



HEMMERA ENVIROCHEM INC.
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Date Received: 02-SEP-16
Report Date: 19-SEP-16 15:06 (MT)
Version: FINAL

Client Phone: 867-456-4865

Certificate of Analysis

Lab Work Order #: L1823304
Project P.O. #: NOT SUBMITTED
Job Reference: 1343-005.28
C of C Numbers: 1, 2
Legal Site Desc:

Comments: ADDITIONAL 15-SEP-16 16:03

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1823304-1	L1823304-2	L1823304-3	L1823304-4	L1823304-5
		Water 31-AUG-16 11:10 GSI-DC-06B	Water 31-AUG-16 12:25 GSI-DC-07B	Water 31-AUG-16 15:10 GSI-DC-08B	Water 31-AUG-16 14:15 GSI-DC-09B	Water 31-AUG-16 13:00 GSI-DC-10B
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	960	995	892	363	1070
	Hardness (as CaCO3) (mg/L)	578	572	429	174	568
	pH (pH)	8.07	7.78	7.21	7.68	6.79
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	595	201	406	95.3	113
	Ammonia, Total (as N) (mg/L)	3.39	2.38	11.6	1.51	1.54
	Chloride (Cl) (mg/L)	8.1	<2.5 ^{DLDS}	3.2	<0.50	<2.5 ^{DLDS}
	Fluoride (F) (mg/L)	0.35	<0.10 ^{DLDS}	0.16	0.086	<0.10 ^{DLDS}
	Nitrate (as N) (mg/L)	<0.025 ^{DLDS}	<0.025 ^{DLDS}	0.049	0.0196	<0.025 ^{DLDS}
	Nitrite (as N) (mg/L)	<0.0050 ^{DLDS}	<0.0050 ^{DLDS}	0.0168	0.0017	<0.0050 ^{DLDS}
	Total Kjeldahl Nitrogen (mg/L)	5.20	3.00	32.0	2.4	2.56
	Sulfate (SO4) (mg/L)	1.9	388	105	94.7	508
	Anion Sum (meq/L)	12.2	12.1	10.4	3.88	12.8
	Cation Sum (meq/L)	14.0	13.4	17.4	4.48	16.8
	Cation - Anion Balance (%)	6.9	5.3	25.1	7.1	13.4
Cyanides	Cyanide, Weak Acid Diss (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Thiocyanate (SCN) (mg/L)	0.54	<0.50	2.93	<0.50	0.61
	Cyanide, Free (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Organic / Inorganic Carbon	Total Inorganic Carbon (mg/L)	142	59.3	128	29.3	38.4
	Total Organic Carbon (mg/L)	52.6	15.9	451	23.3	35.0
Total Metals	Mercury (Hg)-Total (mg/L)					
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)	0.0139	0.0084	0.589	0.0642	0.140
	Antimony (Sb)-Dissolved (mg/L)	0.00027	0.00016	0.00217	0.00018	0.00028
	Arsenic (As)-Dissolved (mg/L)	0.444	0.140	0.106	0.0696	0.132
	Barium (Ba)-Dissolved (mg/L)	0.0812	0.175	0.305	0.0356	0.389
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	0.000109	0.000024	<0.000040 ^{DLA}
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.00010 ^{DLA}
	Boron (B)-Dissolved (mg/L)	<0.010	0.021	<0.010	0.013	<0.020 ^{DLA}
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.0000295	<0.0000050	<0.000010 ^{DLA}
	Calcium (Ca)-Dissolved (mg/L)	142	159	128	36.8	153
	Chromium (Cr)-Dissolved (mg/L)	0.00144	0.00032	0.0140	0.00100	0.00211
	Cobalt (Co)-Dissolved (mg/L)	0.00108	0.00162	0.00829	0.00065	0.0183
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	0.00152	<0.00020	<0.00040 ^{DLA}
	Iron (Fe)-Dissolved (mg/L)	19.5	19.2	134	8.75	67.5

* 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	L1823304-6	L1823304-7	L1823304-8	L1823304-9	L1823304-10
					Water	Water	Water	Water	Water
		31-AUG-16	11:00	MP09-08	31-AUG-16	01-SEP-16		31-AUG-16	31-AUG-16
					11:00	09:35		11:00	11:00
					MP09-08	MP09-12	TRIP BLANK	DUP-4	FB-3
Grouping	Analyte								
WATER									
Physical Tests	Conductivity (uS/cm)	814	925	<2.0	814	<2.0		814	<2.0
	Hardness (as CaCO3) (mg/L)	482	524		484	<0.50		484	<0.50
	pH (pH)	8.11	8.10	5.35	8.15	5.37		8.15	5.37
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	270	386	<1.0	273	<1.0		273	<1.0
	Ammonia, Total (as N) (mg/L)	0.0222	5.96	<0.0050	0.0231	<0.0050		0.0231	<0.0050
	Chloride (Cl) (mg/L)	<2.5 ^{DLDS}	<2.5 ^{DLDS}	<0.50	<2.5 ^{DLDS}	<0.50		<2.5 ^{DLDS}	<0.50
	Fluoride (F) (mg/L)	<0.10 ^{DLDS}	0.30	<0.020	<0.10 ^{DLDS}	<0.020		<0.10 ^{DLDS}	<0.020
	Nitrate (as N) (mg/L)	<0.025 ^{DLDS}	<0.025 ^{DLDS}	<0.0050	<0.025 ^{DLDS}	<0.0050		<0.025 ^{DLDS}	<0.0050
	Nitrite (as N) (mg/L)	<0.0050 ^{DLDS}	<0.0050 ^{DLDS}	<0.0010	<0.0050 ^{DLDS}	<0.0010		<0.0050 ^{DLDS}	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.753	6.12	<0.050	0.528	<0.050		0.528	<0.050
	Sulfate (SO4) (mg/L)	213	178	<0.30	216	<0.30		216	<0.30
	Anion Sum (meq/L)	9.84	11.4		9.95	<0.10		9.95	<0.10
	Cation Sum (meq/L)	10.1	11.7		10.1	<0.10		10.1	<0.10
	Cation - Anion Balance (%)	1.1	1.3		0.9	0.0		0.9	0.0
Cyanides	Cyanide, Weak Acid Diss (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050
	Cyanide, Total (mg/L)	<0.0050	0.422	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050
	Thiocyanate (SCN) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50		<0.50	<0.50
	Cyanide, Free (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050
Organic / Inorganic Carbon	Total Inorganic Carbon (mg/L)	67.3	98.2	<0.50	67.1	<0.50		67.1	<0.50
	Total Organic Carbon (mg/L)	12.8	18.6	<0.50	10.4	<0.50		10.4	<0.50
Total Metals	Mercury (Hg)-Total (mg/L)			<0.0000050					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD		FIELD	FIELD		FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD		FIELD	FIELD		FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0037	0.0074		0.0036	<0.0010		0.0036	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00050	0.0215		0.00035	<0.00010		0.00035	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.0140	7.40		0.0133	<0.00010		0.0133	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.0518	0.0458		0.0522	<0.000050		0.0522	<0.000050
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020		<0.000020	<0.000020		<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050		<0.000050	<0.000050		<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	0.104		<0.010	<0.010		<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	0.000103		<0.0000050	0.0000200		<0.0000050	0.0000200
	Calcium (Ca)-Dissolved (mg/L)	133	144		134	<0.050		134	<0.050
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00032		<0.00010	<0.00010		<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	0.00069	0.00288		0.00069	<0.00010		0.00069	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00073		<0.00020	<0.00020		<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)	0.862	6.32		0.846	<0.010		0.846	<0.010

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1823304-11	L1823304-12	L1823304-13	L1823304-14	L1823304-15
		Description	Water	Water	Water	Water	Water
		Sampled Date	31-AUG-16	31-AUG-16	31-AUG-16	29-AUG-16	29-AUG-16
		Sampled Time	08:45	10:00	09:00	08:45	17:30
		Client ID	MP09-03	GSI-PC-03B	GSI-PC-04B	GSI-DC-01B	MP09-14
Grouping	Analyte						
WATER							
Physical Tests	Conductivity (uS/cm)		675	2600	825		
	Hardness (as CaCO3) (mg/L)		380	1710	457	119	535
	pH (pH)		8.02	8.22	7.30		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)		196	610	201		
	Ammonia, Total (as N) (mg/L)						
	Chloride (Cl) (mg/L)		<2.5 ^{DLDS}	<10 ^{DLDS}	<2.5 ^{DLDS}		
	Fluoride (F) (mg/L)		<0.10 ^{DLDS}	<0.40 ^{DLDS}	<0.10 ^{DLDS}		
	Nitrate (as N) (mg/L)		<0.025 ^{DLDS}	0.21	<0.025 ^{DLDS}		
	Nitrite (as N) (mg/L)		0.0059	0.055	<0.0050 ^{DLDS}		
	Total Kjeldahl Nitrogen (mg/L)		5.66 ^{PEHT}	3.9	1.24 ^{PEHT}		
	Sulfate (SO4) (mg/L)		193	1300	272		
	Anion Sum (meq/L)		7.95	39.2	9.67		
	Cation Sum (meq/L)		8.18	38.6	10.1		
	Cation - Anion Balance (%)		1.4	-0.8	2.2		
	Cyanides	Cyanide, Weak Acid Diss (mg/L)					
Cyanide, Total (mg/L)							
Thiocyanate (SCN) (mg/L)							
Cyanide, Free (mg/L)							
Organic / Inorganic Carbon	Total Inorganic Carbon (mg/L)						
	Total Organic Carbon (mg/L)						
Total Metals	Mercury (Hg)-Total (mg/L)						
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		0.0400	0.0512	0.0532	0.0057	0.0057
	Antimony (Sb)-Dissolved (mg/L)		0.00183	0.00607	0.00095	0.00374	0.00198
	Arsenic (As)-Dissolved (mg/L)		0.0342	0.0458	0.0115	0.00314	0.502
	Barium (Ba)-Dissolved (mg/L)		0.147	0.102	0.102	0.0110	0.0917
	Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000040 ^{DLA}	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.00010 ^{DLA}	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)		<0.010	0.039	<0.010	0.022	0.050
	Cadmium (Cd)-Dissolved (mg/L)		0.0000578	0.000030	0.0000475	0.0000640	0.0000670
	Calcium (Ca)-Dissolved (mg/L)		103	98.5	111	39.1	149
	Chromium (Cr)-Dissolved (mg/L)		0.00043	0.0262	0.0133	0.00334	0.00022
	Cobalt (Co)-Dissolved (mg/L)		0.00313	0.00420	0.00325	0.00083	0.00076
	Copper (Cu)-Dissolved (mg/L)		0.00096	0.00390	0.00301	0.0276	<0.00020
	Iron (Fe)-Dissolved (mg/L)		2.15	15.7	4.59	0.058	0.767

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1823304-16 Water 31-AUG-16 14:05 MP09-14	L1823304-17 Water 01-SEP-16 08:08 MP09-03	L1823304-18 Water 01-SEP-16 08:40 GSI-PC-04B	L1823304-19 Water 01-SEP-16 09:35 FB-4
Grouping	Analyte				
WATER					
Physical Tests	Conductivity (uS/cm)	1470			<2.0
	Hardness (as CaCO3) (mg/L)				<0.50
	pH (pH)	8.27			5.01
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	295			<1.0
	Ammonia, Total (as N) (mg/L)				<0.0050
	Chloride (Cl) (mg/L)	<2.5 ^{DLDS}			<0.50
	Fluoride (F) (mg/L)	0.24			<0.020
	Nitrate (as N) (mg/L)	<0.025 ^{DLDS}			<0.0050
	Nitrite (as N) (mg/L)	<0.0050 ^{DLDS}			<0.0010
	Total Kjeldahl Nitrogen (mg/L)	10.5 ^{PEHT}			<0.050
	Sulfate (SO4) (mg/L)	620			<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	<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)				<0.50
	Total Organic Carbon (mg/L)				<0.50
Total Metals	Mercury (Hg)-Total (mg/L)				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD			FIELD
	Dissolved Metals Filtration Location				FIELD
	Aluminum (Al)-Dissolved (mg/L)				<0.0010
	Antimony (Sb)-Dissolved (mg/L)				<0.00010
	Arsenic (As)-Dissolved (mg/L)				<0.00010
	Barium (Ba)-Dissolved (mg/L)				<0.000050
	Beryllium (Be)-Dissolved (mg/L)				<0.000020
	Bismuth (Bi)-Dissolved (mg/L)				<0.000050
	Boron (B)-Dissolved (mg/L)				<0.010
	Cadmium (Cd)-Dissolved (mg/L)				<0.0000050
	Calcium (Ca)-Dissolved (mg/L)				<0.050
	Chromium (Cr)-Dissolved (mg/L)				<0.00010
	Cobalt (Co)-Dissolved (mg/L)				<0.00010
	Copper (Cu)-Dissolved (mg/L)				<0.00020
	Iron (Fe)-Dissolved (mg/L)				<0.010

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1823304-1 Water 31-AUG-16 11:10 GSI-DC-06B	L1823304-2 Water 31-AUG-16 12:25 GSI-DC-07B	L1823304-3 Water 31-AUG-16 15:10 GSI-DC-08B	L1823304-4 Water 31-AUG-16 14:15 GSI-DC-09B	L1823304-5 Water 31-AUG-16 13:00 GSI-DC-10B
Grouping	Analyte					
WATER						
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.00178	0.000064	<0.00010 ^{DLA}
	Lithium (Li)-Dissolved (mg/L)	<0.0010	0.0012	<0.0010	<0.0010	<0.0020 ^{DLA}
	Magnesium (Mg)-Dissolved (mg/L)	54.1	42.6	26.4	20.0	44.8
	Manganese (Mn)-Dissolved (mg/L)	2.25	1.50	2.34	0.591	14.5
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00211	0.000356	0.00254	0.000240	0.00061
	Nickel (Ni)-Dissolved (mg/L)	0.00275	0.00062	0.0149	0.00083	0.0039
	Phosphorus (P)-Dissolved (mg/L)	0.271	0.098	0.320	0.156	<0.050
	Potassium (K)-Dissolved (mg/L)	2.95	3.60	3.18	1.91	2.01
	Selenium (Se)-Dissolved (mg/L)	0.000472	0.000134	0.00155	0.000121	0.00027
	Silicon (Si)-Dissolved (mg/L)	8.87	8.09	9.31	7.58	7.97
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	0.000030	<0.000010	<0.000020 ^{DLA}
	Sodium (Na)-Dissolved (mg/L)	22.6	15.3	12.1	7.73	25.8
	Strontium (Sr)-Dissolved (mg/L)	0.768	0.498	0.515	0.119	0.574
	Sulfur (S)-Dissolved (mg/L)	2.04	127	34.0	31.1	167
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000020 ^{DLA}
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020 ^{DLA}
	Titanium (Ti)-Dissolved (mg/L)	0.00325	0.00059	0.0387	0.00390	0.00221
	Uranium (U)-Dissolved (mg/L)	0.000082	0.000040	0.000552	0.000142	0.000235
	Vanadium (V)-Dissolved (mg/L)	0.00759	0.00129	0.0766	0.00503	0.0108
	Zinc (Zn)-Dissolved (mg/L)	0.0010	0.0011	0.0085	0.0025	0.0051
	Zirconium (Zr)-Dissolved (mg/L)	0.00199	0.00035	0.00540	0.00061	0.00127

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1823304-6	L1823304-7	L1823304-8	L1823304-9	L1823304-10
		Description	Water	Water	Water	Water	Water
		Sampled Date	31-AUG-16	01-SEP-16		31-AUG-16	31-AUG-16
		Sampled Time	11:00	09:35		11:00	11:00
		Client ID	MP09-08	MP09-12	TRIP BLANK	DUP-4	FB-3
Grouping	Analyte						
WATER							
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)		<0.000050	0.00443		<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)		0.0049	0.0046		0.0048	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)		36.1	39.7		36.4	<0.10
	Manganese (Mn)-Dissolved (mg/L)		1.04	4.61		1.05	<0.00010
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050		<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)		0.00141	0.00485		0.00103	<0.000050
	Nickel (Ni)-Dissolved (mg/L)		<0.00050	0.00643		<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)		<0.050	0.089		<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)		1.21	6.93		1.21	<0.10
	Selenium (Se)-Dissolved (mg/L)		0.000123	0.000090		0.000076	<0.000050
	Silicon (Si)-Dissolved (mg/L)		8.01	12.5		8.03	<0.050
	Silver (Ag)-Dissolved (mg/L)		<0.000010	0.000014		<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)		7.39	3.35		7.42	<0.050
	Strontium (Sr)-Dissolved (mg/L)		1.41	0.536		1.41	<0.00020
	Sulfur (S)-Dissolved (mg/L)		70.7	52.2		70.6	<0.50
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	0.000042		<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010		<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030		<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)		0.00437	0.00116		0.00438	<0.000010
	Vanadium (V)-Dissolved (mg/L)		<0.00050	0.00059		<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)		<0.0010	0.0397		0.0016	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030	0.00031		<0.00030	<0.00030

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1823304-11	L1823304-12	L1823304-13	L1823304-14	L1823304-15
		Description	Water	Water	Water	Water	Water
		Sampled Date	31-AUG-16	31-AUG-16	31-AUG-16	29-AUG-16	29-AUG-16
		Sampled Time	08:45	10:00	09:00	08:45	17:30
		Client ID	MP09-03	GSI-PC-03B	GSI-PC-04B	GSI-DC-01B	MP09-14
Grouping	Analyte						
WATER							
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)		0.000801	0.00071	0.000920	0.00115	0.000246
	Lithium (Li)-Dissolved (mg/L)		<0.0010	0.0339	0.0029	<0.0010	0.0096
	Magnesium (Mg)-Dissolved (mg/L)		30.0	356	43.8	5.13	39.7
	Manganese (Mn)-Dissolved (mg/L)		2.27	2.21	2.24	0.369	0.113
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)		0.00182	0.0116	0.00665	0.00628	0.000892
	Nickel (Ni)-Dissolved (mg/L)		0.00465	0.0681	0.0480	0.0138	0.00324
	Phosphorus (P)-Dissolved (mg/L)		<0.050	0.066	<0.050	0.090	<0.050
	Potassium (K)-Dissolved (mg/L)		3.54	13.5	3.41	1.26	34.6
	Selenium (Se)-Dissolved (mg/L)		0.000093	0.00023	0.000079	0.000075	0.000377
	Silicon (Si)-Dissolved (mg/L)		6.17	9.68	6.11	2.07	4.80
	Silver (Ag)-Dissolved (mg/L)		0.000018	<0.000020 ^{DLA}	<0.000010	0.000042	<0.000010
	Sodium (Na)-Dissolved (mg/L)		6.56	73.0	12.7	2.26	19.7
	Strontium (Sr)-Dissolved (mg/L)		0.567	1.45	0.650	0.0854	0.772
	Sulfur (S)-Dissolved (mg/L)		73.7	384	89.6	11.2	142
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000020 ^{DLA}	<0.000010	0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)		<0.00010	0.00023	0.00020	0.00022	0.00020
	Titanium (Ti)-Dissolved (mg/L)		0.00227	0.00464	0.00099	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)		0.00153	0.00893	0.000270	0.000159	0.000076
	Vanadium (V)-Dissolved (mg/L)		0.00186	0.0028	0.00128	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)		0.0180	0.0135	0.0294	0.0076	0.0106
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030	0.00081	<0.00030	<0.00030	<0.00030

* 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	L1823304-16 Water 31-AUG-16 14:05 MP09-14	L1823304-17 Water 01-SEP-16 08:08 MP09-03	L1823304-18 Water 01-SEP-16 08:40 GSI-PC-04B	L1823304-19 Water 01-SEP-16 09:35 FB-4
Grouping	Analyte				
WATER					
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)				<0.000050
	Lithium (Li)-Dissolved (mg/L)				<0.0010
	Magnesium (Mg)-Dissolved (mg/L)				<0.10
	Manganese (Mn)-Dissolved (mg/L)				<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050			<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)				<0.000050
	Nickel (Ni)-Dissolved (mg/L)				<0.00050
	Phosphorus (P)-Dissolved (mg/L)				<0.050
	Potassium (K)-Dissolved (mg/L)				<0.10
	Selenium (Se)-Dissolved (mg/L)				<0.000050
	Silicon (Si)-Dissolved (mg/L)				<0.050
	Silver (Ag)-Dissolved (mg/L)				<0.000010
	Sodium (Na)-Dissolved (mg/L)				<0.050
	Strontium (Sr)-Dissolved (mg/L)				<0.00020
	Sulfur (S)-Dissolved (mg/L)				<0.50
	Thallium (Tl)-Dissolved (mg/L)				<0.000010
	Tin (Sn)-Dissolved (mg/L)				<0.00010
	Titanium (Ti)-Dissolved (mg/L)				<0.00030
	Uranium (U)-Dissolved (mg/L)				<0.000010
	Vanadium (V)-Dissolved (mg/L)				<0.00050
	Zinc (Zn)-Dissolved (mg/L)				<0.0010
	Zirconium (Zr)-Dissolved (mg/L)				<0.00030

* 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)
Matrix Spike	Total Inorganic Carbon	MS-B	L1823304-1, -10, -19, -2, -4, -5, -6, -8, -9
Matrix Spike	Total Inorganic Carbon	MS-B	L1823304-3, -7
Matrix Spike	Total Inorganic Carbon	MS-B	L1823304-3, -7
Matrix Spike	Total Organic Carbon	MS-B	L1823304-1, -19, -2, -3, -4, -7
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Boron (B)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Nitrate (as N)	MS-B	L1823304-1, -10, -11, -12, -13, -16, -19, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1823304-1, -10, -11, -12, -13, -14, -15, -19, -2, -3, -4, -5, -6, -7, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis

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.			
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)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

Reference Information

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-VA	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 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.			
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 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).			
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-VA	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.			

Reference Information

NO3-L-IC-N-VA 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.

SO4-IC-N-VA 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 2

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.

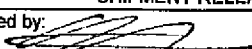
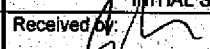
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



L1823304-COFC

Report To		Report Format / Distribution			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)																				
Company: Hemmera Environchem Inc.		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL)			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: 887-458-4865		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			Specify Date Required for E2, E or P:																				
		Email 2 chris@elr.ca			Analysis Request																				
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																				
Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input checked="" type="checkbox"/> MAIL <input type="checkbox"/> FAX																							
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Email 1 or Fax nsandys@hemmera.com																							
Company: Hemmera Environchem Inc.		Email 2 chris@elr.ca																							
Contact: Natasha Sandys																									
Project Information		Oil and Gas Required Fields (client use)																							
ALS Quote #: Q66042		Approver ID:																							
Job #: 1343-005.28		GL Account:																							
PO / AFE:		Routing Code:																							
LSD:		Activity Code:																							
		Location:																							
ALS Lab Work Order # (lab use only)		ALS Contact:			Sampler:			JC, MM, NB, AN																	
												Number of Containers													
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	Dissolved Metals, Hardness	Dissolved Mercury	Nitrate, Nitrite, Total Kjeldahl N (TKN)	Cl, F, Sulfate, conductivity, pH, alkalinity	Anion Sum, Cation Sum, Cation/Anion Ratio		Cyanide - Weak Acid Diss., Total, Free	Ammonia N (total), Total Organic Carbon	Thiocyanate (SCN)	Total Inorganic Carbon									
																	7								
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3																									

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						
					10					14.0						
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)											
Released by: 		Date: Sept. 2/16	Time: 10:00	Received by: 	Date: 2-SEP-16	Time: 11:30	Received by:					Date:				

