



HEMMERA ENVIROCHEM INC.
ATTN: Natasha Sandys
230 - 2237 2nd Avenue
Whitehorse YK Y1A 0K7

Date Received: 28-JUL-15
Report Date: 11-SEP-15 14:56 (MT)
Version: FINAL REV. 3

Client Phone: 867-456-4865

Certificate of Analysis

Lab Work Order #: L1649166
Project P.O. #: NOT SUBMITTED
Job Reference: 1343-005.10
C of C Numbers: 1
Legal Site Desc:

Comments: 11-SEP-2015 This report replaces the previous version and contains additional analyses, as requested.

Brent Mack, B.Sc.
Account Manager

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

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
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	L1649166-1 Water 26-JUL-15 15:45 R3	L1649166-2 Water 26-JUL-15 12:20 R7	L1649166-3 Water 26-JUL-15 20:00 GWCC-1	L1649166-4 Water 26-JUL-15 19:35 GWCC-2	L1649166-5 Water 26-JUL-15 19:00 GWCC-3	
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	679	176	2340	1680	956
	Hardness (as CaCO3) (mg/L)	440	104	1720	1230	609
	pH (pH)	7.99	7.40	7.44	7.63	7.55
	Total Suspended Solids (mg/L)	115	11.3	<3.0	<3.0	<3.0
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	0.0300	0.0714	<0.0050	<0.0050	<0.0050
	Nitrate (as N) (mg/L)	0.0521	0.0887	0.466 ^{DLA}	0.373 ^{DLA}	0.158 ^{DLA}
	Nitrite (as N) (mg/L)	0.0019	<0.0010	<0.010	<0.0050	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0448	0.0390	<0.0020	<0.0020	<0.0020
	Sulfate (SO4) (mg/L)	264	29.6	1410	910	394
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	17.7	29.0	5.53	7.42	9.67
Total Metals	Aluminum (Al)-Total (mg/L)	2.08	0.383	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00032	0.00024	0.00121	0.00111	0.00094
	Arsenic (As)-Total (mg/L)	0.00236	0.00200	0.00196	0.00135	0.00087
	Barium (Ba)-Total (mg/L)	0.123	0.0968	0.0167	0.0194	0.0314
	Beryllium (Be)-Total (mg/L)	0.000079	0.000037	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	0.013	<0.010	0.258	0.117	0.080
	Cadmium (Cd)-Total (mg/L)	0.0000949	0.0000421	0.000192	0.000163	0.0000788
	Calcium (Ca)-Total (mg/L)	80.0	23.9	196	165	108
	Chromium (Cr)-Total (mg/L)	0.00471	0.00204	0.00200	0.00120	0.00067
	Cobalt (Co)-Total (mg/L)	0.00180	0.00109	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00697	0.00484	0.00096	0.00124	0.00119
	Iron (Fe)-Total (mg/L)	3.99	2.30	<0.010	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	0.00183	0.000318	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0046	0.0011	0.0688	0.0128	0.0079
	Magnesium (Mg)-Total (mg/L)	58.4	10.2	278	183	82.1
	Manganese (Mn)-Total (mg/L)	0.190	0.294	0.00023	<0.00010	0.00022
	Mercury (Hg)-Total (mg/L)	0.0000136	0.0000058	<0.0000050	0.0000055	0.0000063
	Molybdenum (Mo)-Total (mg/L)	0.00135	0.000667	0.00260	0.00277	0.00265
	Nickel (Ni)-Total (mg/L)	0.00893	0.00475	0.0750	0.0424	0.0304
	Phosphorus (P)-Total (mg/L)	0.094	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	1.10	0.24	3.27	2.03	1.36
	Selenium (Se)-Total (mg/L)	0.000642	0.000295	0.00419	0.00319	0.00129
	Silicon (Si)-Total (mg/L)	9.30	5.81	6.27	5.21	5.14
	Silver (Ag)-Total (mg/L)	0.000042	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	4.49	1.47	17.0	6.34	3.66

* 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	L1649166-6 Water 26-JUL-15 18:45 GWCC-4	L1649166-7 Water 26-JUL-15 19:00 DUP-2	L1649166-8 Water 26-JUL-15 19:00 TRAVEL BLANK	
Grouping	Analyte				
WATER					
Physical Tests	Conductivity (uS/cm)	694	982	<2.0	
	Hardness (as CaCO3) (mg/L)	427	614	<0.50	
	pH (pH)	7.55	7.53	5.01	
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	
Anions and Nutrients	Ammonia, Total (as N) (mg/L)	0.0050	0.0062	0.0100 ^{RRV}	
	Nitrate (as N) (mg/L)	0.0681	0.160 ^{DLA}	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0020	<0.0010	
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	<0.0020	
	Sulfate (SO4) (mg/L)	230	391	<0.30	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	10.4	9.83		
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	0.0045	<0.0030	
	Antimony (Sb)-Total (mg/L)	0.00094	0.00093	<0.00010	
	Arsenic (As)-Total (mg/L)	0.00131	0.00091	<0.00010	
	Barium (Ba)-Total (mg/L)	0.0324	0.0314	<0.000050	
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	
	Boron (B)-Total (mg/L)	0.055	0.082	<0.010	
	Cadmium (Cd)-Total (mg/L)	0.0000500	0.0000817	<0.0000050	
	Calcium (Ca)-Total (mg/L)	82.0	113	<0.050	
	Chromium (Cr)-Total (mg/L)	0.00048	0.00070	<0.00010	
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Total (mg/L)	0.00128	0.00125	<0.00050	
	Iron (Fe)-Total (mg/L)	<0.010	0.015	<0.010	
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Total (mg/L)	0.0068	0.0079	<0.0010	
	Magnesium (Mg)-Total (mg/L)	52.6	85.4	<0.10	
	Manganese (Mn)-Total (mg/L)	0.00057	0.00050	<0.00010	
	Mercury (Hg)-Total (mg/L)	<0.0000050	0.0000059	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.00257	0.00267	<0.000050	
	Nickel (Ni)-Total (mg/L)	0.0330	0.0315	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	1.22	1.43	<0.10	
	Selenium (Se)-Total (mg/L)	0.000712	0.00134	<0.000050	
	Silicon (Si)-Total (mg/L)	5.94	5.30	<0.050	
Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
Sodium (Na)-Total (mg/L)	2.88	3.75	<0.050		

* 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	L1649166-1 Water 26-JUL-15 15:45 R3	L1649166-2 Water 26-JUL-15 12:20 R7	L1649166-3 Water 26-JUL-15 20:00 GWCC-1	L1649166-4 Water 26-JUL-15 19:35 GWCC-2	L1649166-5 Water 26-JUL-15 19:00 GWCC-3	
Grouping	Analyte					
WATER						
Total Metals	Strontium (Sr)-Total (mg/L)	0.380	0.0756	1.85	0.887	0.517
	Sulfur (S)-Total (mg/L)	93.9	10.2	441	298	130
	Thallium (Tl)-Total (mg/L)	0.000033	<0.000010	0.000087	0.000065	0.000075
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.0544	0.0117	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.00554	0.000116	0.00664	0.00294	0.00142
	Vanadium (V)-Total (mg/L)	0.00657	0.00253	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0159	0.0035	0.0073	0.0050	0.0035
	Zirconium (Zr)-Total (mg/L)	0.00098	0.00110	<0.00030	<0.00030	<0.00030
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)	0.0470	0.109	0.0011	0.0012	0.0020
	Antimony (Sb)-Dissolved (mg/L)	0.00020	0.00022	0.00130	0.00111	0.00089
	Arsenic (As)-Dissolved (mg/L)	0.00074	0.00177	0.00194	0.00137	0.00083
	Barium (Ba)-Dissolved (mg/L)	0.0482	0.0905	0.0173	0.0193	0.0311
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	0.000031	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	0.302	0.110	0.070
	Cadmium (Cd)-Dissolved (mg/L)	0.0000086	0.0000325	0.000176	0.000167	0.0000878
	Calcium (Ca)-Dissolved (mg/L)	81.4	24.3	209	178	110
	Chromium (Cr)-Dissolved (mg/L)	0.00060	0.00156	0.00203	0.00110	0.00049
	Cobalt (Co)-Dissolved (mg/L)	0.00038	0.00092	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00208	0.00435	0.00091	0.00112	0.00114
	Iron (Fe)-Dissolved (mg/L)	0.358	1.65	0.013	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000116	0.000104	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0030	<0.0010	0.0780	0.0127	0.0080
	Magnesium (Mg)-Dissolved (mg/L)	57.4	10.5	292	191	81.4
	Manganese (Mn)-Dissolved (mg/L)	0.122	0.290	0.00025	0.00013	0.00023
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	0.0000056	0.0000076
	Molybdenum (Mo)-Dissolved (mg/L)	0.00108	0.000646	0.00260	0.00264	0.00255
	Nickel (Ni)-Dissolved (mg/L)	0.00363	0.00437	0.0723	0.0413	0.0304
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.76	0.25	3.34	2.13	1.38
	Selenium (Se)-Dissolved (mg/L)	0.000465	0.000303	0.00435	0.00323	0.00135
	Silicon (Si)-Dissolved (mg/L)	5.84	5.37	6.29	5.30	5.14
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	4.25	1.56	16.4	6.23	3.60

* 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	L1649166-6 Water 26-JUL-15 18:45 GWCC-4	L1649166-7 Water 26-JUL-15 19:00 DUP-2	L1649166-8 Water 26-JUL-15 19:00 TRAVEL BLANK	
Grouping	Analyte				
WATER					
Total Metals	Strontium (Sr)-Total (mg/L)	0.399	0.528	<0.00020	
	Sulfur (S)-Total (mg/L)	78.1	131	<0.50	
	Thallium (Tl)-Total (mg/L)	0.000073	0.000074	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.000962	0.00142	<0.000010	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0033	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0025	0.0022		
	Antimony (Sb)-Dissolved (mg/L)	0.00090	0.00087		
	Arsenic (As)-Dissolved (mg/L)	0.00129	0.00081		
	Barium (Ba)-Dissolved (mg/L)	0.0327	0.0297		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	0.049	0.068		
	Cadmium (Cd)-Dissolved (mg/L)	0.0000611	0.0000849		
	Calcium (Ca)-Dissolved (mg/L)	84.5	110		
	Chromium (Cr)-Dissolved (mg/L)	0.00041	0.00047		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00135	0.00112		
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	0.0066	0.0077		
	Magnesium (Mg)-Dissolved (mg/L)	52.5	82.2		
	Manganese (Mn)-Dissolved (mg/L)	0.00052	0.00015		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	0.0000064		
	Molybdenum (Mo)-Dissolved (mg/L)	0.00239	0.00247		
	Nickel (Ni)-Dissolved (mg/L)	0.0325	0.0294		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	1.19	1.35		
	Selenium (Se)-Dissolved (mg/L)	0.000672	0.00131		
	Silicon (Si)-Dissolved (mg/L)	5.90	5.15		
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	2.90	3.47		

* 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	L1649166-1	L1649166-2	L1649166-3	L1649166-4	L1649166-5
					Water	Water	Water	Water	Water
		26-JUL-15	15:45	R3	26-JUL-15	12:20	26-JUL-15	19:35	26-JUL-15
					R3	R7	GWCC-1	GWCC-2	GWCC-3
Grouping	Analyte								
WATER									
Dissolved Metals	Strontium (Sr)-Dissolved (mg/L)	0.376	0.0747	1.82	0.878	0.512			
	Sulfur (S)-Dissolved (mg/L)	92.9	9.92	433	295	128			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000088	0.000067	0.000075			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	0.00090	0.00282	<0.00030	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.00504	0.000090	0.00670	0.00295	0.00137			
	Vanadium (V)-Dissolved (mg/L)	0.00079	0.00158	<0.00050	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0013	0.0021	0.0070	0.0046	0.0029			
	Zirconium (Zr)-Dissolved (mg/L)	0.00070	0.00124	<0.00030	<0.00030	<0.00030			
Speciated Metals	Chromium (III)-Dissolved (mg/L)		0.00156	<0.00045	<0.00042				
	Chromium (III)-Total (mg/L)	0.00141	0.00204	<0.00048	<0.00044				
	Hexavalent Chromium (mg/L)	0.0033 ^{RRV}	<0.0010	0.0024	0.0016				
	Hexavalent Chromium-Dissolved (mg/L)		<0.0010	0.0018	0.0014				

* 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	L1649166-6 Water 26-JUL-15 18:45 GWCC-4	L1649166-7 Water 26-JUL-15 19:00 DUP-2	L1649166-8 Water 26-JUL-15 19:00 TRAVEL BLANK	
Grouping	Analyte				
WATER					
Dissolved Metals	Strontium (Sr)-Dissolved (mg/L)	0.388	0.501		
	Sulfur (S)-Dissolved (mg/L)	76.5	128		
	Thallium (Tl)-Dissolved (mg/L)	0.000072	0.000072		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030		
	Uranium (U)-Dissolved (mg/L)	0.000913	0.00135		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	0.0053	0.0022		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030		
Speciated Metals	Chromium (III)-Dissolved (mg/L)				
	Chromium (III)-Total (mg/L)				
	Hexavalent Chromium (mg/L)				
	Hexavalent Chromium-Dissolved (mg/L)				

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

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1649166-1	R3	WSMT	Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.
L1649166-9	R3 - HG ALS CUT FROM RA	WSMT	Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.
		SPL	Sample was Preserved at the laboratory - Hg Vial preserved 28-Jul-15

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Antimony (Sb)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Bismuth (Bi)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Cadmium (Cd)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Chromium (Cr)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Copper (Cu)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Lead (Pb)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Silver (Ag)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Thallium (Tl)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Tin (Sn)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Titanium (Ti)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Uranium (U)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Vanadium (V)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Zinc (Zn)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Zirconium (Zr)-Dissolved	DLA	L1649166-1, -2, -3, -4, -5, -6, -7
Duplicate	Bismuth (Bi)-Total	DLA	L1649166-2, -3, -4, -5, -6, -7, -8
Duplicate	Silver (Ag)-Total	DLA	L1649166-2, -3, -4, -5, -6, -7, -8
Duplicate	Thallium (Tl)-Total	DLA	L1649166-2, -3, -4, -5, -6, -7, -8
Duplicate	Tin (Sn)-Total	DLA	L1649166-2, -3, -4, -5, -6, -7, -8
Duplicate	Vanadium (V)-Total	DLA	L1649166-2, -3, -4, -5, -6, -7, -8
Duplicate	Zirconium (Zr)-Total	DLA	L1649166-2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sulfate (SO4)	MS-B	L1649166-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1649166-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1649166-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1649166-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Dissolved Organic Carbon	MS-B	L1649166-3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1649166-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1649166-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1649166-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Total	MS-B	L1649166-1
Matrix Spike	Copper (Cu)-Total	MS-B	L1649166-1
Matrix Spike	Sodium (Na)-Total	MS-B	L1649166-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L1649166-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	

Reference Information

BE-T-L-CCMS-VA	Water	Total Be (Low) 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.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CR-CR3-DIS-CALC-ED	Water	Dissolved Trivalent Chromium in Water	CALCULATION
Chromium (III)-Dissolved is calculated as the difference between the dissolved chromium and the dissolved hexavalent chromium (Cr(VI)) results.			
CR-CR3-ED	Water	Chromium, Trivalent (Cr +3)	Total Dissolved Cr - Cr(+6)
Chromium (III) is calculated as the difference between Total Chromium and Chromium (VI) results.			
CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION
Chromium (III)-Total is calculated as the difference between the total chromium and the hexavalent chromium (Cr(VI)) results.			
CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)
This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.			
Results are based on an un-filtered, field-preserved sample.			
CR6-D-IC-ED	Water	Chromium, Dissolved Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)
This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.			
Results are based on a field-filtered, field-preserved sample.			
EC-MAN-WR	Water	Conductivity by Meter	APHA 2510 (B)
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using an electrode.			
ETL-CR3DIS-ED	Water	Chromium, Total Dissolved for Speciation	APHA 3120 B-ICP-OES
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 CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
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-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
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	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			

Reference Information

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

MET-TOT-LOW-ICP-VA	Water	Total Metals in Water by ICPOES	EPA 3005A/6010B
<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 acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).</p>			
NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)
<p>This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.</p>			
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
<p>This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.</p>			
NO2-L-IC-N-WR	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
NO3-L-IC-N-WR	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.</p>			
PH-MAN-WR	Water	pH by Meter	APHA 4500-H+
<p>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.</p>			
S-DIS-ICP-VA	Water	Dissolved Sulfur in Water by ICPOES	EPA SW-846 3005A/6010B
<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 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).</p>			
<p>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.</p>			
S-TOT-ICP-VA	Water	Total Sulfur in Water by ICPOES	EPA SW-846 3005A/6010B
<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 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).</p>			
<p>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.</p>			
SO4-IC-N-WR	Water	Sulfate in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
TSS-MAN-WR	Water	Total Suspended Solids by Gravimetric	APHA 2540 D
<p>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.</p>			

** 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

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.

