023	<0.00020 ^{DLA}	0.00059
	Silicon (Si)-Dissolved (mg/L)	9.76	8.54	4.57	8.37	11.1 ^{DLA}
	Silver (Ag)-Dissolved (mg/L)	<0.000020 ^{DLA}	0.000021	<0.000010	<0.000020 ^{DLA}	<0.000020 ^{DLA}
	Sodium (Na)-Dissolved (mg/L)	11.8	10.3	73.7	10.1	12.5

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1519343-1	L1519343-2	L1519343-3	L1519343-4	L1519343-5
Description	Water	Water	Water	Water	Water	Water
Sampled Date	16-SEP-14	16-SEP-14	16-SEP-14	16-SEP-14	16-SEP-14	16-SEP-14
Sampled Time	08:36	12:10	10:55	14:55	13:47	13:47
Client ID	MW14-14	P03-01-2	P03-01-8	TH86-2	TH86-5	TH86-5
Grouping	Analyte					
WATER						
Dissolved Metals	Strontium (Sr)-Dissolved (mg/L)	1.27	0.416	2.02	0.183	0.906
	Sulfur (S)-Dissolved (mg/L)	571	7.17	19300	6.95	8.13
	Thallium (Tl)-Dissolved (mg/L)	<0.000020 ^{DLA}	<0.000010	<0.0020 ^{DLA}	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	0.00059	<0.00010	<0.020 ^{DLA}	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.020 ^{DLA}	<0.010	<2.0 ^{DLA}	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.000479	0.000506	<0.0020 ^{DLA}	0.00266	0.00288
	Vanadium (V)-Dissolved (mg/L)	<0.0020 ^{DLA}	<0.0010	<0.20	<0.0010	<0.0010
	Zinc (Zn)-Dissolved (mg/L)	12.5	0.0074	999	0.0026	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.0016 ^{DLA}	<0.00080	<0.16 ^{DLA}	<0.00080	<0.00080

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1519343-6	L1519343-7	L1519343-8	L1519343-9	L1519343-10
Description	Water	Water	Water	Water	Water	Water
Sampled Date	15-SEP-14	15-SEP-14	15-SEP-14	15-SEP-14	15-SEP-14	17-SEP-14
Sampled Time	17:30	15:42	15:42	18:32	15:42	08:30
Client ID	MW14-04D	MW14-05	MW14-05	P09-LCD4	DUP11	MW14-04S
Grouping	Analyte					
WATER						
Dissolved Metals	Strontium (Sr)-Dissolved (mg/L)	1.53	1.31	0.452	1.33	2.51
	Sulfur (S)-Dissolved (mg/L)	460	760	46.2	752	793
	Thallium (Tl)-Dissolved (mg/L)	<0.00020 ^{DLA}	<0.00020 ^{DLA}	0.000011	<0.00020 ^{DLA}	0.000044 ^{DLA}
	Tin (Sn)-Dissolved (mg/L)	<0.00020 ^{DLA}	<0.00020 ^{DLA}	0.00025	<0.00020 ^{DLA}	<0.00020 ^{DLA}
	Titanium (Ti)-Dissolved (mg/L)	<0.020 ^{DLA}	<0.020 ^{DLA}	<0.010	<0.020 ^{DLA}	<0.020 ^{DLA}
	Uranium (U)-Dissolved (mg/L)	0.128	0.145	0.00316	0.146	0.230
	Vanadium (V)-Dissolved (mg/L)	<0.0020 ^{DLA}	<0.0020 ^{DLA}	<0.0010	<0.0020 ^{DLA}	<0.0020 ^{DLA}
	Zinc (Zn)-Dissolved (mg/L)	0.173	0.0331	0.0110	0.0399	0.0264
	Zirconium (Zr)-Dissolved (mg/L)	<0.0016 ^{DLA}	<0.0016 ^{DLA}	<0.00080	<0.0016 ^{DLA}	<0.0016 ^{DLA}

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

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
WSMT	Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Chromium (Cr)-Total	MB-LOR	L1519343-10, -7, -8, -9
Method Blank	Manganese (Mn)-Total	MB-LOR	L1519343-10, -7, -8, -9
Matrix Spike	Sulfate (SO4)	MS-B	L1519343-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfate (SO4)	MS-B	L1519343-1, -10, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
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**
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 "Acidity"
<p>This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.</p> <p>Samples of industrial wastes, acid mine drainage, or other solutions that contain appreciable amounts of hydrolyzable metal ions such as aluminum, iron, and manganese may require hot peroxide treatment to ensure oxidation and hydrolysis of reduced forms of polyvalent cations. Acidity results may be highly variable if this procedure is not followed. Results in this report for 'Acidity (as CaCO3)' have not been peroxide treated.</p>			
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 Acidity
<p>This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.</p> <p>Samples of industrial wastes, acid mine drainage, or other solutions that contain appreciable amounts of hydrolyzable metal ions such as aluminum, iron, and manganese may require hot peroxide treatment to ensure oxidation and hydrolysis of reduced forms of polyvalent cations. Acidity results may be highly variable if this procedure is not followed. Results in this report for 'Acidity (as CaCO3)' have not been peroxide treated.</p>			
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2
<p>This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.</p>			
ANIONS-CL-IC-WR	Water	Chloride by Ion Chromatography	EPA 300.1
<p>This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.</p>			
ANIONS-SO4-IC-WR	Water	Sulphate by Ion Chromatography	EPA 300.1
<p>This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.</p>			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
<p>This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.</p>			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
<p>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.</p>			
HG-DIS-LOW-CVAFS-VA	Water	Dissolved Mercury in Water by CVAFS(Low)	EPA SW-846 3005A & EPA 245.7
<p>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 filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).</p>			
HG-TOT-LOW-CVAFS-VA	Water	Total Mercury in Water by CVAFS(Low)	EPA 245.7
<p>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</p>			

Reference Information

States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

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 hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

MET-DIS-LOW-ICP-VA Water Dissolved Metals in Water by ICPOES EPA 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 procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

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 hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

MET-TOT-LOW-ICP-VA Water Total Metals in Water by ICPOES EPA 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.

S-DIS-ICP-VA Water Dissolved Sulfur 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, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

S-TOT-ICP-VA Water Total Sulfur 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, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in

Reference Information

submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

TSS-LOW-WR Water Total Suspended Solids by Grav. (1 mg/L) 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.

ZR-D-MS-VA Water Dissolved Zr in Water by ICPMS EPA SW-846 3005A/6020A

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, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

ZR-T-MS-VA Water Total Zr in Water by ICPMS EPA SW-846 3005A/6020A

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, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

** 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
WR	ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1-17092014

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.