



HEMMERA ENVIROCHEM INC.
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Date Received: 30-MAY-16
Report Date: 15-JUL-16 13:27 (MT)
Version: FINAL REV. 3

Client Phone: 867-456-4865

Certificate of Analysis

Lab Work Order #: L1775300
Project P.O. #: NOT SUBMITTED
Job Reference: 1343-005.27
C of C Numbers: 1
Legal Site Desc:

Comments:

15-JUL-2016 This report replaces the previous version and includes a corrected TKN value for the Travel Blank sample.

Brent Mack, 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	L1775300-1 Water 27-MAY-16 12:20 GSI-PC-03B	L1775300-2 Water 26-MAY-16 12:45 MP09-14	L1775300-3 Water 27-MAY-16 11:50 MP09-08	L1775300-4 Water 25-MAY-16 14:10 GSI-HA-04A	L1775300-5 Water 27-MAY-16 08:10 GSI-HA-04A	
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	3920		726	347	
	Hardness (as CaCO3) (mg/L)	2790	144	413	262	
	pH (pH)	8.12		7.53	7.59	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	900		225	136	
	Ammonia, Total (as N) (mg/L)			0.0318		
	Chloride (Cl) (mg/L)	<10 ^{DLDS}		<0.50	<0.50	
	Fluoride (F) (mg/L)	<0.40 ^{DLDS}		0.077	0.097	
	Nitrate (as N) (mg/L)	<0.10 ^{DLDS}		<0.0050	0.0059	
	Nitrite (as N) (mg/L)	<0.020 ^{DLDS}		<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)			0.233		
	Sulfate (SO4) (mg/L)	2030		172	68.3	
	Anion Sum (meq/L)	60.3		8.08		
	Cation Sum (meq/L)	62.0		8.65		
	Cation - Anion Balance (%)	1.3		3.4		
	Cyanides	Cyanide, Weak Acid Diss (mg/L)	<0.0050		<0.0050	<0.0050
		Cyanide, Total (mg/L)	<0.0050		<0.0050	<0.0050
Thiocyanate (SCN) (mg/L)				<0.50		
Cyanide, Free (mg/L)		<0.0050		<0.0050	<0.0050	
Organic / Inorganic Carbon	Total Inorganic Carbon (mg/L)			60.4		
	Total Organic Carbon (mg/L)			5.99		
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					

* 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	L1775300-6 Water 27-MAY-16 16:10 GSI-HA-04A	L1775300-7 Water 27-MAY-16 10:10 MW09-22	L1775300-8 Water 27-MAY-16 16:25 MW09-22	L1775300-9 Water 27-MAY-16 12:50 DUP-3	L1775300-10 Water 27-MAY-16 10:10 FB-4
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)			937	728	<2.0
	Hardness (as CaCO3) (mg/L)		471		414	<0.50
	pH (pH)			7.03	7.45	5.41
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)			165	225	<1.0
	Ammonia, Total (as N) (mg/L)	0.0641	0.702		0.0345	<0.0050
	Chloride (Cl) (mg/L)			<1.0 ^{DLDS}	0.75	<0.50
	Fluoride (F) (mg/L)			0.046	0.088	<0.020
	Nitrate (as N) (mg/L)			0.330	<0.0050	<0.0050
	Nitrite (as N) (mg/L)			0.0188	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	1.38	2.45		0.265	<0.050
	Sulfate (SO4) (mg/L)			343	172	<0.30
	Anion Sum (meq/L)				8.10	<0.10
	Cation Sum (meq/L)				8.66	<0.10
	Cation - Anion Balance (%)				3.3	0.0
Cyanides	Cyanide, Weak Acid Diss (mg/L)		<0.0050		<0.0050	<0.0050
	Cyanide, Total (mg/L)		0.0177		<0.0050	<0.0050
	Thiocyanate (SCN) (mg/L)	<0.50	<0.50		<0.50	<0.50
	Cyanide, Free (mg/L)		<0.0050		<0.0050	<0.0050
Organic / Inorganic Carbon	Total Inorganic Carbon (mg/L)	30.8		59.2	61.3	<0.50
	Total Organic Carbon (mg/L)	18.0	18.5		6.18	<0.50
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					

* 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	L1775300-11 Water 27-MAY-16 TRAVEL BLANK			
Grouping	Analyte				
WATER					
Physical Tests	Conductivity (uS/cm)	<2.0			
	Hardness (as CaCO3) (mg/L)	<0.50			
	pH (pH)	5.47			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	<1.0			
	Ammonia, Total (as N) (mg/L)	<0.0050			
	Chloride (Cl) (mg/L)	<0.50			
	Fluoride (F) (mg/L)	<0.020			
	Nitrate (as N) (mg/L)	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	<0.050			
	Sulfate (SO4) (mg/L)	<0.30			
	Anion Sum (meq/L)	<0.10			
	Cation Sum (meq/L)	<0.10			
	Cation - Anion Balance (%)	0.0			
Cyanides	Cyanide, Weak Acid Diss (mg/L)	<0.0050			
	Cyanide, Total (mg/L)	<0.0050			
	Thiocyanate (SCN) (mg/L)	<0.50			
	Cyanide, Free (mg/L)	<0.0050			
Organic / Inorganic Carbon	Total Inorganic Carbon (mg/L)	<0.50			
	Total Organic Carbon (mg/L)	<0.50			
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030			
	Antimony (Sb)-Total (mg/L)	<0.00010			
	Arsenic (As)-Total (mg/L)	<0.00010			
	Barium (Ba)-Total (mg/L)	<0.000050			
	Beryllium (Be)-Total (mg/L)	<0.000020			
	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)	<0.050			
	Chromium (Cr)-Total (mg/L)	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050			
	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)	<0.10			

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1775300-1	L1775300-2	L1775300-3	L1775300-4	L1775300-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	27-MAY-16	26-MAY-16	27-MAY-16	25-MAY-16	27-MAY-16
		Sampled Time	12:20	12:45	11:50	14:10	08:10
		Client ID	GSI-PC-03B	MP09-14	MP09-08	GSI-HA-04A	GSI-HA-04A
Grouping	Analyte						
WATER							
Total Metals	Manganese (Mn)-Total (mg/L)						
	Mercury (Hg)-Total (mg/L)						
	Molybdenum (Mo)-Total (mg/L)						
	Nickel (Ni)-Total (mg/L)						
	Phosphorus (P)-Total (mg/L)						
	Potassium (K)-Total (mg/L)						
	Selenium (Se)-Total (mg/L)						
	Silicon (Si)-Total (mg/L)						
	Silver (Ag)-Total (mg/L)						
	Sodium (Na)-Total (mg/L)						
	Strontium (Sr)-Total (mg/L)						
	Sulfur (S)-Total (mg/L)						
	Thallium (Tl)-Total (mg/L)						
	Tin (Sn)-Total (mg/L)						
	Titanium (Ti)-Total (mg/L)						
	Uranium (U)-Total (mg/L)						
	Vanadium (V)-Total (mg/L)						
	Zinc (Zn)-Total (mg/L)						
	Zirconium (Zr)-Total (mg/L)						
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD			FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD		FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0315	0.0021	0.0046	0.0232		
	Antimony (Sb)-Dissolved (mg/L)	0.00296	0.00481	<0.00010	0.00090		
	Arsenic (As)-Dissolved (mg/L)	0.0874	0.809	0.0148	0.0249		
	Barium (Ba)-Dissolved (mg/L)	0.126	0.0237	0.0446	0.0531		
	Beryllium (Be)-Dissolved (mg/L)	<0.000040 ^{DLA}	<0.000020	<0.000020	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.00010 ^{DLA}	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	0.036	0.020	<0.010	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	0.000135	0.0000467	<0.0000050	0.0000330		
	Calcium (Ca)-Dissolved (mg/L)	125	44.7	114	67.0		
	Chromium (Cr)-Dissolved (mg/L)	0.0290	0.00015	<0.00010	0.00114		
	Cobalt (Co)-Dissolved (mg/L)	0.00579	0.00040	0.00065	0.00025		
	Copper (Cu)-Dissolved (mg/L)	0.00541	0.00043	<0.00020	0.00164		
	Iron (Fe)-Dissolved (mg/L)	7.28	0.600	1.11	1.80		
	Lead (Pb)-Dissolved (mg/L)	0.00080	0.000650	<0.000050	0.000315		
	Lithium (Li)-Dissolved (mg/L)	0.0469	0.0022	0.0036	0.0020		
	Magnesium (Mg)-Dissolved (mg/L)	603	7.83	30.9	23.1		

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1775300-6 Water 27-MAY-16 16:10 GSI-HA-04A	L1775300-7 Water 27-MAY-16 10:10 MW09-22	L1775300-8 Water 27-MAY-16 16:25 MW09-22	L1775300-9 Water 27-MAY-16 12:50 DUP-3	L1775300-10 Water 27-MAY-16 10:10 FB-4
Grouping	Analyte					
WATER						
Total Metals	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD		FIELD	FIELD
	Dissolved Metals Filtration Location		FIELD		FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		0.0275		0.0051	<0.0010
	Antimony (Sb)-Dissolved (mg/L)		0.00031		<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)		0.00206		0.0152	<0.00010
	Barium (Ba)-Dissolved (mg/L)		0.0829		0.0434	<0.000050
	Beryllium (Be)-Dissolved (mg/L)		<0.000020		<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050		<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)		0.029		<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)		0.0000550		<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)		167		115	<0.050
	Chromium (Cr)-Dissolved (mg/L)		0.00047		<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)		0.00884		0.00066	<0.00010
	Copper (Cu)-Dissolved (mg/L)		0.00348		<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)		0.936		1.11	<0.010
	Lead (Pb)-Dissolved (mg/L)		0.000081		<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)		<0.0010		0.0034	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)		13.0		30.9	<0.10

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1775300-11			
		Water			
		27-MAY-16			
		TRAVEL BLANK			
Grouping	Analyte				
WATER					
Total Metals	Manganese (Mn)-Total (mg/L)	<0.00010			
	Mercury (Hg)-Total (mg/L)	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	<0.000050			
	Nickel (Ni)-Total (mg/L)	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050			
	Potassium (K)-Total (mg/L)	<0.10			
	Selenium (Se)-Total (mg/L)	<0.000050			
	Silicon (Si)-Total (mg/L)	<0.050			
	Silver (Ag)-Total (mg/L)	<0.000010			
	Sodium (Na)-Total (mg/L)	<0.050			
	Strontium (Sr)-Total (mg/L)	<0.00020			
	Sulfur (S)-Total (mg/L)	<0.50			
	Thallium (Tl)-Total (mg/L)	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030			
	Uranium (U)-Total (mg/L)	<0.000010			
	Vanadium (V)-Total (mg/L)	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location				
	Dissolved Metals Filtration Location				
	Aluminum (Al)-Dissolved (mg/L)				
	Antimony (Sb)-Dissolved (mg/L)				
	Arsenic (As)-Dissolved (mg/L)				
	Barium (Ba)-Dissolved (mg/L)				
	Beryllium (Be)-Dissolved (mg/L)				
	Bismuth (Bi)-Dissolved (mg/L)				
	Boron (B)-Dissolved (mg/L)				
	Cadmium (Cd)-Dissolved (mg/L)				
	Calcium (Ca)-Dissolved (mg/L)				
	Chromium (Cr)-Dissolved (mg/L)				
	Cobalt (Co)-Dissolved (mg/L)				
	Copper (Cu)-Dissolved (mg/L)				
	Iron (Fe)-Dissolved (mg/L)				
	Lead (Pb)-Dissolved (mg/L)				
	Lithium (Li)-Dissolved (mg/L)				
	Magnesium (Mg)-Dissolved (mg/L)				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1775300-1	L1775300-2	L1775300-3	L1775300-4	L1775300-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	27-MAY-16	26-MAY-16	27-MAY-16	25-MAY-16	27-MAY-16
		Sampled Time	12:20	12:45	11:50	14:10	08:10
		Client ID	GSI-PC-03B	MP09-14	MP09-08	GSI-HA-04A	GSI-HA-04A
Grouping	Analyte						
WATER							
Dissolved Metals	Manganese (Mn)-Dissolved (mg/L)		2.10	0.115	0.804	1.24	
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050		<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)		0.0153	0.000727	0.000406	0.000770	
	Nickel (Ni)-Dissolved (mg/L)		0.0743	0.00523	<0.00050	0.00172	
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)		24.6	9.49	1.12	2.24	
	Selenium (Se)-Dissolved (mg/L)		0.00039	<0.000050	0.000100	0.000061	
	Silicon (Si)-Dissolved (mg/L)		8.84	0.932	7.39	4.66	
	Silver (Ag)-Dissolved (mg/L)		<0.000020 ^{DLA}	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)		117	4.80	6.32	2.79	
	Strontium (Sr)-Dissolved (mg/L)		2.18	0.158	1.15	0.165	
	Sulfur (S)-Dissolved (mg/L)		629	31.4	59.6	38.9	
	Thallium (Tl)-Dissolved (mg/L)		<0.000020 ^{DLA}	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)		0.00025	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)		0.00336	<0.00030	<0.00030	0.00095	
	Uranium (U)-Dissolved (mg/L)		0.0239	0.000129	0.00246	0.000367	
	Vanadium (V)-Dissolved (mg/L)		0.0033	<0.00050	<0.00050	0.00084	
	Zinc (Zn)-Dissolved (mg/L)		0.0376	0.0059	0.0026	0.0037	
	Zirconium (Zr)-Dissolved (mg/L)		0.00114	<0.00030	<0.00030	<0.00030	

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1775300-6	L1775300-7	L1775300-8	L1775300-9	L1775300-10
		Description	Water	Water	Water	Water	Water
		Sampled Date	27-MAY-16	27-MAY-16	27-MAY-16	27-MAY-16	27-MAY-16
		Sampled Time	16:10	10:10	16:25	12:50	10:10
		Client ID	GSI-HA-04A	MW09-22	MW09-22	DUP-3	FB-4
Grouping	Analyte						
WATER							
Dissolved Metals	Manganese (Mn)-Dissolved (mg/L)			3.49		0.810	<0.00010
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050		<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)			0.000195		0.000382	<0.000050
	Nickel (Ni)-Dissolved (mg/L)			0.00127		<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)			<0.050		<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)			3.01		1.14	<0.10
	Selenium (Se)-Dissolved (mg/L)			0.000148		0.000084	<0.000050
	Silicon (Si)-Dissolved (mg/L)			4.35		7.40	<0.050
	Silver (Ag)-Dissolved (mg/L)			0.000019		<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)			22.5		6.31	<0.050
	Strontium (Sr)-Dissolved (mg/L)			0.448		1.12	<0.00020
	Sulfur (S)-Dissolved (mg/L)			108		59.7	<0.50
	Thallium (Tl)-Dissolved (mg/L)			<0.000010		<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)			<0.00010		<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)			0.00069		<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)			0.000684		0.00241	<0.000010
	Vanadium (V)-Dissolved (mg/L)			0.00053		<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)			0.0020		<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)			0.00031		<0.00030	<0.00030

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID				
	L1775300-11 Water 27-MAY-16 TRAVEL BLANK				
Grouping	Analyte				
WATER					
Dissolved Metals	Manganese (Mn)-Dissolved (mg/L) Mercury (Hg)-Dissolved (mg/L) Molybdenum (Mo)-Dissolved (mg/L) Nickel (Ni)-Dissolved (mg/L) Phosphorus (P)-Dissolved (mg/L) Potassium (K)-Dissolved (mg/L) Selenium (Se)-Dissolved (mg/L) Silicon (Si)-Dissolved (mg/L) Silver (Ag)-Dissolved (mg/L) Sodium (Na)-Dissolved (mg/L) Strontium (Sr)-Dissolved (mg/L) Sulfur (S)-Dissolved (mg/L) Thallium (Tl)-Dissolved (mg/L) Tin (Sn)-Dissolved (mg/L) Titanium (Ti)-Dissolved (mg/L) Uranium (U)-Dissolved (mg/L) Vanadium (V)-Dissolved (mg/L) Zinc (Zn)-Dissolved (mg/L) Zirconium (Zr)-Dissolved (mg/L)				

* 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)
Method Blank	Alkalinity, Total (as CaCO3)	B	L1775300-1, -10, -11, -3, -5, -8, -9
Method Blank	Alkalinity, Total (as CaCO3)	B	L1775300-1, -10, -11, -3, -5, -8, -9
Method Blank	Chromium (Cr)-Total	MB-LOR	L1775300-11
Matrix Spike	Total Inorganic Carbon	MS-B	L1775300-3, -6, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Total Inorganic Carbon	MS-B	L1775300-10, -11
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Total Kjeldahl Nitrogen	MSTN	L1775300-11
Duplicate	Total Kjeldahl Nitrogen	TKND	L1775300-11

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
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.
MSTN	TKN Matrix Spike recovery was low due to interference from high nitrate, which causes negative bias on TKN.
TKND	TKN duplication was poor due to interference from high nitrate, which causes negative bias on TKN.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
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.			
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-TIC-VA	Water	Total inorganic carbon by CO2 purge	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

Reference Information

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-WR Water Chloride in Water by IC EPA 300.1 (mod)
 Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-CFA-VA Water Free Cyanide in water by CFA ASTM 7237
 This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-SCN-VA Water Thiocyanate by Colour APHA 4500-CN CYANIDE
 This analysis is carried out using procedures adapted from APHA Method 4500-CN- M "Thiocyanate" Thiocyanate is determined by the ferric nitrate colourimetric method.

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.

CN-WAD-CFA-VA Water Weak Acid Diss. Cyanide in water by CFA APHA 4500-CN CYANIDE
 This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.
 This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

F-IC-N-WR Water Fluoride in Water by IC EPA 300.1 (mod)
 Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

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-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.

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:

$$\text{Ion Balance (\%)} = \frac{[\text{Cation Sum} - \text{Anion Sum}]}{[\text{Cation Sum} + \text{Anion Sum}]}$$

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.

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

Reference Information

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).

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

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.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

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.

NO2-L-IC-N-WR Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

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

NO3-L-IC-N-WR Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

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

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 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.

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

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

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

** 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

Reference Information

VA

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

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.



L1775300-COFC

Report To		Report Form:		below (Rush Turnaround Time (TAT) is not available for all tests)																			
Company: Hemmera Environchem Inc.		Select Report Format: <input checked="" type="checkbox"/> PDF <input type="checkbox"/> ORIGINAL		R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)																			
Contact: Natasha Sandys		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT																			
Address: 230 - 2237 2nd Avenue Whitehorse, YT		<input type="checkbox"/> Criteria on Report - provide details below if box checked		E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT																			
Phone: 867-456-4865		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge																			
Email 1 or Fax nsandys@hemmera.com		Email 1 or Fax nsandys@hemmera.com		Specify Date Required for E2,E or P:																			
Email 2 chris@elr.ca		Email 2 chris@elr.ca		Analysis Request																			
Invoice To Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Invoice Distribution		Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																			
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input checked="" type="checkbox"/> MAIL <input type="checkbox"/> FAX		F/P		F/P				P		P		P									
Company: Hemmera Environchem Inc.		Email 1 or Fax nsandys@hemmera.com		Dissolved Metals, Hardness		Dissolved Mercury		Nitrate, Nitrite, Total Kjeldahl N (TKN)		Cl, F, Sulfate, conductivity, pH, alkalinity		Anion Sum, Cation Sum, Cation/Anion Balance		Cyanide - Weak Acid Diss., Total, Free		Ammonia N (total), Total Organic Carbon		Thiocyanate (SCN)		Total Inorganic Carbon		Number of Containers	
Contact: Natasha Sandys		Email 2 chris@elr.ca		Oil and Gas Required Fields (client use)																			
Project Information		Approver ID: [REDACTED]		Cost Center: [REDACTED]																			
ALS Quote #: Q56042		GL Account: [REDACTED]		Routing Code: [REDACTED]																			
Job #: 1343-005.27		Activity Code: [REDACTED]		Location: [REDACTED]																			
PO / AFE:		ALS Contact:		Sampler: JC,MM,NB,KB																			
LSD:																							
ALS Lab Work Order # (lab use only)																							
ALS Sample # (lab use only)		Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mmm-yy)	Time (hh:mm)	Sample Type																
GSI-PC-03B					27-May-16	12:20	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R		
MP09-14					26-May-16	12:45	Water	R														1	
MP09-08					27-May-16	11:50	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	7	
GSI-HA-04A					25-May-16	14:10	Water	R	R													2	
GSI-HA-04A					27-May-16	8:10	Water			R	R	R	R									2	
GSI-HA-04A					27-May-16	16:10	Water							R	R	R	R					3	
MW09-22					27-May-16	10:10	Water	R	R					R	R	R	R					5	
MW09-22					27-May-16	16:25	Water			R	R	R					R					2	
Dup-3					27-May-16	12:50	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	7	
FB-4					27-May-16	10:10	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	7	
Travel Blank					27-May-16		Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	7	
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client use)				SAMPLE CONDITION AS RECEIVED (lab use only)																	
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		- Please send ELR EQWin EDD file with regular results report.				Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>																	
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						Ice packs Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>																	
						Cooling Initiated <input checked="" type="checkbox"/>																	
						INITIAL COOLER TEMPERATURES °C						FINAL COOLER TEMPERATURES °C											
						2.4						8/9/2016											
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEPTION (lab use only)				FINAL SHIPMENT RECEPTION (lab use only)															
Released by: [Signature]		Date: May 30 2016	Time: 9:15	Received by: [Signature]		Date: May 30 2016	Time: 9:30	Received by: [Signature]		Date: May 31	Time: 4pm												