BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

2017 ENVIRONMENT AND CLIMATE CHANGE CANADA
METAL MINING EFFLUENT REGULATIONS ANNUAL REPORT

TABLE OF CONTENTS

SECTION 1.0 - INTRODUCTION 1
1.1 WASTE ROCK FACILITY POND (MS-08) 1
1.2 CRUSHING FACILITY POND (MS-06) 3
SECTION 2.0 - EFFLUENT AND WATER QUALITY MONITORING 5
2.1 SUMMARY OF DELETERIOUS SUBSTANCES MONITORING 5
2.2 ACUTE TOXICITY 8
2.3 EFFLUENT CHARACTERIZATION 9
2.4 SUB-LETHAL TOXICITY TESTING 12
SECTION 3.0 - SAMPLING METHODOLOGY 15
3.1 SAMPLING PROGRAM – QUALITY ASSURANCE AND QUALITY CONTROL PLAN 15
SECTION 4.0 - NON-COMPLIANCE INFORMATION 17

LIST OF TABLES

TABLE 1 - ANALYTICAL RESULTS OF EFFLUENT DELETERIOUS SUBSTANCES - MS-08 6

TABLE 2 - VOLUMES OF EFFLUENT DISCHARGED MS-08 7

TABLE 3 - RESULTS OF ACUTE LETHALITY TESTS AND DAPHNIA MAGNA TESTS MS-08 8

TABLE 4 - RESULTS FROM EFFLUENT CHARACTERIZATION MS-08 10

TABLE 5 - RESULTS FROM EFFLUENT CHARACTERIZATION MS-08 EFFLUENT-EXPOSURE AREA 10

TABLE 6 - RESULTS FROM EFFLUENT CHARACTERIZATION MS-08 EFFLUENT-REFERENCE AREA 11

TABLE 7 - RESULTS FROM SUB-LETHAL TOXICITY TESTING EC_{25} OR IC_{25} MS-08 13

TABLE 8 - RESULTS FROM SUB-LETHAL TOXICITY TESTING LC_{50} MS-08 14

TABLE 9 - RESULTS FROM QAQC ANALYSES 16

TABLE 10 – TIMELINE OF KEY EVENTS AND ACTIONS TAKEN AT THE WASTE ROCK FACILITY 18

APPENDICES

APPENDIX A MONITORING LOCATION MAPS & LETTERS OF NOTIFICATION

APPENDIX B CERTIFICATES OF ANALYSIS

APPENDIX C SURFACE WATER SAMPLING PROGRAM – QA AND QC CONTROL PLAN

APPENDIX D MMER SAMPLING AND REPORTING REQUIREMENTS MEMORANDUM

APPENDIX E MS-08 SUPPLEMENTAL SUMMARY

APPENDIX F METAL MINING EFFLUENT REGULATIONS EMERGENCY RESPONSE PLAN

APPENDIX G EEM INTERPRETIVE REPORT

SECTION 1.0 - INTRODUCTION

In accordance with the Metal Mining Effluent Regulations (MMER), this report has been prepared to summarize the monitoring and controlled discharges that occurred at Baffinland Iron Mines Corporation's (Baffinland) Mary River Project (Project) during 2017 from surface water management ponds regulated under the MMER at the Project's Mary River Mine Site (Mine Site).

The Project is focused on developing several high grade iron ore deposits in the Qikiqtani Region of Baffin Island, Nunavut. During 2017, Baffinland continued to increase mining operations at the Project's Deposit No. 1, located at the Mine Site, approximately 100 kilometres south of Milne Inlet. Mining at Deposit No. 1 is an open pit operation that involves blasting, crushing and screening of high grade iron ore. Due to the iron ore's high grade, iron ore generated by crushing and screening operations at the Mine Site is considered market ready and requires no further milling or processing. Throughout the year, ore generated at the Mine Site is transported by ore haul trucks and stockpiled at a port site on Milne Inlet, referred to as Milne Port. Ore is transported to Milne Port from the Mine Site using a 100 kilometre road known as the Milne Inlet Tote Road (Tote Road). Ore stockpiled at Milne Port throughout the year is shipped to European markets from Milne Inlet during the open water season (July to October).

On July 10, 2015, the Project became subject to the MMER under the *Fisheries Act* as a result of the discharge of effluent in excess of 50 cubic metres (m^3) from the Project's Waste Rock Facility surface water management pond (WRF pond) located at the Mine Site, referred to as effluent monitoring station MS-08.

On June 18, 2016, Baffinland provided Environment and Climate Change Canada (ECCC) with notification and pertinent information regarding the addition of a second effluent monitoring location under MMER for the Project's Crusher Facility surface water management pond (CF pond), referred to as effluent monitoring station MS-06.

On June 2, 2017, Baffinland notified ECCC of changes to the final discharge point (FDP) locations for both MS-08 and MS-06. The new coordinates provided in the notification improved the accuracy of the FDPs for both MS-06 and MS-08 and reflect the locations where Baffinland is no longer in control of the effluent discharged to the receiving environment from monitoring locations.

Copies of notifications sent by Baffinland to ECCC during 2017 are provided in Appendix A of this report.

1.1 WASTE ROCK FACILITY POND (MS-08)

The Waste Rock Facility (WRF) was constructed to support Deposit No. 1 mining operations and is located northeast of the Deposit No. 1 open pit. Seepage and storm water runoff originating from the WRF is intercepted by the Facility's perimeter collection ditches and directed to the WRF pond. The WRF pond is a high-density polyethylene (HDPE) lined earthen walled basin with an approximate capacity of 9,200 cubic metres (m^3) and a surface area of 11,000 square metres (m^2). Runoff (i.e., effluent) collected in the WRF pond is treated for solids removal via pond-based settling. Additional treatment was performed in 2017 for total suspended solids removal and pH adjustment due to observed changes in runoff water quality (refer to Section 4.0 for additional details). WRF pond effluent is discharged via active pumping using a Gorman or Wajax 6” or 4” trash pump and sections of lay-flat hose. The FDP for MS-08 is a sampling port after the discharge pump. Coordinates for the MS-08 FDP are provided below. Following the FDP, effluent passes through 700 metres (m) of lay-flat hose and is discharged to tundra of the approved receiving environment, the Mary River watershed.

Final Discharge Point MS-08:	Latitude: 71° 20’ 41.9”	Longitude: 79° 14’ 20.8”

Effluent discharge volumes are monitored and recorded during periods of discharge through the use of a GPI TM Series 3” Water Meter. The frequency and volume of effluent discharges from the WRF pond is dictated by the pond’s capacity, as such, effluent is discharged intermittently on an as-needed basis from approximately late-June to early/mid-September. Consequently, the implementation of MMER effluent and water quality monitoring is restricted to periods of effluent discharge rather than throughout the year due to Project constraints associated with climate, safety and logistics (details provided in Appendix D). Since the Project became subject to MMER, volume and effluent quality monitoring at the MS-08 FDP is initiated and conducted during periods of effluent discharge.

Effluent from the end of the lay-flat hose is discharged overland (no defined channel) and flows east-northeast over boulder-cobble till material for approximately 600 m before entering a headwater depression that contains intermittent natural flow. The gradient of the depression continues eastward, eventually forming a clearly defined channel approximately 1,170 m down gradient of the end of the lay-flat hose line. This defined channel drains southeast approximately 740 m before discharging into a Mary River tributary referred to as Mary River Tributary-F (MRTF). From this confluence, MRTF flows south approximately 3.3 kilometres (km) before discharging into the Mary River. MRTF is non-fish bearing, due to the combination of complete freeze up during winter, relatively higher stream gradient and the presence of natural in-stream fish barriers near its confluence with the Mary River. Thus, the Mary River represents the primary fish bearing waters reached by mine effluent, and is the Project’s receiving water body for the fish monitoring program required by the environmental effects monitoring (EEM) under MMER.

In 2017, the EEM study design was finalised following on-site discussions and consultation with ECCC on August 16 and 17, 2017. The Phase 1 EEM Interpretive Report was prepared by Minnow Environmental Inc. (Minnow) and submitted to ECCC on January 10, 2018 (Appendix G). The field component of the Phase 1 EEM biological study at the Project was conducted between August 24 to 28, 2017 using the approach outlined in the approved study design, focusing on the evaluation of effects at effluent-exposed areas of two (2) watercourses, MRTF and the Mary River. Environmental Effects Monitoring Coordinators from ECCC were on-site during the time of the field program to observe implementation of the study design.

In summary, the Mary River Project Phase 1 EEM indicated very low effluent concentrations within the immediate MRTF receiving environment and only minor effluent-related influences on water quality of MRTF and the Mary River during periods of effluent discharge. Although Mary River non-YOY arctic char had lower condition at the effluent-exposed area than at the reference area, concentrations of mine-related parameters were well below WQG. Effluent-related influences on primary EEM benthic invertebrate community endpoints were not observed closer to the effluent discharge at Mary River Tributary-F. In turn, this suggested that factors other than mine-effluent accounted for the difference in non-young of the year (YOY) arctic charr condition between the effluent-exposed and reference areas of Mary River.

Two (2) water monitoring stations have been established on the Mary River for the purpose of MMER water quality monitoring, including an upstream reference station (MS-08-US) and an effluent-exposed downstream station (MS-08-DS). Coordinates for the Mary River water monitoring stations are provided below.

MS-08-US (Reference)	Latitude: 71° 18’ 37.8”	Longitude: 79° 11’ 13.5”
MS-08-DS (Effluent-Exposed)	Latitude: 71° 18’ 38.9”	Longitude: 79° 12’ 09.4”

1.2 CRUSHING FACILITY POND (MS-06)

The Crusher Facility at the Mine Site consists of a pad that houses three (3) crusher spreads as well as associated run-of-mine, lump and fines ore stockpiles. Ditches along the perimeter of the pad directs storm water runoff from the pad to the CF pond. The CF pond is a HDPE lined earthen walled basin with an approximate capacity of 4,500 m^3. Runoff (i.e., effluent) collected in the pond is treated for solids removal via pond-based settling. Effluent from the pond is pumped to the approved Mary River outfall discharge location located approximately 1.3 km southeast of the pond using the Mine Site’s treated sewage effluent pipeline, originating at the Mine Site sewage treatment plant. Coordinates for the MS-06 DFP are provided below.

Final Discharge Point MS-06:	Latitude: 71° 18’ 41.0”	Longitude: 79° 16’ 51.1”

When effluent discharges are required at MS-06, effluent is pumped and transferred via the treated sewage effluent pipeline to the outfall location near Mary River. The FDP for MS-06 is a sample port located after the pump and before the connection to the sewage effluent pipeline.

Mary River is a fish bearing waterbody at the location that receives effluent discharged from MS-06, as well as being the receiving waterbody for monitoring of potential effects from effluent discharged from MS-08. As previously stated, two stations have been established on Mary River for the purpose of MMER water quality monitoring, the MS-08 reference station (MS-08-US) and the MS-08 effluent-exposed station (MS-

08-DS), associated with effluent discharges from the WRF Pond (MS-08). An additional receiving environment water quality monitoring station has been established on Mary River to monitor influences from MS-06 effluent discharge (MS-06-DS). Coordinates for the Mary River water quality monitoring stations are provided below.

MS-08-US (Reference):	Latitude: 71° 18’ 37.8”	Longitude: 79° 11’ 13.5”
MS-08-DS (Effluent-Exposed):	Latitude: 71° 18’ 38.9”	Longitude: 79° 12’ 09.4”
MS-06-DS (Effluent-Exposed):	Latitude: 71° 18’ 01.5”	Longitude: 79° 15’ 32.8”

A figure showing the location of all sampling points is provided in Appendix A of this report.

During 2017, routine inspections of the CF pond were conducted, including monitoring the pond’s freeboard, available capacity and water quality. No effluent discharges from the CF pond (MS-06) to the environment occurred in 2017. As per Schedule 6, Part 2, Item 2 of the MMER, “*any measurement not taken because there was no deposit from the final discharge point shall be identified by the letters “NDEP” No Deposit*”, as such, no water quality results are included in this report for MS-06 based on its NDEP status during 2017.

SECTION 2.0 - EFFLUENT AND WATER QUALITY MONITORING

The following section discusses the effluent and water quality monitoring of discharges from MS-08 during 2017. Frequency of sampling was dictated by dates of discharge in addition to shipping-related logistical constraints and parameter holding time requirements.

2.1 SUMMARY OF DELETERIOUS SUBSTANCES MONITORING

Deleterious substance monitoring was performed eleven (11) times during the discharge of effluent from MS-08 in 2017. The detection limits, mean monthly averages, and mean monthly limits are presented below in Table 1, along with the results for sample analyses performed. All Certificates of Analyses (CoA) are provided in Appendix B. The daily and monthly cumulative volumes of effluent discharged from MS-08 for 2017 are displayed in Table 2. The last date of discharge in 2017 was September 4, 2017 from MS-08.

Table 1 - Analytical Results of Effluent Deleterious Substances - MS-08

Detection Limits	0.0001	0.001	0.0001	0.0005	0.00005	0.003	2	0.0045*	0.1	0.1	-
Month	**As (mg/L)**	**Cu (mg/L)**	**Pb (mg/L)**	**Ni (mg/L)**	**Se (mg/L)**	**Zn (mg/L)**	**TSS (mg/L)**	**Ra-226 (Bq/L)**	**Lowest pH**	**Highest pH**	**Effluent Volume (m3)**
27-Jun-17	0.0001	0.001	0.000096	0.00145	0.000095	0.003	2	0.0068	7.12		
June Monthy Mean	0.0001	0.001	0.000096	0.00145	0.000095	0.003	2	0.0068	7.12	7.12	0
1-Jul-17	0.0001	0.009	0.000323	0.00175	0.00005	0.003	3.4	0.0051	7.19		
4-Jul-17	0.0001	0.003	0.000688	0.00695	0.000087	0.0046	13.6	0.012	7.08		
11-Jul-17	0.0001	0.0024	0.000354	0.0211	0.000902	0.0068	2.3	0.012	6.5		
18-Jul-17	0.0001	0.0026	0.000329	0.0266	0.00117	0.0067	5.8	0.012	6.93		
21-Jul-17	0.0001	0.007	0.000485	0.0283	0.00119	0.01	2	0.01	6.92		
25-Jul-17	0.0001	0.0013	0.000143	0.0267	0.00128	0.0048	2	0.0077	6.98		
July Monthly Mean	0.0001	0.0042	0.00039	0.019	0.00078	0.0060	4.85	0.0098	6.5	7.19	7429.1
1-Aug-17	0.001	0.029	0.00764	0.215	0.0031	0.042	10.7	0.015	5.25		
24-Aug-17	0.001	0.01	0.0005	0.317	0.00474	0.03	13.3	0.03	6.99		
30-Aug-17	0.001	0.01	0.0008	0.261	0.0041	0.03	26.3	-	6.5		
August Monthly Mean	0.001	0.016	0.0030	0.264	0.0040	0.034	**16.77**	0.023	5.25	6.99	6053.63
4-Sep-17	0.0001	0.01	0.0005	0.398	0.00567	0.032	13.2	-	5.75		
September	0.0001	0.01	0.0005	0.398	0.00567	0.032	13.2	-	5.75	5.75	5012.12
Mean Monthly Limit **	0.5	0.3	0.2	0.5		0.5	15	0.37	-	-	-

* Minimum Detectable Limit
** Mean Monthly Limit outlined in MMER Schedule 4

Table 1 - Volumes of Effluent Discharged MS-08

Date	Volume Discharged (m³)	Recycled and Reclaimed Water Consumption (m³)	Date	Volume Discharged (m³)	Recycled and Reclaimed Water Consumption (m³)	Date	Volume Discharged (m³)	Recycled and Reclaimed Water Consumption (m³)
1-Jul-17	--	--	1-Aug-17	465.61	54.30	1-Sep-17	754.39	-
2-Jul-17	1715.78	--	2-Aug-17	--	49.40	2-Sep-17	437.18	-
3-Jul-17	936.47	--	3-Aug-17	368.89	57.60	3-Sep-17	1185.86	-
4-Jul-17	--	416.4	4-Aug-17	--	66.40	4-Sep-17	793.61	-
5-Jul-17	--	--	5-Aug-17	--	57.40	5-Sep-17	976.79	-
6-Jul-17	--	30.3	6-Aug-17	--	57.00	6-Sep-17	864.29	-
7-Jul-17	--	90.8	7-Aug-17	--	64.30	7-Sep-17	--	-
8-Jul-17	11.83	302.8	8-Aug-17	--	62.40	8-Sep-17	--	-
9-Jul-17	--	272.5	9-Aug-17	--	62.30	9-Sep-17	--	-
10-Jul-17	--	60.6	10-Aug-17	--	23.50	10-Sep-17	--	-
11-Jul-17	--	--	11-Aug-17	--	--	11-Sep-17	--	--
12-Jul-17	--	--	12-Aug-17	--	--	12-Sep-17	--	--
13-Jul-17	--	--	13-Aug-17	--	--	13-Sep-17	--	--
14-Jul-17	--	--	14-Aug-17	--	--	14-Sep-17	--	--
15-Jul-17	--	--	15-Aug-17	--	33.10	15-Sep-17	--	-
16-Jul-17	--	--	16-Aug-17	--	64.10	16-Sep-17	--	-
17-Jul-17	767.38	--	17-Aug-17	--	62.90	17-Sep-17	--	-
18-Jul-17	20.18	--	18-Aug-17	--	63.00	18-Sep-17	--	-
19-Jul-17	1338.64	--	19-Aug-17	--	18.00	19-Sep-17	--	-
20-Jul-17	249.16	--	20-Aug-17	--	63.10	20-Sep-17	--	-
21-Jul-17	826.05	--	21-Aug-17	--	60.60	21-Sep-17	--	-
22-Jul-17	--	--	22-Aug-17	--	--	**22-Sep-17**	**--**	--
23-Jul-17	--	151.4	23-Aug-17	--	--	23-Sep-17	**--**	--
24-Jul-17	--	181.7	24-Aug-17	369.34	--	24-Sep-17	**--**	--
25-Jul-17	--	--	25-Aug-17	376.38	--	25-Sep-17	**--**	--
26-Jul-17	--	25.8	26-Aug-17	874.01	--	26-Sep-17	**--**	--
27-Jul-17	--	61.2	27-Aug-17	523.07	--	27-Sep-17	**--**	--
28-Jul-17	--	66.5	28-Aug-17	234.77	--	28-Sep-17	**--**	--
29-Jul-17	335.24	68.8	29-Aug-17	603.85	--	29-Sep-17	**--**	--
30-Jul-17	882	63.4	30-Aug-17	1230.15	--	30-Sep-17	**--**	--
31-Jul-17	346.37	64.5	31-Aug-17	1007.56	--	--	**--**	--
July	**7429.1**	**1856.7**	**August**	**6053.63**	**919.40**	**September**	**5012.12**	**-**

2.2 ACUTE TOXICITY

Acute toxicity samples were collected and analyzed for MS-08 effluent on June 27th, July 11th, August 1st and 24th, and September 5th, 2017. Initial samples collected in June and July were confirmed to be acutely non-lethal, whereas the sample on August 1st was demonstrated to be acutely lethal for both Rainbow Trout and *Daphnia magna*. The sample collected on August 24th, following treatment of the WRF pond with sodium carbonate to adjust pH, was confirmed to be acutely non-lethal however the following sample collected on September 5th was confirmed to be acutely lethal for *Daphnia magna*. Results of these acute toxicity samples are summarized in Table 3; Refer to Appendix B for Certificates of Analyses. Samples of MS-08 effluent that were demonstrated to be acutely lethal were promptly reported and documented in NT-NU Spill Reports submitted to ECCC and other relevant regulatory agencies during 2017.

Table 2 - Results of Acute Lethality Tests and Daphnia magna Tests MS-08

Sample Number	Sample ID	Date Sample Collected	Results for Rainbow Trout Acute Lethality Tests (mean percentage mortality in 100% effluent test concentration)	Results for Daphnia magna Monitoring Tests (mean percentage mortality in 100% effluent test concentration)
51558	**MS-08**	**27-Jun-17**	0	0
51686	**MS-08**	**11-Jul-17**	0	0
51841	**MS-08**	**1-Aug-17**	100	100
52038	**MS-08**	**24-Aug-17**	0	6.7
52192	**MS-08**	**5-Sep-17**	30	100

2.3 EFFLUENT CHARACTERIZATION

Effluent characterization sampling was conducted at the MS-08 FDP and Mary River water quality monitoring stations MS-08-DS and MS-08-US during effluent discharges. Parameters required to be reported under MMER are presented in Tables 4, 5, and 6 below. More details of these results and the optional site-specific parameters measured can be found in the Certificates of Analyses in Appendix B of this report. The Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life for long term exposure (CCME LT WQG) are included as supplementary information in Tables 4, 5, and 6.

Table 3 - Results from Effluent Characterization MS-08

Date	Hardness (mg/L)	Alkalinity (mg/L)	Aluminum (mg/L)	Cadmium (mg/L)	Iron (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Electrical Conductivity (µmhos/cm)
MDL	10	10	0.003	0.00001	0.03	0.00001	0.00005	0.05	0.02	3.0
21-Jul-17	318	10	0.0363	0.000057	0.477	--	0.00005	0.431	2.46	656
24-Aug-17	1990	82	0.05	0.00038	7.1	0.00001	0.0005	1.67	7.98	3330
CCME LT WQG (mg/L)	--	--	0.1	0.00009	0.3	0.000026	0.073	--	13	--

Table 4 - Results from Effluent Characterization MS-08 Effluent-Exposure Area

Date	Hardness (mg/L)	Alkalinity (mg/L)	Aluminum (mg/L)	Cadmium (mg/L)	Iron (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Electrical Conductivity (µmhos/cm)
MDL	10	10	0.003	0.00001	0.03	0.00001	0.00005	0.05	0.02	3.0
21-Jul-17	24	24	0.0948	0.00001	0.102	--	0.000089	0.020	0.075	52.9
24-Aug-17	63	61	0.15	0.00001	0.091	0.000010	0.000315	0.020	0.020	141
CCME LT WQG (mg/L)	--	--	0.1	0.00009	0.3	0.000026	0.073	--	13	--

Table 5 - Results from Effluent Characterization MS-08 Effluent-Reference Area

Date	Hardness (mg/L)	Alkalinity (mg/L)	Aluminum (mg/L)	Cadmium (mg/L)	Iron (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Electrical Conductivity (µmhos/cm)
MDL	10	10	0.003	0.00001	0.03	0.00001	0.00005	0.05	0.02	3.0
21-Jul-17	22	24	0.0908	0.000010	0.09	--	0.000089	0.020	0.020	49.8
24-Aug-17	61	58	0.154	0.000010	0.114	0.000010	0.00031	0.020	0.020	136
CCME LT WQG (mg/L)	--	--	0.1	0.00009	0.3	0.000026	0.073	--	13	--

2.4 SUB-LETHAL TOXICITY TESTING

Effluent from the WRF pond (MS-08) was discharged for only short periods during the 2017 at MS-08, July 2nd to August 3rd and August 24th to September 6th. Sub-lethal toxicity testing as per MMER Schedule 5, Part 1, Section 5 was performed twice during 2017 at MS-08, once during each of the pumping periods, July 25th and August 24th. Sub-lethal toxicity results for 2017 effluent discharges from MS-08 are provided in Tables 7 and 8 below. The Certificates of Analyses for the sub-lethal toxicity results are provided in Appendix B.

Table 6 - Results from Sub-Lethal Toxicity Testing EC_{25} or IC_{25} MS-08

Date	Species Tested	Sub-lethal Test Type	Sample Method	Lab	EC_{25} or IC_{25}*	Lower 95% C.L	Upper 95% C.L	Notes
25-Jul-17	*Pimephales promelas*	Growth	Grab	Aquatox	>100.00%	--	--	
25-Jul-17	*Ceriodaphnia dubia*	Reproduction	Grab	Aquatox	>100.00%	--	--	
25-Jul-17	*Lemna minor*	Growth (fond weight)	Grab	Aquatox	56.20%	33.20%	88.70%	
25-Jul-17	*Lemna minor*	Growth (fond number)	Grab	Aquatox	22.80%	16.20%	27.90%	
25-Jul-17	*Pseudokirchneriella subcapitata*	Cell yield	Grab	Aquatox	>90.91%	--	--	
24-Aug-17	*Pimephales promelas*	Growth	Grab	Aquatox	>100.00%	--	--	
24-Aug-17	*Ceriodaphnia dubia*	Reproduction	Grab	Aquatox	6.46%	3.39%	10.00%	
24-Aug-17	*Lemna minor*	Growth (fond weight)	Grab	Aquatox	3.85%	1.71%	6.10%	
24-Aug-17	*Lemna minor*	Growth (fond number)	Grab	Aquatox	1.73%	0.81*%	4.26%	*the lower confidence limit for IC25 (frond count) was less than the lowest concentration tested (1.56%)
24-Aug-17	*Pseudokirchneriella subcapitata*	Cell yield	Grab	Aquatox	<90.91%	--	--	

* EC_{25} represents the concentration at which a 25 percent effect has occurred.
IC_{25} represents the concentration that demonstrates a 25 percent reduction in toxicity.

Table 7 - Results from Sub-Lethal Toxicity Testing LC_{50} MS-08

Date	Species Tested	Sublethal Test Type	Sample Method	Lab	LC_{50}*	Lower 95% C.L.	Upper 95% C.L.
25-Jul-17	*Pimephales promelas*	Growth	Grab	Aquatox	>100.00%	--	--
25-Jul-17	*Ceriodaphnia dubia*	Reproduction	Grab	Aquatox	>100.00%	--	--
24-Aug-17	*Pimephales promelas*	Growth	Grab	Aquatox	>100.00%	--	--
24-Aug-17	*Ceriodaphnia dubia*	Reproduction	Grab	Aquatox	>100.00%	9.00%	100.00%

*LC_{50} represents the concentration at which 50 percent lethality has occurred.

SECTION 3.0 - SAMPLING METHODOLOGY

3.1 SAMPLING PROGRAM – QUALITY ASSURANCE AND QUALITY CONTROL PLAN

Baffinland has developed a Surface Water Sampling Program – Quality Assurance and Quality Control Plan (BAF-PH1-830-P16-0001) as a requirement of Part I, Item 16 of Water Licence No. 2AM-MRY1325. This Surface Water Sampling Program (QA/QC) has been prepared following the general recommendations presented in *Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licences in Meeting SNP Requirements and for Submission of a QA/QC Plan* (INAC, 1996). This Plan is included in Appendix C.

The QA/QC objectives of this Plan are designed to provide guidance to field staff and analytical laboratories in order to maintain a high level of confidence in the water quality data generated by the Project.

QA/QC samples taken in 2017 included sample duplicates and field blanks. QA/QC samples and the analytical results are provided in Table 9. Certificates of Analyses for the QA/QC samples are provided in Appendix B.

Table 8 - Results from QAQC Analyses

		Date	11-Jul-17	11-Jul-17	21-Jul-17	21-Jul-17	21-Jul-17	21-Jul-17
		Sample ID	MS-08	MS-0801	MS-08-US	MS-08-US01	MS-08	MS-0802
Analyte	Units	Detection Limits						
Conductivity	(µmhos/cm)	3	486	486	49.8	49.8	656	<3.0
Hardness	(mg/L)	10	-	-	22	23	318	<10
pH	-	0.1	6.5	6.6	7.62	7.55	6.92	6.21
TSS	(mg/L)	2	2.3	4.6	3.4	<2.0	<2.0	<2.0
Alkalinity	(mg/L)	10	-	-	24	24	10	<10
Ammonia	(mg/L)	0.02	-	-	<0.02	<0.02	0.431	<0.02
Nitrate	(mg/L)	0.02	-	-	<0.02	<0.02	2.46	<0.02
Al	(mg/L)	0.005	0.107	0.0742	0.0908	0.0894	0.0363	0.0363
As	(mg/L)	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cd	(mg/L)	0.00001	0.000049	0.000053	<0.00001	<0.00001	0.000057	<0.00001
Cu	(mg/L)	0.001	0.0024	0.0024	<0.001	<0.001	0.007	<0.001
Fe	(mg/L)	0.05	0.939	0.855	0.09	0.088	0.477	<0.05
Pb	(mg/L)	0.00005	0.000354	0.000762	0.000112	0.000089	0.000485	<0.00005
Mo	(mg/L)	0.00005	0.000061	0.000058	0.000089	0.000107	<0.00005	<0.00005
Ni	(mg/L)	0.0005	0.0211	0.0206	0.0006	<0.0005	0.0283	<0.0005
Se	(mg/L)	0.00005	0.000902	0.000933	<0.00005	<0.00005	0.00119	<0.00005
Zn	(mg/L)	0.003	0.0068	0.008	<0.003	<0.003	0.01	<0.003
Ra 226	(Bq/L)	0.0045	0.012	<0.0067	<0.0003	<0.0003	<0.0003	<0.0003

SECTION 4.0 - NON-COMPLIANCE INFORMATION

During 2017, controlled effluent discharges from the WRF pond (MS-08) began in early July and continued, as required, until freeze-up in September. Controlled discharges from the WRF pond involved pumping effluent from the pond to the final discharge point (MS-08-FDP) established under the MMER.

During controlled discharges from the WRF pond, effluent water quality samples were collected as outlined in the MMER and Type A Water Licence to ensure effluent discharged to the receiving environment was in compliance with applicable water quality discharge criteria. During 2017, exceedances of the applicable water quality discharge criteria during controlled discharges from the WRF pond, consisted of two (2) minor exceedances of 15 mg/L TSS limit in early July followed by multiple exceedances of the applicable pH and TSS limits in August and September. Acute toxicity[1] samples taken on August 8, 2017 and September 5, 2017 at the WRF pond failed for select organisms with mortality rates greater than 50% of test organisms. Applicable Spill Reports were submitted for these exceedances to the appropriate regulators.

During August 2017, the pH of runoff collected in the WRF pond dropped below the pH discharge limits outlined in the MMER. Observations indicated the decrease in pH may have been the result of potential acid rock drainage (ARD). In addition, during July and early August several large precipitation events resulted in significant volumes of runoff being retained within the WRF pond. With limited capacity remaining in the pond for additional runoff, Baffinland submitted a letter on August 16, 2017 notifying regulators and stakeholders of the Company's immediate need to treat and conduct a controlled discharge to the receiving environment.

The pond was subsequently batch treated with sodium carbonate in mid-August 2017 to increase the pH within the permissible range for discharge. Although the batch treatment was initially successful in raising the pH of runoff contained with the pond, subsequent active discharges from the pond during late August and September resulted in several exceedances of the MMER discharge criteria for pH and total suspended solids (TSS). Exceedances for the non-compliant discharges were reported to the relevant regulators and are documented in NT-NU Spill Reports 17-289, 17-312, 17-328 and 17-361. Refer to Appendix E for additional details on the exceedances reported for the 2017 discharges from the pond, which were submitted to ECCC enforcement branch.

During an on-site INAC and ECCC inspection in late August, uncontrolled seepage originating from the toe of the pond's berm was observed not previously identified in routine internal inspections and annual third party geotechnical or regulator inspections. The seepage was reported by Baffinland to relevant regulators and is documented in NT-NU Spill Report 17-312. It should be noted that the timeline

[1] Acute lethality to Rainbow trout, Oncorhynchus mykiss (as per ECCC's Environmental Protection Series Method EPS/1/RM/13)
Acute lethality to Daphnia magna, (as per ECCC's Environmental Protection Series Method EPS/1/RM/14)

presented in Table 10 is not a complete record of all events, correspondence and corrective actions taken in regards to the concerns identified at the WRF in 2017.

Key actions taken to date to address the concerns at the WRF include the following:

- Batch treatment of the pond with sodium carbonate to raise the pH within applicable water quality discharge criteria, in consultation with the engineers from Wood Group PLC (formerly Amec Foster Wheeler);
- Retained third party consultants (Hatch, Golder, Le Group Desfor) to assess the observed seepage and WRF pond design and make recommendations to Baffinland for the appropriate corrective actions;
- Constructed an emergency ditch network and containment sumps around the outer perimeter of the WRF pond in efforts to contain observed seepage;
- Injected rhodamine dye into the WRF pond to identify the potential source of observed seepage;
- Sourced a dedicated water treatment plant to manage effluent discharges from the WRF pond in 2018 (the water treatment plant is planned to be installed by May 1, 2018);
- Developed a MMER Emergency Response Plan to: clarify roles & responsibilities; clarify emergency spill response procedures; and outline the controls in place to ensure effluent discharges from Project infrastructure are compliant with the water quality discharge criteria;
- Developed Interim Waste Rock Deposition Plan detailing how waste rock would be managed in the short-term;
- Continue to engage with regulators, and provide updates and responses to information requests as required; and
- Continue to work with Golder on developing the appropriate corrective actions to address concerns identified in 2017 at the WRF.

Table 9 – Timeline of key events and actions taken at the Waste Rock Facility

Date	Event / Action Taken
August 3, 2017	Discharges from WRF halted due to low pH conditions at the Facility's surface water management pond.
August 16, 2017	Baffinland notifies regulators and stakeholders of the Company's plans to treat runoff contained at the WRF pond and conduct a controlled discharge to receiving environment to address the pond's low pH and limited remaining storage capacity.
August 22 – 24, 2017	In consultation with engineers from Wood Group PLC (formerly Amec Foster Wheeler), Baffinland batch treats WRF pond with sodium carbonate to raise the pH to levels within the permissible range for discharge.
August 23, 2017	INAC and ECCC conduct an on-site inspection of the WRF and discover uncontrolled seepage originating from the toe of WRF pond containment berm not previously identified in annual geotechnical or regulator inspections.
August 25, 2017	Baffinland constructs emergency containment ditch to contain uncontrolled seepage originating from pond's containment berm.

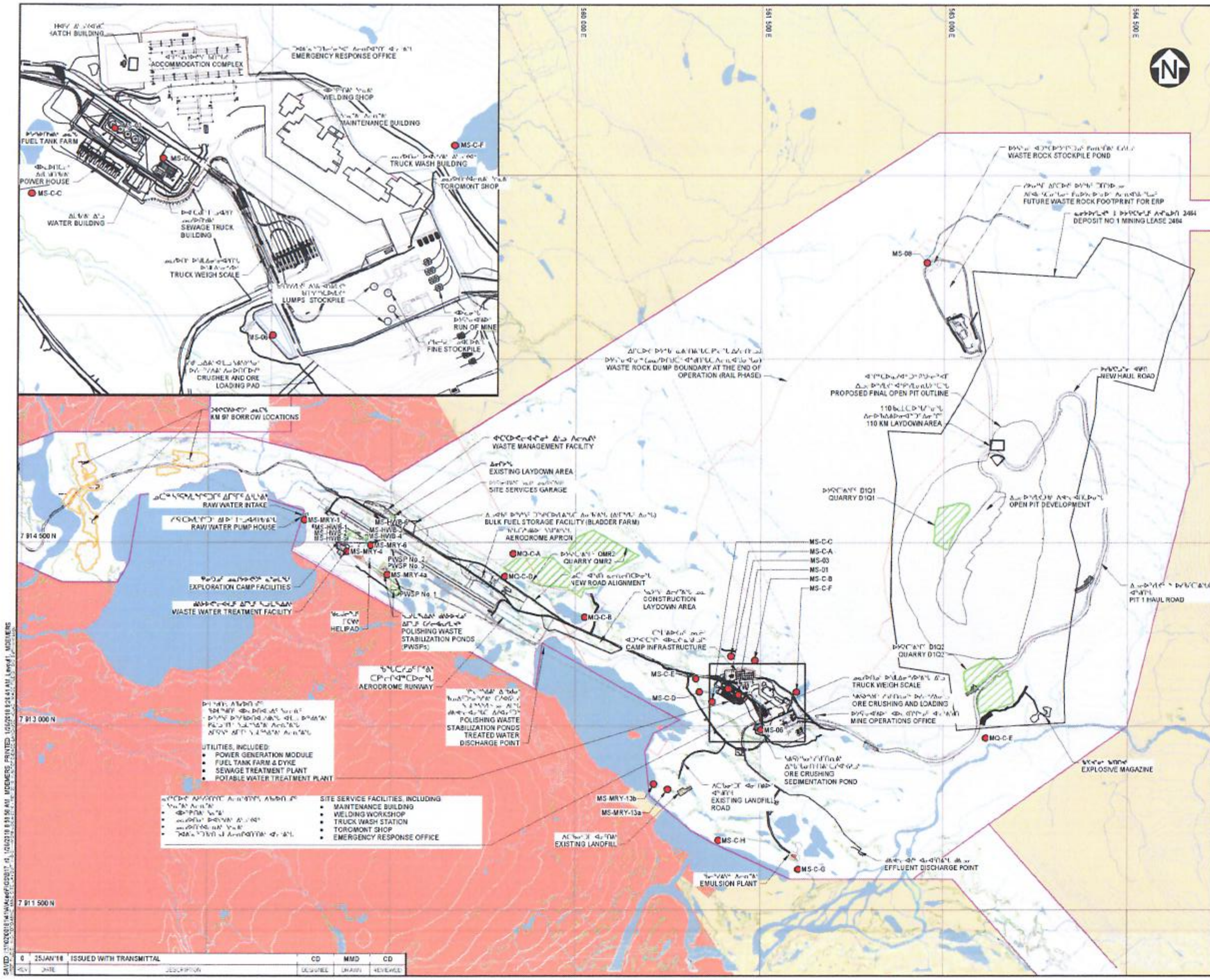
Date	Event / Action Taken
August 31, 2017	Baffinland submits action plan to regulators and stakeholders detailing plans to address identified concerns at WRF.
September 1 & 2 2017	Field engineer from Hatch Ltd. (Hatch) conducts inspection of observed seepage and provides recommendations to Baffinland for corrective actions.
September 2, 2017	Baffinland provides update to regulators and stakeholders with proposed corrective actions to be taken to address seepage.
September 7, 2017	Baffinland receives letter from QIA requesting an onsite inspection and requesting additional information regarding the Waste Rock Facility and the associated 2017 events.
September 7 - 17, 2017	Additional work completed at the WRF pond to address seepage discovered on August 23, 2017, including re-grading the area up-gradient of surface water management pond (including east collection ditch and WRF pond's liner key-in), expanding the emergency ditch network (initiated on August 25, 2017) and installing two large sumps lined with HDPE liner to contain water collected by emergency ditches.
September 5, 2017	Baffinland received Inspector's Direction from INAC detailing actions to be taken to address concerns identified at the WRF during August 2017.
September 13, 2017	Baffinland receives notification that ECCC had initiated an investigation into the 2017 events at the WRF.
October 4 – 24, 2017	Baffinland retains additional third party industry specialists and experts (Golder Associates, Le Group Desfor) to assess the seepage and the pond's design to offer additional recommendations on the appropriate corrective actions and mitigations measures needed to address concerns.
October 19 - November 1, 2017	Rhodamine dye injected into WRF pond on October 19, 2017. Rhodamine dye testing equipment arrives at the Mine Site on October 26, 2017. Testing of water downstream of WRF pond for rhodamine dye initiated on October 27, 2017. Rhodamine dye first detected in water downstream of pond on October 28, 2017. Additional testing conducted from October 29 - November 1, 2017 confirm presence of rhodamine dye downstream of WRF pond.
October 21 – November 6, 2017	Capacity of emergency ditch is increased by constructing a berm around the outside perimeter of the emergency ditch.
October 31, 2017	Baffinland provides a hydrological assessment of the pond's design to regulators and stakeholders in response Measures to be Taken - Item 4 of the INAC Inspector's Direction.
November 8 & 9	Update on actions taken and planned for the WRF presented to regulators and stakeholders at Freshwater Workshop chaired by Baffinland in Iqaluit, NU.
November 15, 2017	Baffinland provides a revised Phase 1 Waste Rock Management Plan (Rev. 1) to regulators and stakeholders in response to Measures to be Taken - Item 3 of the INAC Inspector's Direction. The revision consisted of updating water treatment methods included in the management plan for runoff contained at the WRF.
November 21, 2017	Baffinland provides summary of events and actions taken to date in response to ECCC notice of investigation.
November 30, 2017	Baffinland provides response to QIA letter regarding onsite inspection and additional information regarding the WRF.
January 15, 2018	Baffinland provides regulators and stakeholders a MMER Emergency Response Plan and Interim Waste Rock Deposition Plan and responds to INAC's questions regarding the Waste Rock Facility.
March 8, 2018	Baffinland submits modification application to NWB and other relevant parties. Infrastructure improvements outlined in the modification included a water treatment plant to manage effluent discharges from the WRF pond in 2018. Dedicated water treatment plant planned to be mobilized and installed at the WRF prior to freshet 2018.

APPENDIX A

MONITORING LOCATION MAP

&

LETTERS OF NOTIFICATION



LEGEND:

- INUIT OWNED LAND - SURFACE ONLY EXCLUDING MINERALS
- INUIT OWNED LAND - SURFACE AND SUBSURFACE INCLUDING MINERALS
- WATER
- BORROW AREAS (2013 UNDER Q10C3001)
- QUARRY AREA (EXISTING UNDER Q13C301)
- WASTE STORAGE AREA
- RIVER/STREAM/DRAINAGE
- ROAD
- QIA SURFACE COMMERCIAL LEASE BOUNDARY
- WATER LICENCE WATER QUALITY MONITORING LOCATION

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 17N.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. PLAN BASED ON INFORMATION PROVIDED BY HATCH, DATED (JAN 13, 2015)
4. CONTOUR INTERVAL IS 10 METRES.
5. ALL SAMPLE ID'S SHOWN IN BRACKETS REPRESENT THE TYPE B WATER LICENCE(S) MONITORING POINTS. ALL OTHERS ARE MONITORING POINTS AS PER THE TYPE A WATER LICENCE (2AM-MRY1325)

1. UTM NAD83 ZONE 17N.
2. EAGLE MAPPING (2005)
3.
4. 2.5
5. (2AM-MRY1325)

SCALE A 300 150 0 500 1000 1500 m

Baffinland

MARY RIVER PROJECT

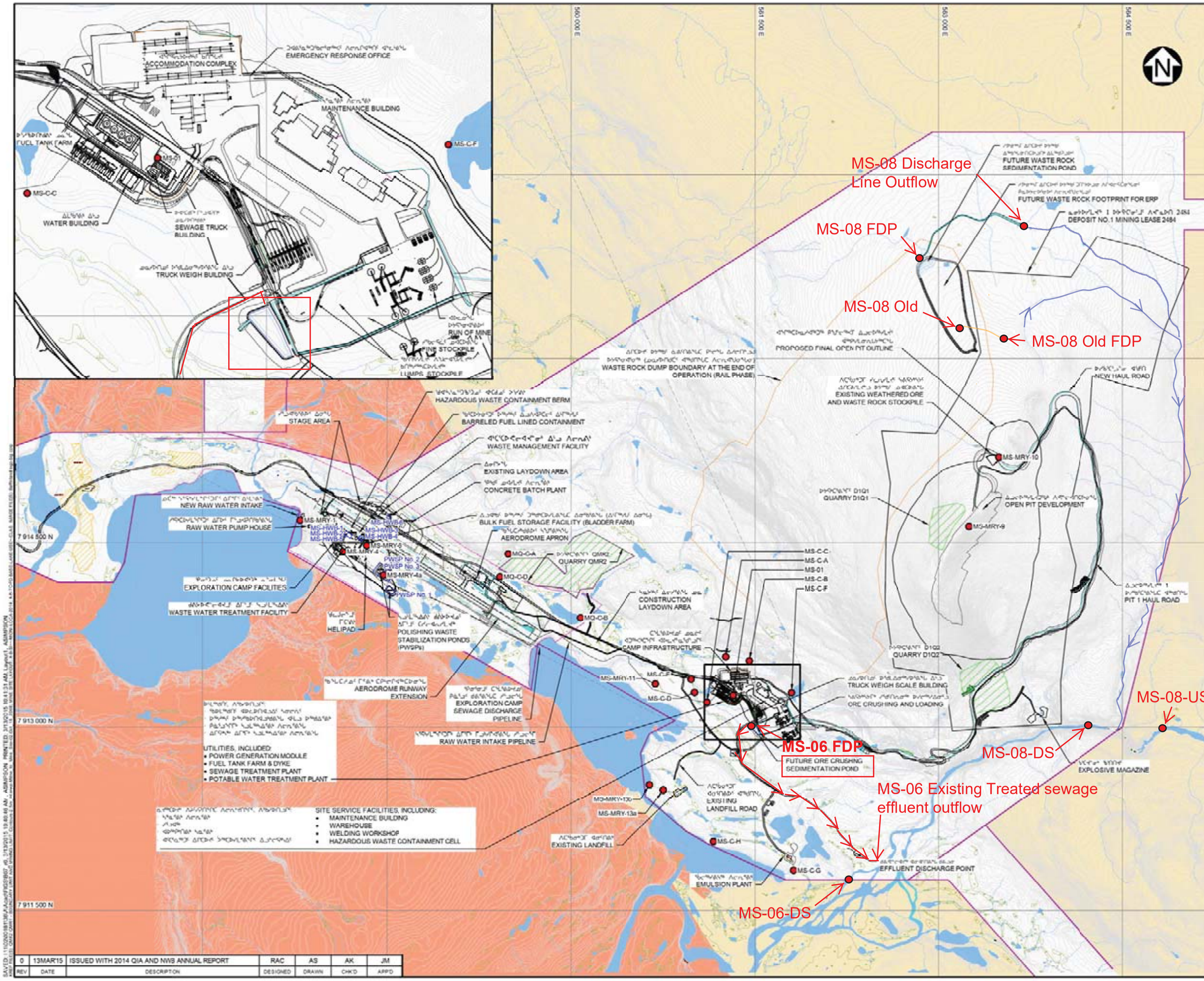
MINE SITE LAYOUT AND MMER/WATER LICENCE MONITORING LOCATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB102-181/41	NB18-00065

FIGURE 1.5 | REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	25JAN'18	ISSUED WITH TRANSMITTAL	CD	MMD	CD



LEGEND:

- INUIT OWNED LAND - SURFACE ONLY EXCLUDING MINERALS
- INUIT OWNED LAND - SURFACE AND SUBSURFACE INCLUDING MINERALS
- WATER
- BORROW AREAS (2013 UNDER Q10C3001)
- QUARRY AREA (EXISTING UNDER Q13C301)
- WASTE STORAGE AREA
- RIVER/STREAM/DRAINAGE
- ROAD
- QIA SURFACE COMMERCIAL LEASE BOUNDARY
- WATER LICENCE WATER QUALITY MONITORING LOCATION

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 17N.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PLAN BASED ON INFORMATION PROVIDED BY HATCH, DATED (JAN 13, 2015).
4. CONTOUR INTERVAL IS 2.5 METRES.
5. ALL SAMPLE ID'S SHOWN IN BRACKETS REPRESENT THE TYPE B WATER LICENCE(S) MONITORING POINTS. ALL OTHERS ARE MONITORING POINTS AS PER THE TYPE A WATER LICENCE (2AM-MRY1325).

SCALE A: 300 150 0 500 1000 1500 m

Baffinland

MARY RIVER PROJECT

MINE SITE LAYOUT AND WATER LICENCE MONITORING LOCATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.	REV
NB102-181/36	NB15-00029	0

FIGURE 1.5

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	13MAR15	ISSUED WITH 2014 QIA AND NWB ANNUAL REPORT	RAC	AS	AK	JM

August 16, 2017

Justin Hack, Resource Management Officer
Nunavut Field Operations
Aboriginal Affairs and Northern Development Canada
Box 100
Iqaluit, NU X0A 0H0

Curtis Didham, Enforcement Officer
Iqaluit Office
Environment and Climate Change Canada
933 Mivvik Street
Iqaluit, NU X0A 0H0

RE: Notification of Potential Controlled Discharge from Waste Rock Sedimentation Pond (MS-08); Type "A" Water Licence 2AM-MRY1325 – Amend. No. 1

The purpose of this letter is to inform relevant regulators and stakeholders of Baffinland Iron Mines Corporation's proposed mitigation measures to address concerns regarding the Mary River Mine Site's Waste Rock Sedimentation Pond (the Pond), including a potential controlled discharge from the pond, through the Final Discharge Point, to the receiving environment.

During the last month, the Mary River Mine Site has experienced several large precipitation events that have resulted in significant amounts of runoff from the Mine Site waste rock stockpile being contained within the Pond. Current water levels within the Pond allow for less than <0.5m of freeboard. Due to the continuing influx of runoff into the Pond, it is possible that runoff will exceed the Pond's capacity in the near future.

Moreover, within the last two (2) weeks, the pH level in the Pond has progressively dropped and is currently fluctuating around a pH of 4. These low pH levels are suspected to be the main reason for the failure of a set of acute toxicity samples taken from the Pond on August 1, 2017. Upon becoming aware of the Pond's low pH levels, discharge of effluent from the Pond to the receiving environment ceased on August 3, 2017 and has not resumed since.

To increase the pH in the Pond to levels within the permissible range for discharge[1], Baffinland has reached out to several consultants to determine the best immediate and long term water treatment options. The best immediate water treatment option currently consists of batch treatment of the pond or in-line active discharge treatment with soda ash to increase the pH. Although this method would allow pH levels to meet the relevant discharge criteria (pH 6.0 – 9.5), internal beaker tests conducted onsite have shown that this method causes secondary chemical reactions that increase the alkalinity, conductivity and TSS of the treated water and result in TSS levels above the allowable TSS discharge criteria (15 mg/L).

However, given the limited available capacity for storing water at the Mine Site and the limited water treatment options, it is Baffinland's intention to treat the Pond as described above and conduct a controlled discharge to the environment using the MS-08 FDP commencing in the next several days, if

[1] Discharge criteria outlined in the Federal Metal Mines Effluent Regulations (MMER) and Baffinland's Type A Water Licence (2AM-MRY1325) for MS-08.

2275 Upper Middle Road East, Suite 300 | Oakville, ON, Canada L6H 0C3
Main: 416.364.8820 | Fax: 416.364.0193 | www.baffinland.com

required. Daily monitoring will be conducted during the discharge to ensure pH levels remain in compliance with the relevant discharge criteria.

Because Baffinland sees this event as an ongoing risk, Baffinland is considering the following long term mitigation measures to prevent a similar event from occurring in the future:

- Establishing a permanent water treatment system at the Pond (MS-08) capable of pH adjustment and water treatment for other relevant water quality parameters (TSS, metals)
- Modifying waste rock stockpiling procedures, with a focus on potential acid generating rock (PAG) capping thickness and frequency requirements
- Expanding and increasing the capacity of the Pond associated with the Mine Site waste rock stockpile

Baffinland will continue to provide updates as immediate and long term mitigation measures are implemented and as the situation progresses. Please do not hesitate to contact the undersigned, or Laura Taylor, should you have any questions or comments.

Regards,

Bill Bowden

William Bowden
Environmental Superintendent

Cc: Stephen Williamson Bathory (Qikiqtani Inuit Association)
David Hohnstein, Sean Joseph (NWB)
Jonathan Mesher, Sarah Forté, (INAC)
Todd Burlingame, Adam Grzegorczyk, Wayne McPhee, William Bowden, Andrew Vermeer (Baffinland)

APPENDIX B

CERTIFICATES OF ANALYSIS

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 29-JUN-17
Report Date: 17-JUL-17 06:49 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1950717
Project P.O. #: 4500027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Wayne Smith

Wayne Smith, C.Chem., C.E.T.
Client Services Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1950717-1 MS-08							
Sampled By: CD/MK on 27-JUN-17 @ 13:00							
Matrix: WATER							
Physical Tests							
Conductivity	52.3		3.0	umhos/cm		29-JUN-17	R3758884
Hardness (as CaCO3)	22		10	mg/L		30-JUN-17	
pH	7.12		0.10	pH units		29-JUN-17	R3758884
Total Suspended Solids	<2.0		2.0	mg/L	30-JUN-17	01-JUL-17	R3760014
Total Dissolved Solids	25	DLDS	13	mg/L		30-JUN-17	R3763384
Anions and Nutrients							
Acidity (as CaCO3)	3.3		2.0	mg/L		30-JUN-17	R3759563
Alkalinity, Total (as CaCO3)	<10		10	mg/L		30-JUN-17	R3759894
Ammonia, Total (as N)	0.049		0.020	mg/L		30-JUN-17	R3759440
Chloride (Cl)	<0.50		0.50	mg/L		30-JUN-17	R3759811
Fluoride (F)	<0.020		0.020	mg/L		30-JUN-17	R3759811
Nitrate (as N)	0.081		0.020	mg/L		30-JUN-17	R3759811
Total Kjeldahl Nitrogen	0.17		0.15	mg/L	30-JUN-17	30-JUN-17	R3759775
Phosphorus, Total	0.0045		0.0030	mg/L	29-JUN-17	30-JUN-17	R3759259
Sulfate (SO4)	15.0		0.30	mg/L		30-JUN-17	R3759811
Cyanides							
Cyanide, Total	<0.0020		0.0020	mg/L		30-JUN-17	R3759768
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<1.0		1.0	mg/L		30-JUN-17	R3759802
Total Organic Carbon	<1.0		1.0	mg/L		29-JUN-17	R3761785
Total Metals							
Aluminum (Al)-Total	0.109		0.010	mg/L	29-JUN-17	29-JUN-17	R3759296
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3759296
Arsenic (As)-Total	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3759296
Barium (Ba)-Total	0.00192		0.00020	mg/L	29-JUN-17	29-JUN-17	R3759296
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3759296
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	29-JUN-17	29-JUN-17	R3759296
Boron (B)-Total	<0.010		0.010	mg/L	29-JUN-17	29-JUN-17	R3759296
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	29-JUN-17	29-JUN-17	R3759296
Calcium (Ca)-Total	2.13		0.50	mg/L	29-JUN-17	29-JUN-17	R3759296
Cesium (Cs)-Total	0.000012		0.000010	mg/L	29-JUN-17	29-JUN-17	R3759296
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	29-JUN-17	29-JUN-17	R3759296
Cobalt (Co)-Total	0.00126		0.00010	mg/L	29-JUN-17	29-JUN-17	R3759296
Copper (Cu)-Total	<0.0010		0.0010	mg/L	29-JUN-17	29-JUN-17	R3759296
Iron (Fe)-Total	0.191		0.050	mg/L	29-JUN-17	29-JUN-17	R3759296
Lead (Pb)-Total	0.000096		0.000050	mg/L	29-JUN-17	29-JUN-17	R3759296
Lithium (Li)-Total	0.0010		0.0010	mg/L	29-JUN-17	29-JUN-17	R3759296
Magnesium (Mg)-Total	3.70		0.050	mg/L	29-JUN-17	29-JUN-17	R3759296
Manganese (Mn)-Total	0.0883		0.00050	mg/L	29-JUN-17	29-JUN-17	R3759296
Mercury (Hg)-Total	<0.000010		0.000010	mg/L		30-JUN-17	R3759394
Molybdenum (Mo)-Total	0.000056		0.000050	mg/L	29-JUN-17	29-JUN-17	R3759296
Nickel (Ni)-Total	0.00145		0.00050	mg/L	29-JUN-17	29-JUN-17	R3759296

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1950717-1 MS-08 Sampled By: CD/MK on 27-JUN-17 @ 13:00 Matrix: WATER							
Total Metals							
Phosphorus (P)-Total	<0.050		0.050	mg/L	29-JUN-17	29-JUN-17	R3759296
Potassium (K)-Total	0.240		0.050	mg/L	29-JUN-17	29-JUN-17	R3759296
Rubidium (Rb)-Total	0.00053		0.00020	mg/L	29-JUN-17	29-JUN-17	R3759296
Selenium (Se)-Total	0.000095		0.000050	mg/L	29-JUN-17	29-JUN-17	R3759296
Silicon (Si)-Total	0.28		0.10	mg/L	29-JUN-17	29-JUN-17	R3759296
Silver (Ag)-Total	<0.000050		0.000050	mg/L	29-JUN-17	29-JUN-17	R3759296
Sodium (Na)-Total	<0.50		0.50	mg/L	29-JUN-17	29-JUN-17	R3759296
Strontium (Sr)-Total	0.0016		0.0010	mg/L	29-JUN-17	29-JUN-17	R3759296
Sulfur (S)-Total	5.40		0.50	mg/L	29-JUN-17	29-JUN-17	R3759296
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	29-JUN-17	29-JUN-17	R3759296
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	29-JUN-17	29-JUN-17	R3759296
Thorium (Th)-Total	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3759296
Tin (Sn)-Total	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3759296
Titanium (Ti)-Total	0.00372		0.00030	mg/L	29-JUN-17	29-JUN-17	R3759296
Tungsten (W)-Total	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3759296
Uranium (U)-Total	0.000080		0.000010	mg/L	29-JUN-17	29-JUN-17	R3759296
Vanadium (V)-Total	<0.00050		0.00050	mg/L	29-JUN-17	29-JUN-17	R3759296
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	29-JUN-17	29-JUN-17	R3759296
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	29-JUN-17	29-JUN-17	R3759296
Dissolved Metals							
Dissolved Mercury Filtration Location	FIELD					30-JUN-17	R3759381
Dissolved Metals Filtration Location	FIELD					29-JUN-17	R3758564
Aluminum (Al)-Dissolved	0.0087		0.0050	mg/L	29-JUN-17	29-JUN-17	R3758633
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3758633
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3758633
Barium (Ba)-Dissolved	0.00180		0.00010	mg/L	29-JUN-17	29-JUN-17	R3758633
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3758633
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	29-JUN-17	29-JUN-17	R3758633
Boron (B)-Dissolved	<0.010		0.010	mg/L	29-JUN-17	29-JUN-17	R3758633
Cadmium (Cd)-Dissolved	<0.000010		0.000010	mg/L	29-JUN-17	29-JUN-17	R3758633
Calcium (Ca)-Dissolved	2.34		0.050	mg/L	29-JUN-17	29-JUN-17	R3758633
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	29-JUN-17	29-JUN-17	R3758633
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	29-JUN-17	29-JUN-17	R3758633
Cobalt (Co)-Dissolved	0.00122		0.00010	mg/L	29-JUN-17	29-JUN-17	R3758633
Copper (Cu)-Dissolved	0.00035		0.00020	mg/L	29-JUN-17	29-JUN-17	R3758633
Iron (Fe)-Dissolved	0.018		0.010	mg/L	29-JUN-17	29-JUN-17	R3758633
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	29-JUN-17	29-JUN-17	R3758633
Lithium (Li)-Dissolved	0.0013		0.0010	mg/L	29-JUN-17	29-JUN-17	R3758633
Magnesium (Mg)-Dissolved	3.87		0.050	mg/L	29-JUN-17	29-JUN-17	R3758633
Manganese (Mn)-Dissolved	0.0920		0.00050	mg/L	29-JUN-17	29-JUN-17	R3758633
Mercury (Hg)-Dissolved	<0.000010		0.000010	mg/L	30-JUN-17	30-JUN-17	R3759391

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1950717-1 MS-08 Sampled By: CD/MK on 27-JUN-17 @ 13:00 Matrix: WATER							
Dissolved Metals							
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L	29-JUN-17	29-JUN-17	R3758633
Nickel (Ni)-Dissolved	0.00131		0.00050	mg/L	29-JUN-17	29-JUN-17	R3758633
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	29-JUN-17	29-JUN-17	R3758633
Potassium (K)-Dissolved	0.277		0.050	mg/L	29-JUN-17	29-JUN-17	R3758633
Rubidium (Rb)-Dissolved	0.00034		0.00020	mg/L	29-JUN-17	29-JUN-17	R3758633
Selenium (Se)-Dissolved	0.000085		0.000050	mg/L	29-JUN-17	29-JUN-17	R3758633
Silicon (Si)-Dissolved	0.079		0.050	mg/L	29-JUN-17	29-JUN-17	R3758633
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	29-JUN-17	29-JUN-17	R3758633
Sodium (Na)-Dissolved	<0.50		0.50	mg/L	29-JUN-17	29-JUN-17	R3758633
Strontium (Sr)-Dissolved	0.0019		0.0010	mg/L	29-JUN-17	29-JUN-17	R3758633
Sulfur (S)-Dissolved	4.21		0.50	mg/L	29-JUN-17	29-JUN-17	R3758633
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	29-JUN-17	29-JUN-17	R3758633
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	29-JUN-17	29-JUN-17	R3758633
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3758633
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3758633
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	29-JUN-17	29-JUN-17	R3758633
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	29-JUN-17	29-JUN-17	R3758633
Uranium (U)-Dissolved	0.000032		0.000010	mg/L	29-JUN-17	29-JUN-17	R3758633
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	29-JUN-17	29-JUN-17	R3758633
Zinc (Zn)-Dissolved	0.0024		0.0010	mg/L	29-JUN-17	29-JUN-17	R3758633
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	29-JUN-17	29-JUN-17	R3758633
Radiological Parameters							
Ra-226	<0.0068		0.0068	Bq/L	03-JUL-17	11-JUL-17	R3768345

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Chloride (Cl)	MS-B	L1950717-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1950717-1
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1950717-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1950717-1
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1950717-1
Matrix Spike	Aluminum (Al)-Total	MS-B	L1950717-1
Matrix Spike	Iron (Fe)-Total	MS-B	L1950717-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1950717-1
Matrix Spike	Manganese (Mn)-Total	MS-B	L1950717-1
Matrix Spike	Silicon (Si)-Total	MS-B	L1950717-1
Matrix Spike	Sulfur (S)-Total	MS-B	L1950717-1
Matrix Spike	Ammonia, Total (as N)	MS-B	L1950717-1
Matrix Spike	Phosphorus, Total	MS-B	L1950717-1

Sample Parameter Qualifier key listed:

Qualifier	Description
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.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

ACY-TITR-TB | Water | Acidity | APHA 2310 B modified

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-WT | Water | Alkalinity, Total (as CaCO3) | EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

C-DIS-ORG-WT | Water | Dissolved Organic Carbon | APHA 5310 B-INSTRUMENTAL

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

CL-IC-N-WT | Water | Chloride by IC | EPA 300.1 (mod)

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

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-TOT-WT | Water | Cyanide, Total | ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

EC-WT | Water | Conductivity | APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

F-IC-N-WT | 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-WT | Water | Hardness | APHA 2340 B

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-WT | Water | Dissolved Mercury in Water by CVAAS | 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-T-CVAA-WT | Water | Total Mercury in Water by CVAAS | EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

Reference Information

MET-D-CCMS-WT	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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-T-CCMS-WT	Water	Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-WT	Water	Ammonia, Total as N	EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

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

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1

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

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

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5□C overnight and then 180–10□C for 1hr.

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1□C for a minimum of four hours or until a constant weight is achieved.

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
TB	ALS ENVIRONMENTAL - THUNDER BAY, ONTARIO, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

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 weight of sample

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

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.

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACY-TITR-TB	**Water**							
Batch R3759563								
WG2560767-3 DUP		**L1950717-1**						
Acidity (as CaCO3)		3.3	<2.0	RPD-NA	mg/L	N/A	20	30-JUN-17
WG2560767-2 LCS								
Acidity (as CaCO3)			101.6		%		85-115	30-JUN-17
WG2560767-1 MB								
Acidity (as CaCO3)			<2.0		mg/L		2	30-JUN-17
ALK-WT	**Water**							
Batch R3759894								
WG2560938-15 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			102.9		%		80-120	30-JUN-17
WG2560938-16 DUP		**L1947308-12**						
Alkalinity, Total (as CaCO3)		10	10		mg/L	0.9	20	30-JUN-17
WG2560938-14 LCS								
Alkalinity, Total (as CaCO3)			103.7		%		85-115	30-JUN-17
WG2560938-13 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	30-JUN-17
C-DIS-ORG-WT	**Water**							
Batch R3759802								
WG2560461-3 DUP		**L1950717-1**						
Dissolved Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	30-JUN-17
WG2560461-2 LCS								
Dissolved Organic Carbon			101.3		%		80-120	30-JUN-17
WG2560461-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	30-JUN-17
WG2560461-4 MS		**L1950717-1**						
Dissolved Organic Carbon			101.8		%		70-130	30-JUN-17
CL-IC-N-WT	**Water**							
Batch R3759811								
WG2560526-4 DUP		**WG2560526-3**						
Chloride (Cl)		184	183		mg/L	0.7	20	30-JUN-17
WG2560526-2 LCS								
Chloride (Cl)			105.4		%		90-110	30-JUN-17
WG2560526-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	30-JUN-17
WG2560526-5 MS		**WG2560526-3**						
Chloride (Cl)			N/A	MS-B	%		-	30-JUN-17
EC-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Water**							
Batch R3758884								
WG2559606-32 DUP		**WG2559606-31**						
Conductivity		1050	1050		umhos/cm	0.4	10	29-JUN-17
WG2559606-29 LCS								
Conductivity			101.1		%		90-110	29-JUN-17
WG2559606-30 MB								
Conductivity			<3.0		umhos/cm		3	29-JUN-17
F-IC-N-WT	**Water**							
Batch R3759811								
WG2560526-4 DUP		**WG2560526-3**						
Fluoride (F)		0.357	0.341		mg/L	4.6	20	30-JUN-17
WG2560526-2 LCS								
Fluoride (F)			99.95		%		90-110	30-JUN-17
WG2560526-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	30-JUN-17
WG2560526-5 MS		**WG2560526-3**						
Fluoride (F)			103.7		%		75-125	30-JUN-17
HG-D-CVAA-WT	**Water**							
Batch R3759391								
WG2560648-4 DUP		**WG2560648-3**						
Mercury (Hg)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-JUN-17
WG2560648-2 LCS								
Mercury (Hg)-Dissolved			103.0		%		80-120	30-JUN-17
WG2560648-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	30-JUN-17
WG2560648-6 MS		**WG2560648-5**						
Mercury (Hg)-Dissolved			96.3		%		70-130	30-JUN-17
HG-T-CVAA-WT	**Water**							
Batch R3759394								
WG2560646-3 DUP		**L1950717-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-JUN-17
WG2560646-2 LCS								
Mercury (Hg)-Total			104.0		%		80-120	30-JUN-17
WG2560646-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	30-JUN-17
WG2560646-4 MS		**L1949952-1**						
Mercury (Hg)-Total			75.4		%		70-130	30-JUN-17
MET-D-CCMS-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3758633								
WG2559786-4 DUP		**WG2559786-3**						
Aluminum (Al)-Dissolved		0.0087	0.0084		mg/L	3.9	20	29-JUN-17
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUN-17
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUN-17
Barium (Ba)-Dissolved		0.00180	0.00180		mg/L	0.1	20	29-JUN-17
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUN-17
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-JUN-17
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-JUN-17
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-JUN-17
Calcium (Ca)-Dissolved		2.34	2.31		mg/L	1.2	20	29-JUN-17
Cesium (Cs)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-JUN-17
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	29-JUN-17
Cobalt (Co)-Dissolved		0.00122	0.00120		mg/L	2.0	20	29-JUN-17
Copper (Cu)-Dissolved		0.00035	0.00035		mg/L	0.2	20	29-JUN-17
Iron (Fe)-Dissolved		0.018	0.018		mg/L	2.6	20	29-JUN-17
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-JUN-17
Lithium (Li)-Dissolved		0.0013	0.0013		mg/L	2.1	20	29-JUN-17
Magnesium (Mg)-Dissolved		3.87	3.83		mg/L	0.9	20	29-JUN-17
Manganese (Mn)-Dissolved		0.0920	0.0900		mg/L	2.2	20	29-JUN-17
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-JUN-17
Nickel (Ni)-Dissolved		0.00131	0.00137		mg/L	4.1	20	29-JUN-17
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	29-JUN-17
Potassium (K)-Dissolved		0.277	0.279		mg/L	0.8	20	29-JUN-17
Rubidium (Rb)-Dissolved		0.00034	0.00032		mg/L	8.0	20	29-JUN-17
Selenium (Se)-Dissolved		0.000085	0.000066	J	mg/L	0.000019	0.0001	29-JUN-17
Silicon (Si)-Dissolved		0.079	0.074		mg/L	6.4	20	29-JUN-17
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-JUN-17
Sodium (Na)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	29-JUN-17
Strontium (Sr)-Dissolved		0.0019	0.0019		mg/L	0.3	20	29-JUN-17
Sulfur (S)-Dissolved		4.21	3.89		mg/L	7.8	20	29-JUN-17
Tellurium (Te)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	29-JUN-17
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-JUN-17
Thorium (Th)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUN-17
Tin (Sn)-Dissolved		<0.00010	<0.00010		mg/L			29-JUN-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3758633								
WG2559786-4 DUP		**WG2559786-3**						
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUN-17
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	29-JUN-17
Tungsten (W)-Dissolved		<0.00010	0.00012	RPD-NA	mg/L	N/A	20	29-JUN-17
Uranium (U)-Dissolved		0.000032	0.000033		mg/L	2.2	20	29-JUN-17
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	29-JUN-17
Zinc (Zn)-Dissolved		0.0024	0.0025		mg/L	3.0	20	29-JUN-17
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	29-JUN-17
WG2559786-2 LCS								
Aluminum (Al)-Dissolved			97.1		%		80-120	29-JUN-17
Antimony (Sb)-Dissolved			98.5		%		80-120	29-JUN-17
Arsenic (As)-Dissolved			94.9		%		80-120	29-JUN-17
Barium (Ba)-Dissolved			98.8		%		80-120	29-JUN-17
Beryllium (Be)-Dissolved			95.2		%		80-120	29-JUN-17
Bismuth (Bi)-Dissolved			95.9		%		80-120	29-JUN-17
Boron (B)-Dissolved			91.7		%		80-120	29-JUN-17
Cadmium (Cd)-Dissolved			101.2		%		80-120	29-JUN-17
Calcium (Ca)-Dissolved			95.0		%		80-120	29-JUN-17
Cesium (Cs)-Dissolved			101.9		%		80-120	29-JUN-17
Chromium (Cr)-Dissolved			96.1		%		80-120	29-JUN-17
Cobalt (Co)-Dissolved			94.6		%		80-120	29-JUN-17
Copper (Cu)-Dissolved			93.1		%		80-120	29-JUN-17
Iron (Fe)-Dissolved			96.9		%		80-120	29-JUN-17
Lead (Pb)-Dissolved			98.5		%		80-120	29-JUN-17
Lithium (Li)-Dissolved			96.1		%		80-120	29-JUN-17
Magnesium (Mg)-Dissolved			97.1		%		80-120	29-JUN-17
Manganese (Mn)-Dissolved			98.1		%		80-120	29-JUN-17
Molybdenum (Mo)-Dissolved			95.4		%		80-120	29-JUN-17
Nickel (Ni)-Dissolved			93.0		%		80-120	29-JUN-17
Phosphorus (P)-Dissolved			100.1		%		80-120	29-JUN-17
Potassium (K)-Dissolved			96.0		%		80-120	29-JUN-17
Rubidium (Rb)-Dissolved			95.3		%		80-120	29-JUN-17
Selenium (Se)-Dissolved			96.8		%		80-120	29-JUN-17
Silicon (Si)-Dissolved			104.7		%		60-140	29-JUN-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3758633								
WG2559786-2 LCS								
Silver (Ag)-Dissolved			99.9		%		80-120	29-JUN-17
Sodium (Na)-Dissolved			98.4		%		80-120	29-JUN-17
Strontium (Sr)-Dissolved			98.2		%		80-120	29-JUN-17
Sulfur (S)-Dissolved			99.5		%		80-120	29-JUN-17
Tellurium (Te)-Dissolved			97.0		%		80-120	29-JUN-17
Thallium (Tl)-Dissolved			96.4		%		80-120	29-JUN-17
Thorium (Th)-Dissolved			98.2		%		80-120	29-JUN-17
Tin (Sn)-Dissolved			97.9		%		80-120	29-JUN-17
Titanium (Ti)-Dissolved			93.3		%		80-120	29-JUN-17
Tungsten (W)-Dissolved			97.6		%		80-120	29-JUN-17
Uranium (U)-Dissolved			96.6		%		80-120	29-JUN-17
Vanadium (V)-Dissolved			96.9		%		80-120	29-JUN-17
Zinc (Zn)-Dissolved			91.9		%		80-120	29-JUN-17
Zirconium (Zr)-Dissolved			92.9		%		80-120	29-JUN-17
WG2559786-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	29-JUN-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	29-JUN-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	29-JUN-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	29-JUN-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	29-JUN-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	29-JUN-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-JUN-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	29-JUN-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	29-JUN-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	29-JUN-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	29-JUN-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	29-JUN-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	29-JUN-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-JUN-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	29-JUN-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	29-JUN-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	29-JUN-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	29-JUN-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	29-JUN-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3758633								
WG2559786-1 MB								
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	29-JUN-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	29-JUN-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	29-JUN-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	29-JUN-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	29-JUN-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	29-JUN-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	29-JUN-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	29-JUN-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	29-JUN-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	29-JUN-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	29-JUN-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	29-JUN-17
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	29-JUN-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	29-JUN-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	29-JUN-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	29-JUN-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	29-JUN-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	29-JUN-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	29-JUN-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	29-JUN-17
WG2559786-5 MS		**WG2559786-3**						
Aluminum (Al)-Dissolved			96.4		%		70-130	29-JUN-17
Antimony (Sb)-Dissolved			105.9		%		70-130	29-JUN-17
Arsenic (As)-Dissolved			99.1		%		70-130	29-JUN-17
Barium (Ba)-Dissolved			96.6		%		70-130	29-JUN-17
Beryllium (Be)-Dissolved			96.4		%		70-130	29-JUN-17
Bismuth (Bi)-Dissolved			90.5		%		70-130	29-JUN-17
Boron (B)-Dissolved			89.7		%		70-130	29-JUN-17
Cadmium (Cd)-Dissolved			103.7		%		70-130	29-JUN-17
Calcium (Ca)-Dissolved			85.9		%		70-130	29-JUN-17
Cesium (Cs)-Dissolved			107.3		%		70-130	29-JUN-17
Chromium (Cr)-Dissolved			97.7		%		70-130	29-JUN-17
Cobalt (Co)-Dissolved			94.5		%		70-130	29-JUN-17
Copper (Cu)-Dissolved			96.8		%		70-130	29-JUN-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3758633								
WG2559786-5 MS		**WG2559786-3**						
Iron (Fe)-Dissolved			93.6		%		70-130	29-JUN-17
Lead (Pb)-Dissolved			97.7		%		70-130	29-JUN-17
Lithium (Li)-Dissolved			95.2		%		70-130	29-JUN-17
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	29-JUN-17
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	29-JUN-17
Molybdenum (Mo)-Dissolved			93.8		%		70-130	29-JUN-17
Nickel (Ni)-Dissolved			95.5		%		70-130	29-JUN-17
Phosphorus (P)-Dissolved			90.3		%		70-130	29-JUN-17
Potassium (K)-Dissolved			96.2		%		70-130	29-JUN-17
Rubidium (Rb)-Dissolved			98.2		%		70-130	29-JUN-17
Selenium (Se)-Dissolved			104.3		%		70-130	29-JUN-17
Silicon (Si)-Dissolved			N/A	MS-B	%		-	29-JUN-17
Silver (Ag)-Dissolved			104.6		%		70-130	29-JUN-17
Sodium (Na)-Dissolved			97.0		%		70-130	29-JUN-17
Strontium (Sr)-Dissolved			95.0		%		70-130	29-JUN-17
Sulfur (S)-Dissolved			N/A	MS-B	%		-	29-JUN-17
Tellurium (Te)-Dissolved			110.7		%		70-130	29-JUN-17
Thallium (Tl)-Dissolved			94.9		%		70-130	29-JUN-17
Thorium (Th)-Dissolved			96.4		%		70-130	29-JUN-17
Tin (Sn)-Dissolved			99.6		%		70-130	29-JUN-17
Titanium (Ti)-Dissolved			94.5		%		70-130	29-JUN-17
Tungsten (W)-Dissolved			97.4		%		70-130	29-JUN-17
Uranium (U)-Dissolved			98.7		%		70-130	29-JUN-17
Vanadium (V)-Dissolved			99.5		%		70-130	29-JUN-17
Zinc (Zn)-Dissolved			96.1		%		70-130	29-JUN-17
Zirconium (Zr)-Dissolved			90.8		%		70-130	29-JUN-17
MET-T-CCMS-WT	**Water**							
Batch R3759296								
WG2560190-4 DUP		**WG2560190-3**						
Aluminum (Al)-Total		0.109	0.099		mg/L	9.6	20	29-JUN-17
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUN-17
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUN-17
Barium (Ba)-Total		0.00192	0.00192		mg/L	0.3	20	29-JUN-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3759296								
WG2560190-4 DUP		**WG2560190-3**						
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUN-17
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-JUN-17
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-JUN-17
Cadmium (Cd)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-JUN-17
Calcium (Ca)-Total		2.13	2.14		mg/L	0.7	20	29-JUN-17
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	29-JUN-17
Cesium (Cs)-Total		0.000012	0.000011		mg/L	2.6	20	29-JUN-17
Cobalt (Co)-Total		0.00126	0.00124		mg/L	1.4	20	29-JUN-17
Copper (Cu)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	29-JUN-17
Iron (Fe)-Total		0.191	0.201		mg/L	4.8	20	29-JUN-17
Lead (Pb)-Total		0.000096	0.000092		mg/L	4.5	20	29-JUN-17
Lithium (Li)-Total		0.0010	<0.0010	RPD-NA	mg/L	N/A	20	29-JUN-17
Magnesium (Mg)-Total		3.70	3.70		mg/L	0.0	20	29-JUN-17
Manganese (Mn)-Total		0.0883	0.0864		mg/L	2.2	20	29-JUN-17
Molybdenum (Mo)-Total		0.000056	0.000059		mg/L	5.2	20	29-JUN-17
Nickel (Ni)-Total		0.00145	0.00150		mg/L	3.6	20	29-JUN-17
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	29-JUN-17
Potassium (K)-Total		0.240	0.237		mg/L	1.2	20	29-JUN-17
Rubidium (Rb)-Total		0.00053	0.00050		mg/L	4.9	20	29-JUN-17
Selenium (Se)-Total		0.000095	0.000093		mg/L	2.8	20	29-JUN-17
Silicon (Si)-Total		0.28	0.27		mg/L	5.4	20	29-JUN-17
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-JUN-17
Sodium (Na)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	29-JUN-17
Strontium (Sr)-Total		0.0016	0.0017		mg/L	1.8	20	29-JUN-17
Sulfur (S)-Total		5.40	5.28		mg/L	2.2	25	29-JUN-17
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-JUN-17
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	29-JUN-17
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	29-JUN-17
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUN-17
Titanium (Ti)-Total		0.00372	0.00332		mg/L	12	20	29-JUN-17
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUN-17
Uranium (U)-Total		0.000080	0.000078		mg/L	2.8	20	29-JUN-17
Vanadium (V)-Total		<0.00050	<0.00050		mg/L			29-JUN-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3759296								
WG2560190-4 DUP		**WG2560190-3**						
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	29-JUN-17
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	29-JUN-17
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	29-JUN-17
WG2560190-2 LCS								
Aluminum (Al)-Total			94.3		%		80-120	29-JUN-17
Antimony (Sb)-Total			92.5		%		80-120	29-JUN-17
Arsenic (As)-Total			96.3		%		80-120	29-JUN-17
Barium (Ba)-Total			98.3		%		80-120	29-JUN-17
Beryllium (Be)-Total			95.9		%		80-120	29-JUN-17
Bismuth (Bi)-Total			98.9		%		80-120	29-JUN-17
Boron (B)-Total			91.4		%		80-120	29-JUN-17
Cadmium (Cd)-Total			92.6		%		80-120	29-JUN-17
Calcium (Ca)-Total			95.5		%		80-120	29-JUN-17
Chromium (Cr)-Total			93.7		%		80-120	29-JUN-17
Cesium (Cs)-Total			96.4		%		80-120	29-JUN-17
Cobalt (Co)-Total			94.6		%		80-120	29-JUN-17
Copper (Cu)-Total			94.3		%		80-120	29-JUN-17
Iron (Fe)-Total			94.5		%		80-120	29-JUN-17
Lead (Pb)-Total			99.9		%		80-120	29-JUN-17
Lithium (Li)-Total			93.9		%		80-120	29-JUN-17
Magnesium (Mg)-Total			96.0		%		80-120	29-JUN-17
Manganese (Mn)-Total			95.6		%		80-120	29-JUN-17
Molybdenum (Mo)-Total			93.8		%		80-120	29-JUN-17
Nickel (Ni)-Total			95.2		%		80-120	29-JUN-17
Phosphorus (P)-Total			108.6		%		70-130	29-JUN-17
Potassium (K)-Total			93.9		%		80-120	29-JUN-17
Rubidium (Rb)-Total			95.9		%		80-120	29-JUN-17
Selenium (Se)-Total			95.8		%		80-120	29-JUN-17
Silicon (Si)-Total			117.6		%		60-140	30-JUN-17
Silver (Ag)-Total			96.6		%		80-120	29-JUN-17
Sodium (Na)-Total			97.6		%		80-120	29-JUN-17
Strontium (Sr)-Total			93.0		%		80-120	29-JUN-17
Sulfur (S)-Total			96.8		%		70-130	29-JUN-17
Thallium (Tl)-Total			95.8				80-120	

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3759296								
WG2560190-2 LCS								
Thallium (Tl)-Total			95.8		%		80-120	29-JUN-17
Tellurium (Te)-Total			95.7		%		80-120	29-JUN-17
Thorium (Th)-Total			102.5		%		70-130	29-JUN-17
Tin (Sn)-Total			89.6		%		80-120	29-JUN-17
Titanium (Ti)-Total			91.6		%		80-120	29-JUN-17
Tungsten (W)-Total			99.1		%		80-120	29-JUN-17
Uranium (U)-Total			102.4		%		80-120	29-JUN-17
Vanadium (V)-Total			95.2		%		80-120	29-JUN-17
Zinc (Zn)-Total			91.8		%		80-120	29-JUN-17
Zirconium (Zr)-Total			92.6		%		80-120	29-JUN-17
WG2560190-1 MB								
Aluminum (Al)-Total			<0.010		mg/L		0.01	29-JUN-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	29-JUN-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	29-JUN-17
Barium (Ba)-Total			<0.00020		mg/L		0.0002	29-JUN-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	29-JUN-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	29-JUN-17
Boron (B)-Total			<0.010		mg/L		0.01	29-JUN-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	29-JUN-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	29-JUN-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	29-JUN-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	29-JUN-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	29-JUN-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	29-JUN-17
Iron (Fe)-Total			<0.050		mg/L		0.05	29-JUN-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	29-JUN-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	29-JUN-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	29-JUN-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	29-JUN-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	29-JUN-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	29-JUN-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	29-JUN-17
Potassium (K)-Total			<0.050		mg/L		0.05	29-JUN-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	29-JUN-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3759296								
WG2560190-1 MB								
Selenium (Se)-Total			<0.000050		mg/L		0.00005	29-JUN-17
Silicon (Si)-Total			<0.10		mg/L		0.1	29-JUN-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	29-JUN-17
Sodium (Na)-Total			<0.50		mg/L		0.5	29-JUN-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	29-JUN-17
Sulfur (S)-Total			<0.50		mg/L		0.5	29-JUN-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	29-JUN-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	29-JUN-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	29-JUN-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	29-JUN-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	29-JUN-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	29-JUN-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	29-JUN-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	29-JUN-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	29-JUN-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	29-JUN-17
WG2560190-5 MS		**WG2560190-3**						
Aluminum (Al)-Total			N/A	MS-B	%		-	29-JUN-17
Antimony (Sb)-Total			92.1		%		70-130	29-JUN-17
Arsenic (As)-Total			95.7		%		70-130	29-JUN-17
Barium (Ba)-Total			89.6		%		70-130	29-JUN-17
Beryllium (Be)-Total			90.1		%		70-130	29-JUN-17
Bismuth (Bi)-Total			100.8		%		70-130	29-JUN-17
Boron (B)-Total			88.8		%		70-130	29-JUN-17
Cadmium (Cd)-Total			91.2		%		70-130	29-JUN-17
Calcium (Ca)-Total			83.9		%		70-130	29-JUN-17
Chromium (Cr)-Total			94.6		%		70-130	29-JUN-17
Cesium (Cs)-Total			93.5		%		70-130	29-JUN-17
Cobalt (Co)-Total			94.6		%		70-130	29-JUN-17
Copper (Cu)-Total			93.7		%		70-130	29-JUN-17
Iron (Fe)-Total			N/A	MS-B	%		-	29-JUN-17
Lead (Pb)-Total			102.4		%		70-130	29-JUN-17
Lithium (Li)-Total			86.9		%		70-130	29-JUN-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	29-JUN-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3759296								
WG2560190-5 MS		**WG2560190-3**						
Manganese (Mn)-Total			N/A	MS-B	%		-	29-JUN-17
Molybdenum (Mo)-Total			92.0		%		70-130	29-JUN-17
Nickel (Ni)-Total			93.6		%		70-130	29-JUN-17
Phosphorus (P)-Total			100.4		%		70-130	29-JUN-17
Potassium (K)-Total			92.5		%		70-130	29-JUN-17
Rubidium (Rb)-Total			98.2		%		70-130	29-JUN-17
Selenium (Se)-Total			94.7		%		70-130	29-JUN-17
Silicon (Si)-Total			N/A	MS-B	%		-	29-JUN-17
Silver (Ag)-Total			93.6		%		70-130	29-JUN-17
Sodium (Na)-Total			96.7		%		70-130	29-JUN-17
Strontium (Sr)-Total			93.4		%		70-130	29-JUN-17
Sulfur (S)-Total			N/A	MS-B	%		-	29-JUN-17
Thallium (Tl)-Total			99.97		%		70-130	29-JUN-17
Tellurium (Te)-Total			90.8		%		70-130	29-JUN-17
Thorium (Th)-Total			104.1		%		70-130	29-JUN-17
Tin (Sn)-Total			89.1		%		70-130	29-JUN-17
Titanium (Ti)-Total			92.5		%		70-130	29-JUN-17
Tungsten (W)-Total			99.2		%		70-130	29-JUN-17
Uranium (U)-Total			102.2		%		70-130	29-JUN-17
Vanadium (V)-Total			94.6		%		70-130	29-JUN-17
Zinc (Zn)-Total			89.1		%		70-130	29-JUN-17
Zirconium (Zr)-Total			90.6		%		70-130	29-JUN-17
NH3-WT	**Water**							
Batch R3759440								
WG2559816-3 DUP		**L1946297-1**						
Ammonia, Total (as N)		0.472	0.473		mg/L	0.4	20	30-JUN-17
WG2559816-2 LCS								
Ammonia, Total (as N)			100.3		%		85-115	30-JUN-17
WG2559816-1 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	30-JUN-17
WG2559816-4 MS		**L1946297-1**						
Ammonia, Total (as N)			N/A	MS-B	%		-	30-JUN-17
NO3-IC-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R3759811								
WG2560526-4 DUP		**WG2560526-3**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	30-JUN-17
WG2560526-2 LCS								
Nitrate (as N)			102.7		%		70-130	30-JUN-17
WG2560526-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	30-JUN-17
WG2560526-5 MS		**WG2560526-3**						
Nitrate (as N)			101.3		%		70-130	30-JUN-17
P-T-COL-WT	**Water**							
Batch R3759259								
WG2560131-3 DUP		**L1948720-1**						
Phosphorus, Total		0.394	0.396		mg/L	0.6	20	30-JUN-17
WG2560131-2 LCS								
Phosphorus, Total			96.6		%		80-120	30-JUN-17
WG2560131-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	30-JUN-17
WG2560131-4 MS		**L1948720-1**						
Phosphorus, Total			N/A	MS-B	%		-	30-JUN-17
PH-WT	**Water**							
Batch R3758884								
WG2559606-32 DUP		**WG2559606-31**						
pH		7.43	7.45	J	pH units	0.02	0.2	29-JUN-17
WG2559606-29 LCS								
pH			6.99		pH units		6.9-7.1	29-JUN-17
SO4-IC-N-WT	**Water**							
Batch R3759811								
WG2560526-4 DUP		**WG2560526-3**						
Sulfate (SO4)		45.4	45.3		mg/L	0.3	20	30-JUN-17
WG2560526-2 LCS								
Sulfate (SO4)			101.3		%		90-110	30-JUN-17
WG2560526-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	30-JUN-17
WG2560526-5 MS		**WG2560526-3**						
Sulfate (SO4)			97.5		%		75-125	30-JUN-17
SOLIDS-TDS-WT	**Water**							

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-WT	**Water**							
Batch R3763384								
WG2560543-3 DUP		**L1948367-3**						
Total Dissolved Solids		100	101		mg/L	1.0	20	30-JUN-17
WG2560543-2 LCS								
Total Dissolved Solids			100.8		%		85-115	30-JUN-17
WG2560543-1 MB								
Total Dissolved Solids			<10		mg/L		10	30-JUN-17
SOLIDS-TSS-WT	**Water**							
Batch R3760014								
WG2560505-3 DUP		**L1949522-1**						
Total Suspended Solids		2500	2130		mg/L	16	20	01-JUL-17
WG2560505-2 LCS								
Total Suspended Solids			99.2		%		85-115	01-JUL-17
WG2560505-1 MB								
Total Suspended Solids			<2.0		mg/L		2	01-JUL-17
TKN-WT	**Water**							
Batch R3759775								
WG2560706-3 DUP		**L1948688-2**						
Total Kjeldahl Nitrogen		0.67	0.93	J	mg/L	0.26	0.3	30-JUN-17
WG2560706-2 LCS								
Total Kjeldahl Nitrogen			97.3		%		75-125	30-JUN-17
WG2560706-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	30-JUN-17
WG2560706-4 MS		**L1948688-2**						
Total Kjeldahl Nitrogen			106.8		%		70-130	30-JUN-17
TOC-WT	**Water**							
Batch R3761785								
WG2560462-3 DUP		**L1951153-1**						
Total Organic Carbon		13.4	13.8		mg/L	2.9	20	29-JUN-17
WG2560462-2 LCS								
Total Organic Carbon			99.0		%		80-120	29-JUN-17
WG2560462-1 MB								
Total Organic Carbon			<1.0		mg/L		1	29-JUN-17
WG2560462-4 MS		**L1951153-1**						
Total Organic Carbon			96.8		%		70-130	29-JUN-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Daphnia magna

Work Order :	233856
Sample Number :	51558

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	C.D./M.K.
Location :	Waterloo ON	Time Collected :	13:00
Job Number :	L1950717	Date Collected :	2017-06-27
Substance :	MS-08	Date Received :	2017-06-29
Sampling Method :	Not provided	Date Tested :	2017-06-30
Sample Description :	Clear, light yellow, odourless.	Temp. on arrival :	20.5° C

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	Dm17-15		
Date Tested (yyyy/mm/dd) :	2017-06-26	Historical Mean LC50 :	5.8 g/L
LC50 (95% Confidence Limits) :	5.7 g/L (5.4 - 6.0)	Warning Limits (± 2SD) :	5.2 - 6.5 g/L
Statistical Method :	Spearman-Karber	Analyst(s) :	AW, SV, CZN

Daphnia magna CULTURE HEALTH DATA

Time to First Brood :	7.5 days	Mean Young Per Brood :	23.2
Culture Mortality :	3.0% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Test Organisms / Replicate :	10
Test Aeration :	None	Total Organisms / Test Level :	30
Organism Batch :	Dm17-15	Organism Loading Rate :	15.0 mL/organism
		Test Method Deviation(s) :	None

Date: 2017-07-05
yyyy-mm-dd

Approved by:
Project Manager

Accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA)

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

Work Order: 233856
Sample Number: 51558

	Hardness (mg/L as $CaCO_3$)	Hardness Adjustment	pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*	Total Pre-Aeration Time (h) @ 30 mL/min/L
Initial Water Chemistry:	22	Yes	7.7	8.7	56	22.0	103	0:00

0 hours

Date & Time 2017-06-30 13:25
Technician: CZN

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*	Hardness
100A	0	0	7.7	8.4	80	22.0	100	36
100B	0	0	7.7	8.4	80	22.0	100	36
100C	0	0	7.7	8.4	80	22.0	100	36
Control A	0	0	8.4	8.4	468	22.0	100	210
Control B	0	0	8.4	8.4	468	22.0	100	210
Control C	0	0	8.4	8.4	468	22.0	100	210

Notes: The sample did not require pre-aeration after hardness adjustment. The O_2 saturation in the hardness-adjusted sample was 100% (CZN).

24 hours

Date & Time 2017-07-01 13:25
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	–	0	–	–	–	22.0
100B	–	0	–	–	–	22.0
100C	–	0	–	–	–	22.0
Control A	–	0		–	–	22.0
Control B	–	0	–	–	–	22.0
Control C	–	0	–	–	–	22.0

Notes:

48 hours

Date & Time 2017-07-02 13:25
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	0	0	7.7	8.5	81	22.0
100B	0	0	7.7	8.5	77	22.0
100C	0	0	7.8	8.4	80	22.0
Control A	0	0	8.5	8.5	473	22.0
Control B	0	0	8.5	8.5	473	22.0
Control C	0	0	8.5	8.5	477	22.0

Notes:

Control organisms showing stress: 0
Organism Batch : Dm17-15

Number immobile does not include number of mortalities.

– = not measured/not required

* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: ESS
Date: 2017-07-05

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 233856
Sample Number : 51558

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	C.D./M.K.
Location :	Waterloo ON	Time Collected :	13:00
Job Number :	L1950717	Date Collected :	2017-06-27
Substance :	MS-08	Date Received :	2017-06-29
Sampling Method :	Not provided	Date Tested :	2017-06-30
Sample Description :	Clear, light yellow, odourless.	Temp. on arrival :	20.5°C

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T17-10		
Date Tested (yyyy-mm-dd) :	2017-06-23	Historical Mean LC50 :	3663 mg/L
LC50 (95% Confidence Limits) :	3370 mg/L (3197 - 3551)	Warning Limits (± 2SD) :	3140 - 4274 mg/L
Statistical Method :	Spearman-Kärber	Analyst(s) :	FS, NL

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.62 ± 0.27 g	Mean Fish Fork Length (± 2 SD) :	40.5 ± 5.9 mm
Range of Weights :	0.44 - 0.89 g	Range of Fork Lengths (mm) :	37 - 46 mm
Fish Loading Rate :	0.4 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	15
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2017-07-05
yyyy-mm-dd

Approved by:
Project Manager

AQUATOX

TOXICITY TEST REPORT
Rainbow Trout

Work Order: 233856
Sample Number: 51558

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	**Initial Water Chemistry:**	6.8	9.1	45	16.0	--
	Chemistry after 30min air:	6.8	9.2	46	16.0	98

0 hours

Date & Time 2017-06-30 9:00
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	6.8	9.2	46	16.0	98
Control	0	0	8.2	9.1	804	16.0	98

Notes:

24 hours

Date & Time 2017-07-01 9:00
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	--	--	--	15.5
Control	0	0	--	--	--	15.5

Notes:

48 hours

Date & Time 2017-07-02 9:00
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	-	--	--	15.0
Control	0	0	--	--	--	15.0

Notes:

72 hours

Date & Time 2017-07-03 9:00
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	--	--	--	15.5
Control	0	0	--	--	--	15.5

Notes:

96 hours

Date & Time 2017-07-04 9:00
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	7.2	9.2	57	16.0
Control	0	0	8.3	9.2	795	16.0

Notes:

Control organisms showing stress: 0
Organism Batch : T17-10

" " = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2017-07-05

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 233854

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 Fax: (519) 763-4419

P.O. Number:	4500017476
Field Sampler Name (print):	CD /MK
Signature:	
Affiliation:	ALS ENV
Sample Storage (prior to shipping):	
Custody Relinquished by:	RH
Date/Time Shipped:	2a Jun 17

Client:	ALS Environmental Waterloo Q# 162705399-15
Phone:	519 - 886 - 6910
Fax:	519 - 886 - 9047
Contact:	Wayne Smith / Rick Hawthorne

Sample Identification: L1950717-1

Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2017-06-27	1300	MS-08	51558	20.5	X		X									Pail

For Lab Use Only

Received By:	N. Kreager
Date:	2017-06-29
Time:	16:40 NK
Storage Location:	
Storage Temp.(°C):	

Please list any special requests or instructions:

~~Regular~~ Baffinland Toxicity Tests

JGW

L1950717

WATERLOO

ALS Environmental

Subcontract Request Form

Subcontract To:

AQUATOX TESTING AND CONSULTING
11B NICHOLAS BEAVER ROAD
RR3
GUELPH,ON N1H 6H9

NOTES:	Please reference on final report and invoice: PO# *L1950717* ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 0 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1950717-1 MS-08		6/ 27/ 2017	**P2**
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	7/19/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	7/13/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Wayne Smith, C.Chem., C.E.T.
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Wayne.Smith@alsglobal.com

Please email confirmation of receipt to: **Wayne.Smith@alsglobal.com**

Shipped By: ______________________ Date Shipped: ______________________

Received By: ______________________ Date Received: ______________________

Verified By: ______________________ Date Verified: ______________________

Temperature: ______________________

Sample Integrity Issues: ______________________

rev 3 2016 09 01 TC

Thursday, July 13, 2017

Wayne Smith
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1706689
Project Name:
Project Number: L1950717

Dear Mr. Smith:

One water sample was received from ALS Environmental, on 6/30/2017. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1706689

Radium-226:

The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1706689
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1950717
Client PO Number: L1950717

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1950717-1	1706689-1		WATER	27-Jun-17	

ALS Environmental

1706689

L1950717

WATERLOO

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# *L1950717*
ALS requires QC data to be provided with your final results.

Please see enclosed 1 sample(s) in 1 Container(s)

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1950717-1 MS-08		6/ 27/ 2017	**P2**
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	7/24/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910
Analysis and reporting info contact: Wayne Smith, C.Chem., C.E.T.
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Wayne.Smith@alsglobal.com

Please email confirmation of receipt to: Wayne.Smith@alsglobal.com

Shipped By: ________ Date Shipped: ________
Received By: C Trimble Date Received: 6-30-17 0930
Verified By: ________ Date Verified: ________
Temperature: ________
Sample Integrity Issues: ________

1706489

Sender :	Commercial Invoice
ALS Environmental Ed Hill 60 Northland Rd Unit 1 WATERLOO ON Canada N2V 2B8 Phone + EXT 15198866910235 Fax. 1 Tax ID / VAT Number:	
Receiver :	Date: : 29-Jun-2017
ALS Environmental Fort Collins Sample Login 225 Commerce Drive FORT COLLINS CO United States Of America 80524 Phone + EXT 18004431511 Fax. Tax ID / VAT Number:	Invoice Number : Shipment Reference :
Exporter ID :	Exporter Code :
	Other Remarks :
	Waybill Number : 1531330043

Full Description of Goods	Qty	Commodity Code	Unit Value	Subtotal Value	Unit Net Weight	Gross Weight	Country of Origin
Water sample for testing	1 Pieces		1.00	1.00			Canada

Total Declared Value :	1.00	Total Net Weight:	0.0
Total Line Items :	1	Total Gross Weight :	
Payer of GST/VAT :		Currency Code :	CAD
Harm.Comm.Code :		Terms Of Payment :	
Invoice Type :	COM	Incoterms 2011 :	DAP
Reason for Export :	Permanent		
Other Charges :			

I/We hereby certify that the information on this Invoice is true and correct and that the contents of this shipment are as stated above.
SIGNATURE :

Sender :	
ALS Environmental Ed Hill 60 Northland Rd Unit 1 WATERLOO ON Canada N2V 2B8 Phone + EXT 15198866910235 Fax. 1 Tax ID / VAT Number:	**Commercial Invoice**
Receiver : ALS Environmental Fort Collins Sample Login 225 Commerce Drive FORT COLLINS CO United States Of America 80524 Phone + EXT 18004431511 Fax. Tax ID / VAT Number:	Date: : 29-Jun-2017 Invoice Number : Shipment Reference :
Exporter ID :	Exporter Code :
	Other Remarks : Waybill Number : 1531330043

Full Description of Goods	Qty	Commodity Code	Unit Value	Subtotal Value	Unit Net Weight	Gross Weight	Country of Origin
Water sample for testing	1 Pieces		1.00	1.00			Canada

Total Declared Value :	1.00	Total Net Weight:	0.0
Total Line Items :	1	Total Gross Weight :	
Payer of GST/VAT :		Currency Code :	CAD
Harm.Comm.Code :		Terms Of Payment :	
Invoice Type :	COM	Incoterms 2011 :	DAP
Reason for Export :	Permanent		
Other Charges :			

I/We hereby certify that the information on this Invoice is true and correct and that the contents of this shipment are as stated above.
SIGNATURE :

Client:	ALS Environmental	**Date:**	*13-Jul-17*
Project:	L1950717	**Work Order:**	1706689
Sample ID:	L1950717-1	**Lab ID:**	1706689-1
Legal Location:		**Matrix:**	WATER
Collection Date:	6/27/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **7/3/2017**	PrepBy: **LAD**
Ra-226	0 (+/- 0.0032)	U	0.0068	BQ/l	NA	7/11/2017 12:54
Carr: BARIUM	*95.2*		*40-110*	*%REC*	DL = NA	7/11/2017 12:54

Client: ALS Environmental
Date: *13-Jul-17*
Project: L1950717
Work Order: 1706689
Sample ID: L1950717-1
Lab ID: 1706689-1
Legal Location:
Matrix: WATER
Collection Date: 6/27/2017
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Client: ALS Environmental
Work Order: 1706689
Project: L1950717

Date: *7/13/2017 9:59:*

QC BATCH REPORT

Batch ID: **RE170703-1-1** Instrument ID: **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170703-1** Units: **BQ/l** Analysis Date: **7/11/2017 12:54**
Client ID: Run ID: **RE170703-1B** Prep Date: **7/3/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.59 (+/- 0.394)	0.00852	1.703		93.2	67-120					P
Carr: BARIUM	16300		16680		97.9	40-110					

LCSD Sample ID: **RE170703-1** Units: **BQ/l** Analysis Date: **7/11/2017 12:54**
Client ID: Run ID: **RE170703-1B** Prep Date: **7/3/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.71 (+/- 0.423)	0.00653	1.703		100	67-120		1.59	0.2	2.1	P
Carr: BARIUM	16200		16680		97.3	40-110		16300			

MB Sample ID: **RE170703-1** Units: **BQ/l** Analysis Date: **7/11/2017 12:54**
Client ID: Run ID: **RE170703-1B** Prep Date: **7/3/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.0010 (+/- 0.0038)	0.0071									U
Carr: BARIUM	16200		16680		96.9	40-110					

The following samples were analyzed in this batch: 1706689-1

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1950717-COFC

COC Number: 15 -

Report To — Contact and company name below will appear on the final report

Company: Baffinland Iron Mines Corp.
Contact: Allan Knight
Phone: 647-253-0596 EXT 6010
Company address below will appear on the final report
Street: 2275 Upper Middle Rd. E., Suite #300
City/Province: Oakville, ON
Postal Code: L6H 0C3

Invoice To
Same as Report To: ☑ YES ☐ NO
Copy of Invoice with Report: ☐ YES ☑ NO
Company:
Contact:

Project Information
ALS Account # / Quote #: 23642 /Q42455
Job #: MS-08
PO / AFE: 4500027854
LSD:

ALS Lab Work Order # (lab use only): L1950717

Report Format / Distribution
Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report: ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: bimcore@alsglobal.com
Email 2: bimww@alsglobal.com
Email 3:

Invoice Distribution
Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@baffinland.com
Email 2: commercial@baffinland.com

Oil and Gas Required Fields (client use)
AFE/Cost Center:
PO#:
Major/Minor Code:
Routing Code:
Requisitioner:
Location:
ALS Contact:
Sampler: CD/MK

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☑
EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐
Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request
Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	Group 3	BIM-MMER-WT	Number of Containers
1	MS-08	27-Jun-17	13:00	Water	R	P2	10

Drinking Water (DW) Samples[1] (client use)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO
Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)
Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐
INITIAL COOLER TEMPERATURES °C:
FINAL COOLER TEMPERATURES °C: 14.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Connor Devereaux	Date: 2017-06-27 13:00	Time:	Received by:	Date:	Time:	Received by: MW	Date: 29 Jun 17	Time: 1000

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

OCTOBER 2015 FRONT

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 06-JUL-17
Report Date: 01-AUG-17 14:02 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1954208
Project P.O. #: 4500027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Rick Hawthorne

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1954208-1 MS-08 Sampled By: KB/MK/LM on 01-JUL-17 @ 15:45 Matrix: WATER							
Physical Tests							
Conductivity	67.3		3.0	umhos/cm		07-JUL-17	R3768273
Hardness (as CaCO3)	26		10	mg/L		10-JUL-17	
pH	7.19	PEHR	0.10	pH units		07-JUL-17	R3768273
Total Suspended Solids	3.4		2.0	mg/L	06-JUL-17	07-JUL-17	R3767041
Total Dissolved Solids	36	DLDS	13	mg/L		07-JUL-17	R3768452
Anions and Nutrients							
Acidity (as CaCO3)	2.4		2.0	mg/L		12-JUL-17	R3771213
Alkalinity, Total (as CaCO3)	<10		10	mg/L		07-JUL-17	R3767567
Ammonia, Total (as N)	0.028		0.020	mg/L		11-JUL-17	R3769309
Chloride (Cl)	0.52		0.50	mg/L		06-JUL-17	R3768247
Fluoride (F)	<0.020		0.020	mg/L		06-JUL-17	R3768247
Nitrate (as N)	0.150		0.020	mg/L		06-JUL-17	R3768247
Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	12-JUL-17	12-JUL-17	R3770346
Phosphorus, Total	0.0061		0.0030	mg/L	11-JUL-17	12-JUL-17	R3770542
Sulfate (SO4)	20.9		0.30	mg/L		06-JUL-17	R3768247
Cyanides							
Cyanide, Total	<0.0020		0.0020	mg/L		07-JUL-17	R3768496
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<0.50		0.50	mg/L		31-JUL-17	R3786489
Total Organic Carbon	0.73		0.50	mg/L		31-JUL-17	R3786472
Total Metals							
Aluminum (Al)-Total	0.106		0.0050	mg/L	07-JUL-17	07-JUL-17	R3767295
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Arsenic (As)-Total	<0.00010		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Barium (Ba)-Total	0.00276		0.00020	mg/L	07-JUL-17	07-JUL-17	R3767295
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	07-JUL-17	07-JUL-17	R3767295
Boron (B)-Total	<0.010		0.010	mg/L	07-JUL-17	07-JUL-17	R3767295
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	07-JUL-17	07-JUL-17	R3767295
Calcium (Ca)-Total	2.88		0.50	mg/L	07-JUL-17	07-JUL-17	R3767295
Cesium (Cs)-Total	0.000015		0.000010	mg/L	07-JUL-17	07-JUL-17	R3767295
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	07-JUL-17	07-JUL-17	R3767295
Cobalt (Co)-Total	0.00130		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Copper (Cu)-Total	0.0090		0.0010	mg/L	07-JUL-17	07-JUL-17	R3767295
Iron (Fe)-Total	0.200		0.050	mg/L	07-JUL-17	07-JUL-17	R3767295
Lead (Pb)-Total	0.000323		0.000050	mg/L	07-JUL-17	07-JUL-17	R3767295
Lithium (Li)-Total	0.0011		0.0010	mg/L	07-JUL-17	07-JUL-17	R3767295
Magnesium (Mg)-Total	4.68		0.050	mg/L	07-JUL-17	07-JUL-17	R3767295
Manganese (Mn)-Total	0.119		0.00050	mg/L	07-JUL-17	07-JUL-17	R3767295
Mercury (Hg)-Total	<0.000010		0.000010	mg/L		07-JUL-17	R3767197
Molybdenum (Mo)-Total	0.000067		0.000050	mg/L	07-JUL-17	07-JUL-17	R3767295
Nickel (Ni)-Total	0.00175		0.00050	mg/L	07-JUL-17	07-JUL-17	R3767295

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1954208-1 MS-08							
Sampled By: KB/MK/LM on 01-JUL-17 @ 15:45							
Matrix: WATER							
Total Metals							
Phosphorus (P)-Total	<0.050		0.050	mg/L	07-JUL-17	07-JUL-17	R3767295
Potassium (K)-Total	0.341		0.050	mg/L	07-JUL-17	07-JUL-17	R3767295
Rubidium (Rb)-Total	0.00069		0.00020	mg/L	07-JUL-17	07-JUL-17	R3767295
Selenium (Se)-Total	0.000087		0.000050	mg/L	07-JUL-17	07-JUL-17	R3767295
Silicon (Si)-Total	0.24		0.10	mg/L	07-JUL-17	07-JUL-17	R3767295
Silver (Ag)-Total	<0.000050		0.000050	mg/L	07-JUL-17	07-JUL-17	R3767295
Sodium (Na)-Total	<0.50		0.50	mg/L	07-JUL-17	07-JUL-17	R3767295
Strontium (Sr)-Total	0.0021		0.0010	mg/L	07-JUL-17	07-JUL-17	R3767295
Sulfur (S)-Total	6.79		0.50	mg/L	07-JUL-17	07-JUL-17	R3767295
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	07-JUL-17	07-JUL-17	R3767295
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	07-JUL-17	07-JUL-17	R3767295
Thorium (Th)-Total	<0.00010		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Tin (Sn)-Total	0.00048		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Titanium (Ti)-Total	0.00470		0.00030	mg/L	07-JUL-17	07-JUL-17	R3767295
Tungsten (W)-Total	<0.00010		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Uranium (U)-Total	0.000119		0.000010	mg/L	07-JUL-17	07-JUL-17	R3767295
Vanadium (V)-Total	<0.00050		0.00050	mg/L	07-JUL-17	07-JUL-17	R3767295
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	07-JUL-17	07-JUL-17	R3767295
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	07-JUL-17	07-JUL-17	R3767295
Dissolved Metals							
Dissolved Mercury Filtration Location	FIELD					07-JUL-17	R3767021
Dissolved Metals Filtration Location	FIELD					07-JUL-17	R3766902
Aluminum (Al)-Dissolved	0.0067		0.0050	mg/L	07-JUL-17	09-JUL-17	R3768113
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Barium (Ba)-Dissolved	0.00210		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	07-JUL-17	09-JUL-17	R3768113
Boron (B)-Dissolved	<0.010		0.010	mg/L	07-JUL-17	09-JUL-17	R3768113
Cadmium (Cd)-Dissolved	<0.000010		0.000010	mg/L	07-JUL-17	09-JUL-17	R3768113
Calcium (Ca)-Dissolved	2.95		0.050	mg/L	07-JUL-17	09-JUL-17	R3768113
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	07-JUL-17	09-JUL-17	R3768113
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	07-JUL-17	09-JUL-17	R3768113
Cobalt (Co)-Dissolved	0.00121		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Copper (Cu)-Dissolved	0.00026		0.00020	mg/L	07-JUL-17	09-JUL-17	R3768113
Iron (Fe)-Dissolved	0.012		0.010	mg/L	07-JUL-17	09-JUL-17	R3768113
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	07-JUL-17	09-JUL-17	R3768113
Lithium (Li)-Dissolved	0.0011		0.0010	mg/L	07-JUL-17	09-JUL-17	R3768113
Magnesium (Mg)-Dissolved	4.55		0.050	mg/L	07-JUL-17	09-JUL-17	R3768113
Manganese (Mn)-Dissolved	0.117		0.00050	mg/L	07-JUL-17	09-JUL-17	R3768113
Mercury (Hg)-Dissolved	<0.000010		0.000010	mg/L	07-JUL-17	07-JUL-17	R3767194

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1954208-1 MS-08							
Sampled By: KB/MK/LM on 01-JUL-17 @ 15:45							
Matrix: WATER							
Dissolved Metals							
Molybdenum (Mo)-Dissolved	0.000066		0.000050	mg/L	07-JUL-17	09-JUL-17	R3768113
Nickel (Ni)-Dissolved	0.00146		0.00050	mg/L	07-JUL-17	09-JUL-17	R3768113
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	07-JUL-17	09-JUL-17	R3768113
Potassium (K)-Dissolved	0.299		0.050	mg/L	07-JUL-17	09-JUL-17	R3768113
Rubidium (Rb)-Dissolved	0.00035		0.00020	mg/L	07-JUL-17	09-JUL-17	R3768113
Selenium (Se)-Dissolved	0.000091		0.000050	mg/L	07-JUL-17	09-JUL-17	R3768113
Silicon (Si)-Dissolved	0.088		0.050	mg/L	07-JUL-17	09-JUL-17	R3768113
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	07-JUL-17	09-JUL-17	R3768113
Sodium (Na)-Dissolved	<0.50		0.50	mg/L	07-JUL-17	09-JUL-17	R3768113
Strontium (Sr)-Dissolved	0.0022		0.0010	mg/L	07-JUL-17	09-JUL-17	R3768113
Sulfur (S)-Dissolved	6.88		0.50	mg/L	07-JUL-17	09-JUL-17	R3768113
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	07-JUL-17	09-JUL-17	R3768113
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	07-JUL-17	09-JUL-17	R3768113
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	07-JUL-17	09-JUL-17	R3768113
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Uranium (U)-Dissolved	0.000053		0.000010	mg/L	07-JUL-17	09-JUL-17	R3768113
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	07-JUL-17	09-JUL-17	R3768113
Zinc (Zn)-Dissolved	0.0013		0.0010	mg/L	07-JUL-17	09-JUL-17	R3768113
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	07-JUL-17	09-JUL-17	R3768113
Radiological Parameters							
Ra-226	<0.0051		0.0051	Bq/L	17-JUL-17	25-JUL-17	R3771237

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1954208-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1954208-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1954208-1
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1954208-1
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1954208-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1954208-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1954208-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1954208-1
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1954208-1
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1954208-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L1954208-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1954208-1
Matrix Spike	Silicon (Si)-Total	MS-B	L1954208-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L1954208-1
Matrix Spike	Zinc (Zn)-Total	MS-B	L1954208-1
Matrix Spike	Ammonia, Total (as N)	MS-B	L1954208-1

Sample Parameter Qualifier key listed:

Qualifier	Description
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.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-TITR-TB	Water	Acidity	APHA 2310 B modified

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALS Test Code	Matrix	Test Description	Method Reference**
C-DOC-HTC-WP	Water	Dissolved Organic Carbon by Combustion	APHA 5310 B-WP

Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.

ALS Test Code	Matrix	Test Description	Method Reference**
C-TOC-HTC-WP	Water	Total Organic Carbon by Combustion	APHA 5310 B-WP

Sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ALS Test Code	Matrix	Test Description	Method Reference**
CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

ALS Test Code	Matrix	Test Description	Method Reference**
EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ALS Test Code	Matrix	Test Description	Method Reference**
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

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.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-D-CVAA-WT	Water	Dissolved Mercury in Water by CVAAS	EPA 1631E (mod)

Reference Information

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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-T-CVAA-WT   Water   Total Mercury in Water by CVAAS   EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-D-CCMS-WT   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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-T-CCMS-WT   Water   Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-WT   Water   Ammonia, Total as N   EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO3-IC-WT   Water   Nitrate in Water by IC   EPA 300.1 (mod)

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

P-T-COL-WT   Water   Total P in Water by Colour   APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PH-WT   Water   pH   APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

RA226-MMER-FC   Water   Ra226 by Alpha Scint, MDC=0.01 Bq/L   EPA 903.1

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

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

SOLIDS-TDS-WT   Water   Total Dissolved Solids   APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5□C overnight and then 180–10□C for 1hr.

SOLIDS-TSS-WT   Water   Suspended solids   APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1□C for a minimum of four hours or until a constant weight is achieved.

TKN-WT   Water   Total Kjeldahl Nitrogen   APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
TB	ALS ENVIRONMENTAL - THUNDER BAY, ONTARIO, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Reference Information

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

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 weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
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.

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACY-TITR-TB	**Water**							
Batch R3771213								
WG2568086-3 DUP		**L1954085-1**						
Acidity (as CaCO3)		2.8	2.6		mg/L	7.4	20	12-JUL-17
WG2568086-2 LCS								
Acidity (as CaCO3)			99.0		%		85-115	12-JUL-17
WG2568086-1 MB								
Acidity (as CaCO3)			<2.0		mg/L		2	12-JUL-17
ALK-WT	**Water**							
Batch R3767567								
WG2565313-7 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			94.1		%		80-120	07-JUL-17
WG2565313-8 DUP		**L1953941-10**						
Alkalinity, Total (as CaCO3)		29	27		mg/L	7.7	20	07-JUL-17
WG2565313-6 LCS								
Alkalinity, Total (as CaCO3)			96.6		%		85-115	07-JUL-17
WG2565313-5 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	07-JUL-17
C-DOC-HTC-WP	**Water**							
Batch R3786489								
WG2582634-2 LCS								
Dissolved Organic Carbon			101.2		%		80-120	31-JUL-17
WG2582634-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	31-JUL-17
WG2582634-4 MS		**L1962693-5**						
Dissolved Organic Carbon			101.0		%		70-130	31-JUL-17
C-TOC-HTC-WP	**Water**							
Batch R3786472								
WG2582675-3 DUP		**L1964125-1**						
Total Organic Carbon		2.00	1.98		mg/L	1.0	20	31-JUL-17
WG2582675-2 LCS								
Total Organic Carbon			100.2		%		80-120	31-JUL-17
WG2582675-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	31-JUL-17
WG2582675-4 MS		**L1964125-2**						
Total Organic Carbon			101.6		%		70-130	31-JUL-17
CL-IC-N-WT	**Water**							

Quality Control Report

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Oakville ON L6H 0C3
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R3768247								
WG2564860-10 DUP		**WG2564860-8**						
Chloride (Cl)		30.4	30.2		mg/L	0.4	20	06-JUL-17
WG2564860-7 LCS								
Chloride (Cl)			100.4		%		90-110	06-JUL-17
WG2564860-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	06-JUL-17
WG2564860-9 MS		**WG2564860-8**						
Chloride (Cl)			98.1		%		75-125	06-JUL-17
CN-TOT-WT	**Water**							
Batch R3768496								
WG2565366-7 DUP		**L1949980-1**						
Cyanide, Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	07-JUL-17
WG2565366-6 LCS								
Cyanide, Total			88.1		%		80-120	07-JUL-17
WG2565366-5 MB								
Cyanide, Total			<0.0020		mg/L		0.002	07-JUL-17
WG2565366-8 MS		**L1949980-1**						
Cyanide, Total			84.4		%		70-130	07-JUL-17
EC-WT	**Water**							
Batch R3768273								
WG2565220-28 DUP		**WG2565220-27**						
Conductivity		209	208		umhos/cm	0.5	10	07-JUL-17
WG2565220-25 LCS								
Conductivity			102.7		%		90-110	07-JUL-17
WG2565220-26 MB								
Conductivity			<3.0		umhos/cm		3	07-JUL-17
F-IC-N-WT	**Water**							
Batch R3768247								
WG2564860-10 DUP		**WG2564860-8**						
Fluoride (F)		0.091	0.090		mg/L	1.2	20	06-JUL-17
WG2564860-7 LCS								
Fluoride (F)			101.8		%		90-110	06-JUL-17
WG2564860-6 MB								
Fluoride (F)			<0.020		mg/L		0.02	06-JUL-17
WG2564860-9 MS		**WG2564860-8**						
Fluoride (F)			99.5		%		75-125	06-JUL-17
HG-D-CVAA-WT	**Water**							

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-WT	**Water**							
Batch R3767194								
WG2565066-4 DUP		**WG2565066-3**						
Mercury (Hg)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-JUL-17
WG2565066-2 LCS								
Mercury (Hg)-Dissolved			97.8		%		80-120	07-JUL-17
WG2565066-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	07-JUL-17
WG2565066-6 MS		**WG2565066-5**						
Mercury (Hg)-Dissolved			90.4		%		70-130	07-JUL-17
HG-T-CVAA-WT	**Water**							
Batch R3767197								
WG2565063-4 DUP		**WG2565063-3**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-JUL-17
WG2565063-2 LCS								
Mercury (Hg)-Total			100.0		%		80-120	07-JUL-17
WG2565063-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	07-JUL-17
WG2565063-6 MS		**WG2565063-5**						
Mercury (Hg)-Total			89.8		%		70-130	07-JUL-17
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-4 DUP		**WG2564890-3**						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	09-JUL-17
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-JUL-17
Arsenic (As)-Dissolved		0.00070	0.00074		mg/L	5.6	20	09-JUL-17
Barium (Ba)-Dissolved		0.0534	0.0529		mg/L	1.0	20	09-JUL-17
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-JUL-17
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-JUL-17
Boron (B)-Dissolved		0.034	0.034		mg/L	0.2	20	09-JUL-17
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-JUL-17
Calcium (Ca)-Dissolved		125	131		mg/L	5.3	20	09-JUL-17
Cesium (Cs)-Dissolved		0.000029	0.000029		mg/L	0.7	20	09-JUL-17
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-JUL-17
Cobalt (Co)-Dissolved		0.00015	0.00015		mg/L	2.9	20	09-JUL-17
Copper (Cu)-Dissolved		0.00279	0.00290		mg/L	3.9	20	09-JUL-17
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	09-JUL-17
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-JUL-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-4 DUP		**WG2564890-3**						
Lithium (Li)-Dissolved		0.0101	0.0099		mg/L	1.6	20	09-JUL-17
Magnesium (Mg)-Dissolved		80.4	83.5		mg/L	3.8	20	09-JUL-17
Manganese (Mn)-Dissolved		0.595	0.614		mg/L	3.1	20	09-JUL-17
Molybdenum (Mo)-Dissolved		0.00166	0.00166		mg/L	0.2	20	09-JUL-17
Nickel (Ni)-Dissolved		0.00126	0.00123		mg/L	2.6	20	09-JUL-17
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	09-JUL-17
Potassium (K)-Dissolved		9.43	9.59		mg/L	1.7	20	09-JUL-17
Rubidium (Rb)-Dissolved		0.00144	0.00147		mg/L	1.9	20	09-JUL-17
Selenium (Se)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-JUL-17
Silicon (Si)-Dissolved		10.6	10.4		mg/L	2.1	20	09-JUL-17
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-JUL-17
Sodium (Na)-Dissolved		139	136		mg/L	2.1	20	09-JUL-17
Strontium (Sr)-Dissolved		0.835	0.869		mg/L	4.0	20	09-JUL-17
Sulfur (S)-Dissolved		32.9	31.9		mg/L	2.9	20	09-JUL-17
Tellurium (Te)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	09-JUL-17
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-JUL-17
Thorium (Th)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-JUL-17
Tin (Sn)-Dissolved		0.00019	0.00020		mg/L	4.8	20	09-JUL-17
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	09-JUL-17
Tungsten (W)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-JUL-17
Uranium (U)-Dissolved		0.00209	0.00238		mg/L	13	20	09-JUL-17
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-JUL-17
Zinc (Zn)-Dissolved		0.0019	0.0015	J	mg/L	0.0004	0.002	09-JUL-17
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	09-JUL-17
WG2564890-2 LCS								
Aluminum (Al)-Dissolved			103.1		%		80-120	09-JUL-17
Antimony (Sb)-Dissolved			103.9		%		80-120	09-JUL-17
Arsenic (As)-Dissolved			101.4		%		80-120	09-JUL-17
Barium (Ba)-Dissolved			105.6		%		80-120	09-JUL-17
Beryllium (Be)-Dissolved			101.5		%		80-120	09-JUL-17
Bismuth (Bi)-Dissolved			104.4		%		80-120	09-JUL-17
Boron (B)-Dissolved			101.5		%		80-120	09-JUL-17
Cadmium (Cd)-Dissolved			102.8		%		80-120	09-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-2 LCS								
Calcium (Ca)-Dissolved			102.1		%		80-120	09-JUL-17
Cesium (Cs)-Dissolved			105.6		%		80-120	09-JUL-17
Chromium (Cr)-Dissolved			101.1		%		80-120	09-JUL-17
Cobalt (Co)-Dissolved			101.8		%		80-120	09-JUL-17
Copper (Cu)-Dissolved			98.4		%		80-120	09-JUL-17
Iron (Fe)-Dissolved			101.6		%		80-120	09-JUL-17
Lead (Pb)-Dissolved			105.2		%		80-120	09-JUL-17
Lithium (Li)-Dissolved			104.9		%		80-120	09-JUL-17
Magnesium (Mg)-Dissolved			105.7		%		80-120	09-JUL-17
Manganese (Mn)-Dissolved			102.7		%		80-120	09-JUL-17
Molybdenum (Mo)-Dissolved			100.9		%		80-120	09-JUL-17
Nickel (Ni)-Dissolved			102.9		%		80-120	09-JUL-17
Phosphorus (P)-Dissolved			100.2		%		80-120	09-JUL-17
Potassium (K)-Dissolved			106.8		%		80-120	09-JUL-17
Rubidium (Rb)-Dissolved			102.5		%		80-120	09-JUL-17
Selenium (Se)-Dissolved			101.3		%		80-120	09-JUL-17
Silicon (Si)-Dissolved			116.2		%		60-140	09-JUL-17
Silver (Ag)-Dissolved			99.7		%		80-120	09-JUL-17
Sodium (Na)-Dissolved			100.4		%		80-120	09-JUL-17
Strontium (Sr)-Dissolved			109.1		%		80-120	09-JUL-17
Sulfur (S)-Dissolved			100.1		%		80-120	09-JUL-17
Tellurium (Te)-Dissolved			102.5		%		80-120	09-JUL-17
Thallium (Tl)-Dissolved			99.97		%		80-120	09-JUL-17
Thorium (Th)-Dissolved			104.9		%		80-120	09-JUL-17
Tin (Sn)-Dissolved			101.9		%		80-120	09-JUL-17
Titanium (Ti)-Dissolved			99.8		%		80-120	09-JUL-17
Tungsten (W)-Dissolved			106.4		%		80-120	09-JUL-17
Uranium (U)-Dissolved			104.8		%		80-120	09-JUL-17
Vanadium (V)-Dissolved			102.6		%		80-120	09-JUL-17
Zinc (Zn)-Dissolved			98.7		%		80-120	09-JUL-17
Zirconium (Zr)-Dissolved			101.4		%		80-120	09-JUL-17
WG2564890-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	09-JUL-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-1 MB								
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	09-JUL-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	09-JUL-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	09-JUL-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	09-JUL-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	09-JUL-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	09-JUL-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	09-JUL-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	09-JUL-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	09-JUL-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	09-JUL-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	09-JUL-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	09-JUL-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	09-JUL-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	09-JUL-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	09-JUL-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	09-JUL-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	09-JUL-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	09-JUL-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	09-JUL-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	09-JUL-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	09-JUL-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	09-JUL-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	09-JUL-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	09-JUL-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	09-JUL-17
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	09-JUL-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-1 MB								
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	09-JUL-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	09-JUL-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-JUL-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	09-JUL-17
WG2564890-5 MS		**WG2564890-3**						
Aluminum (Al)-Dissolved			101.1		%		70-130	09-JUL-17
Antimony (Sb)-Dissolved			106.6		%		70-130	09-JUL-17
Arsenic (As)-Dissolved			101.8		%		70-130	09-JUL-17
Barium (Ba)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Beryllium (Be)-Dissolved			101.4		%		70-130	09-JUL-17
Bismuth (Bi)-Dissolved			87.4		%		70-130	09-JUL-17
Boron (B)-Dissolved			99.2		%		70-130	09-JUL-17
Cadmium (Cd)-Dissolved			102.0		%		70-130	09-JUL-17
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Cesium (Cs)-Dissolved			107.9		%		70-130	09-JUL-17
Chromium (Cr)-Dissolved			96.3		%		70-130	09-JUL-17
Cobalt (Co)-Dissolved			95.2		%		70-130	09-JUL-17
Copper (Cu)-Dissolved			87.6		%		70-130	09-JUL-17
Iron (Fe)-Dissolved			95.5		%		70-130	09-JUL-17
Lead (Pb)-Dissolved			96.4		%		70-130	09-JUL-17
Lithium (Li)-Dissolved			107.8		%		70-130	09-JUL-17
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Molybdenum (Mo)-Dissolved			98.6		%		70-130	09-JUL-17
Nickel (Ni)-Dissolved			92.7		%		70-130	09-JUL-17
Phosphorus (P)-Dissolved			107.2		%		70-130	09-JUL-17
Potassium (K)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Rubidium (Rb)-Dissolved			99.9		%		70-130	09-JUL-17
Selenium (Se)-Dissolved			101.4		%		70-130	09-JUL-17
Silicon (Si)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Silver (Ag)-Dissolved			97.5		%		70-130	09-JUL-17
Sodium (Na)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Sulfur (S)-Dissolved			N/A	MS-B	%		-	09-JUL-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-5 MS		**WG2564890-3**						
Tellurium (Te)-Dissolved			99.9		%		70-130	09-JUL-17
Thallium (Tl)-Dissolved			94.6		%		70-130	09-JUL-17
Thorium (Th)-Dissolved			98.1		%		70-130	09-JUL-17
Tin (Sn)-Dissolved			102.4		%		70-130	09-JUL-17
Titanium (Ti)-Dissolved			104.1		%		70-130	09-JUL-17
Tungsten (W)-Dissolved			102.6		%		70-130	09-JUL-17
Uranium (U)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Vanadium (V)-Dissolved			101.7		%		70-130	09-JUL-17
Zinc (Zn)-Dissolved			89.0		%		70-130	09-JUL-17
Zirconium (Zr)-Dissolved			98.8		%		70-130	09-JUL-17
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564893-4 DUP		**WG2564893-3**						
Aluminum (Al)-Total		0.0051	0.0052		mg/L	0.9	20	07-JUL-17
Antimony (Sb)-Total		0.00012	0.00011		mg/L	5.4	20	07-JUL-17
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-JUL-17
Barium (Ba)-Total		0.00802	0.00798		mg/L	0.5	20	07-JUL-17
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-JUL-17
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	07-JUL-17
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	07-JUL-17
Cadmium (Cd)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-JUL-17
Calcium (Ca)-Total		57.2	54.4		mg/L	5.1	20	07-JUL-17
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	07-JUL-17
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-JUL-17
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-JUL-17
Copper (Cu)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	07-JUL-17
Iron (Fe)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	07-JUL-17
Lead (Pb)-Total		0.000053	0.000050		mg/L	6.4	20	07-JUL-17
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	07-JUL-17
Magnesium (Mg)-Total		8.36	8.42		mg/L	0.7	20	07-JUL-17
Manganese (Mn)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	07-JUL-17
Molybdenum (Mo)-Total		0.000451	0.000449		mg/L	0.5	20	07-JUL-17
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	07-JUL-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564893-4 DUP		**WG2564893-3**						
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	07-JUL-17
Potassium (K)-Total		0.716	0.714		mg/L	0.3	20	07-JUL-17
Rubidium (Rb)-Total		0.00024	0.00022		mg/L	8.5	20	07-JUL-17
Selenium (Se)-Total		0.000187	0.000160		mg/L	16	20	07-JUL-17
Silicon (Si)-Total		1.25	1.32		mg/L	5.8	20	07-JUL-17
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	07-JUL-17
Sodium (Na)-Total		2.41	2.41		mg/L	0.1	20	07-JUL-17
Strontium (Sr)-Total		0.0682	0.0680		mg/L	0.4	20	07-JUL-17
Sulfur (S)-Total		<0.50	0.58	RPD-NA	mg/L	N/A	25	07-JUL-17
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-JUL-17
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-JUL-17
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	07-JUL-17
Tin (Sn)-Total		0.00040	0.00040		mg/L	2.4	20	07-JUL-17
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	07-JUL-17
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-JUL-17
Uranium (U)-Total		0.000151	0.000152		mg/L	0.7	20	07-JUL-17
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	07-JUL-17
Zinc (Zn)-Total		0.0278	0.0279		mg/L	0.4	20	07-JUL-17
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	07-JUL-17
WG2564893-2 LCS								
Aluminum (Al)-Total			104.0		%		80-120	07-JUL-17
Antimony (Sb)-Total			100.8		%		80-120	07-JUL-17
Arsenic (As)-Total			101.7		%		80-120	07-JUL-17
Barium (Ba)-Total			105.4		%		80-120	07-JUL-17
Beryllium (Be)-Total			100.7		%		80-120	07-JUL-17
Bismuth (Bi)-Total			96.5		%		80-120	07-JUL-17
Boron (B)-Total			96.8		%		80-120	07-JUL-17
Cadmium (Cd)-Total			98.3		%		80-120	07-JUL-17
Calcium (Ca)-Total			101.2		%		80-120	07-JUL-17
Chromium (Cr)-Total			101.9		%		80-120	07-JUL-17
Cesium (Cs)-Total			101.6		%		80-120	07-JUL-17
Cobalt (Co)-Total			97.7		%		80-120	07-JUL-17
Copper (Cu)-Total			100.7		%		80-120	07-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564893-2 LCS								
Iron (Fe)-Total			102.1		%		80-120	07-JUL-17
Lead (Pb)-Total			98.7		%		80-120	07-JUL-17
Lithium (Li)-Total			108.8		%		80-120	07-JUL-17
Magnesium (Mg)-Total			104.8		%		80-120	07-JUL-17
Manganese (Mn)-Total			103.5		%		80-120	07-JUL-17
Molybdenum (Mo)-Total			99.8		%		80-120	07-JUL-17
Nickel (Ni)-Total			97.7		%		80-120	07-JUL-17
Phosphorus (P)-Total			106.4		%		70-130	07-JUL-17
Potassium (K)-Total			112.0		%		80-120	07-JUL-17
Rubidium (Rb)-Total			101.8		%		80-120	07-JUL-17
Selenium (Se)-Total			100.8		%		80-120	07-JUL-17
Silicon (Si)-Total			114.0		%		60-140	07-JUL-17
Silver (Ag)-Total			103.9		%		80-120	07-JUL-17
Sodium (Na)-Total			107.9		%		80-120	07-JUL-17
Strontium (Sr)-Total			97.9		%		80-120	07-JUL-17
Sulfur (S)-Total			103.9		%		70-130	07-JUL-17
Thallium (Tl)-Total			95.8		%		80-120	07-JUL-17
Tellurium (Te)-Total			96.8		%		80-120	07-JUL-17
Thorium (Th)-Total			100.9		%		70-130	07-JUL-17
Tin (Sn)-Total			98.6		%		80-120	07-JUL-17
Titanium (Ti)-Total			100.8		%		80-120	07-JUL-17
Tungsten (W)-Total			100.7		%		80-120	07-JUL-17
Uranium (U)-Total			102.0		%		80-120	07-JUL-17
Vanadium (V)-Total			105.2		%		80-120	07-JUL-17
Zinc (Zn)-Total			93.3		%		80-120	07-JUL-17
Zirconium (Zr)-Total			95.9		%		80-120	07-JUL-17
WG2564893-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	07-JUL-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Barium (Ba)-Total			<0.00020		mg/L		0.0002	07-JUL-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	07-JUL-17
Boron (B)-Total			<0.010		mg/L		0.01	07-JUL-17

ALS Environmental

Quality Control Report

Workorder: L1954208 Report Date: 01-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564893-1 MB								
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	07-JUL-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	07-JUL-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	07-JUL-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	07-JUL-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	07-JUL-17
Iron (Fe)-Total			<0.050		mg/L		0.05	07-JUL-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	07-JUL-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	07-JUL-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	07-JUL-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	07-JUL-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	07-JUL-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	07-JUL-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	07-JUL-17
Potassium (K)-Total			<0.050		mg/L		0.05	07-JUL-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	07-JUL-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	07-JUL-17
Silicon (Si)-Total			<0.10		mg/L		0.1	07-JUL-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	07-JUL-17
Sodium (Na)-Total			<0.50		mg/L		0.5	07-JUL-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	07-JUL-17
Sulfur (S)-Total			<0.50		mg/L		0.5	07-JUL-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	07-JUL-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	07-JUL-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	07-JUL-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	07-JUL-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	07-JUL-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	07-JUL-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	07-JUL-17
WG2564893-5 MS		**WG2564893-3**						
Aluminum (Al)-Total			100.7		%		70-130	07-JUL-17

ALS Environmental

Quality Control Report

Workorder: L1954208 Report Date: 01-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564893-5 MS		**WG2564893-3**						
Antimony (Sb)-Total			96.3		%		70-130	07-JUL-17
Arsenic (As)-Total			99.3		%		70-130	07-JUL-17
Barium (Ba)-Total			95.0		%		70-130	07-JUL-17
Beryllium (Be)-Total			100.9		%		70-130	07-JUL-17
Bismuth (Bi)-Total			96.2		%		70-130	07-JUL-17
Boron (B)-Total			101.1		%		70-130	07-JUL-17
Cadmium (Cd)-Total			97.1		%		70-130	07-JUL-17
Calcium (Ca)-Total			N/A	MS-B	%		-	07-JUL-17
Chromium (Cr)-Total			101.7		%		70-130	07-JUL-17
Cesium (Cs)-Total			101.3		%		70-130	07-JUL-17
Cobalt (Co)-Total			94.2		%		70-130	07-JUL-17
Copper (Cu)-Total			95.3		%		70-130	07-JUL-17
Iron (Fe)-Total			93.8		%		70-130	07-JUL-17
Lead (Pb)-Total			101.0		%		70-130	07-JUL-17
Lithium (Li)-Total			111.7		%		70-130	07-JUL-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	07-JUL-17
Manganese (Mn)-Total			98.7		%		70-130	07-JUL-17
Molybdenum (Mo)-Total			98.8		%		70-130	07-JUL-17
Nickel (Ni)-Total			94.8		%		70-130	07-JUL-17
Phosphorus (P)-Total			111.3		%		70-130	07-JUL-17
Potassium (K)-Total			102.5		%		70-130	07-JUL-17
Rubidium (Rb)-Total			99.8		%		70-130	07-JUL-17
Selenium (Se)-Total			103.5		%		70-130	07-JUL-17
Silicon (Si)-Total			N/A	MS-B	%		-	07-JUL-17
Silver (Ag)-Total			101.6		%		70-130	07-JUL-17
Sodium (Na)-Total			96.5		%		70-130	07-JUL-17
Strontium (Sr)-Total			N/A	MS-B	%		-	07-JUL-17
Sulfur (S)-Total			117.7		%		70-130	07-JUL-17
Thallium (Tl)-Total			100.2		%		70-130	07-JUL-17
Tellurium (Te)-Total			94.5		%		70-130	07-JUL-17
Thorium (Th)-Total			103.8		%		70-130	07-JUL-17
Tin (Sn)-Total			98.6		%		70-130	07-JUL-17
Titanium (Ti)-Total			100.3		%		70-130	07-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564893-5 MS		**WG2564893-3**						
Tungsten (W)-Total			103.1		%		70-130	07-JUL-17
Uranium (U)-Total			104.8		%		70-130	07-JUL-17
Vanadium (V)-Total			104.7		%		70-130	07-JUL-17
Zinc (Zn)-Total			N/A	MS-B	%		-	07-JUL-17
Zirconium (Zr)-Total			95.0		%		70-130	07-JUL-17
NH3-WT	**Water**							
Batch R3769309								
WG2567245-3 DUP		**L1953915-2**						
Ammonia, Total (as N)		4.71	4.85		mg/L	2.9	20	11-JUL-17
WG2567245-2 LCS								
Ammonia, Total (as N)			99.7		%		85-115	11-JUL-17
WG2567245-1 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	11-JUL-17
WG2567245-4 MS		**L1953915-2**						
Ammonia, Total (as N)			N/A	MS-B	%		-	11-JUL-17
NO3-IC-WT	**Water**							
Batch R3768247								
WG2564860-10 DUP		**WG2564860-8**						
Nitrate (as N)		0.883	0.880		mg/L	0.3	25	06-JUL-17
WG2564860-7 LCS								
Nitrate (as N)			99.9		%		70-130	06-JUL-17
WG2564860-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	06-JUL-17
WG2564860-9 MS		**WG2564860-8**						
Nitrate (as N)			97.5		%		70-130	06-JUL-17
P-T-COL-WT	**Water**							
Batch R3770542								
WG2567935-3 DUP		**L1954684-1**						
Phosphorus, Total		0.0066	0.0056		mg/L	16	20	12-JUL-17
WG2567935-2 LCS								
Phosphorus, Total			98.5		%		80-120	12-JUL-17
WG2567935-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	12-JUL-17
WG2567935-4 MS		**L1954684-1**						
Phosphorus, Total			86.0		%		70-130	12-JUL-17
PH-WT	**Water**							

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT	**Water**							
Batch R3768273								
WG2565220-28 DUP		**WG2565220-27**						
pH		8.15	8.17	J	pH units	0.02	0.2	07-JUL-17
WG2565220-25 LCS								
pH			6.99		pH units		6.9-7.1	07-JUL-17
SO4-IC-N-WT	**Water**							
Batch R3768247								
WG2564860-10 DUP		**WG2564860-8**						
Sulfate (SO4)		14.7	14.6		mg/L	0.4	20	06-JUL-17
WG2564860-7 LCS								
Sulfate (SO4)			100.7		%		90-110	06-JUL-17
WG2564860-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	06-JUL-17
WG2564860-9 MS		**WG2564860-8**						
Sulfate (SO4)			96.9		%		75-125	06-JUL-17
SOLIDS-TDS-WT	**Water**							
Batch R3768452								
WG2564920-3 DUP		**L1954185-5**						
Total Dissolved Solids		40	40		mg/L	0.8	20	07-JUL-17
WG2564920-2 LCS								
Total Dissolved Solids			97.6		%		85-115	07-JUL-17
WG2564920-1 MB								
Total Dissolved Solids			<10		mg/L		10	07-JUL-17
SOLIDS-TSS-WT	**Water**							
Batch R3767041								
WG2564805-2 LCS								
Total Suspended Solids			100.2		%		85-115	07-JUL-17
WG2564805-1 MB								
Total Suspended Solids			<2.0		mg/L		2	07-JUL-17
TKN-WT	**Water**							
Batch R3770346								
WG2568079-3 DUP		**L1954187-1**						
Total Kjeldahl Nitrogen		<0.15	<0.15	RPD-NA	mg/L	N/A	20	12-JUL-17
WG2568079-2 LCS								
Total Kjeldahl Nitrogen			93.2		%		75-125	12-JUL-17
WG2568079-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	12-JUL-17
WG2568079-4 MS		**L1954187-1**						

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch R3770346								
WG2568079-4 MS		**L1954187-1**						
Total Kjeldahl Nitrogen			102.6		%		70-130	12-JUL-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH							
	1	01-JUL-17 15:45	07-JUL-17 00:00	4	5	days	EHTR
Organic / Inorganic Carbon							
Dissolved Organic Carbon by Combustion							
	1	01-JUL-17 15:45	31-JUL-17 15:00	28	30	days	EHT
Total Organic Carbon by Combustion							
	1	01-JUL-17 15:45	31-JUL-17 15:00	28	30	days	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1954208 were received on 06-JUL-17 11:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Wednesday, July 26, 2017

Wayne Smith
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1707168
Project Name:
Project Number: L1954208

Dear Mr. Smith:

One water sample was received from ALS Environmental, on 7/13/2017. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1707168

Radium-226:
The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1707168
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1954208
Client PO Number: L1954208

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1954208-1	1707168-1		WATER	01-Jul-17	

1707168 **L1954208**

WATERLOO

ALS Environmental

Subcontract Request Form

Subcontract To:

1 x 1L HDPE

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# *L1954208*
ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 1 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
(1) L1954208-1 MS-08		7/ 1/ 2017	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	7/31/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Wayne Smith, C.Chem., C.E.T.
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Wayne.Smith@alsglobal.com

Please email confirmation of receipt to: **Wayne.Smith@alsglobal.com**

Shipped By: [signature] Date Shipped: 7/13/17 @ 0950

Received By: ______ Date Received: ______

Verified By: ______ Date Verified: ______

Temperature: ______

Sample Integrity Issues: ______

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS WATER100 Workorder No: 1707168

Project Manager: SJS Initials: JT Date: 7/13/17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are Custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5. Are the COC and bottle labels complete and legible?		YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		YES	NO
12. Are all samples within holding times for the requested analyses?		YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	N/A	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	NO
16. Were the samples shipped on ice?		YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	NO

Cooler #: 1

Temperature (°C): AMB

No. of custody seals on cooler: 0

DOT Survey/ Acceptance Information

External μR/hr reading: 16

Background μR/hr reading: 10

Were external μR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

If applicable, was the client contacted? YES / NO / NA Contact: ______ Date/Time: ______

Project Manager Signature / Date: Shilah Sumy

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

1707168

ORIGIN ID:YQTA (807) 623-6463
CURTIS ROBINSON
ALS ENVIRONMENTAL
1081 BARTON ST.
THUNDER BAY, ON P7B5N3
CANADA CA

SHIP DATE: 12JUL17
ACTWGT: 6.00 LB
CAD: 103492004/INCA3850
DIMS: 12x6x9 IN
BILL THIRD PARTY

TO AMY WOLF
ALS ENVIRONMENTAL FT COLLINS
225 COMMERCE DR
FORT COLLINS CO 80524 (US)
(970) 490-1511 REF:
INV:
PO: DEPT:

546J1/C0C2/53C1

TRK# 7796 1493 5689
0430

10:30A
INTL PRIORITY

XH FTCA

80524
CO-US DEN

After printing this label:
CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH
1. Fold the printed page along the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.
Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Client:	ALS Environmental	**Date:**	*26-Jul-17*
Project:	L1954208	**Work Order:**	1707168
Sample ID:	L1954208-1	**Lab ID:**	1707168-1
Legal Location:		**Matrix:**	WATER
Collection Date:	7/1/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **7/17/2017**	PrepBy: **HCJ**
Ra-226	0.0038 (+/- 0.0038)	U	0.0051	BQ/l	NA	7/25/2017 12:01
Carr: BARIUM	*98.6*		*40-110*	*%REC*	DL = NA	7/25/2017 12:01

Client: ALS Environmental **Date:** *26-Jul-17*
Project: L1954208 **Work Order:** 1707168
Sample ID: L1954208-1 **Lab ID:** 1707168-1
Legal Location: **Matrix:** WATER
Collection Date: 7/1/2017 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Date: *7/26/2017 1:54:*

Client: ALS Environmental
Work Order: 1707168
Project: L1954208

QC BATCH REPORT

Batch ID: **RE170717-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170717-1** Units: **BQ/l** Analysis Date: **7/25/2017 12:35**
Client ID: Run ID: **RE170717-1B** Prep Date: **7/17/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.61 (+/- 0.399)	0.00757	1.715		93.8	67-120					P,Y1
Carr: BARIUM	16300		16290		100	40-110					Y1

LCSD Sample ID: **RE170717-1** Units: **BQ/l** Analysis Date: **7/25/2017 12:35**
Client ID: Run ID: **RE170717-1B** Prep Date: **7/17/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.69 (+/- 0.418)	0.00926	1.715		98.4	67-120		1.61	0.1	2.1	P
Carr: BARIUM	16300		16290		99.9	40-110		16300			

MB Sample ID: **RE170717-1** Units: **BQ/l** Analysis Date: **7/25/2017 12:01**
Client ID: Run ID: **RE170717-1B** Prep Date: **7/17/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.0044 (+/- 0.0039)	0.0046									U
Carr: BARIUM	16000		16290		98.1	40-110					

The following samples were analyzed in this batch: 1707168-1

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1954208-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	647-253-0596 EXT 6010
	Company address below will appear on the final report
Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax bimcore@alsglobal.com
Email 2 bimww@alsglobal.com
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@baffinland.com
Email 2 commercial@baffinland.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	23642 /Q42455
Job #:	MS-08
PO / AFE:	4500027854
LSD:	06C

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only) L1954208 DA

ALS Contact:

Sampler: KB/MK/LM

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	BIM-MMER-WT	Number of Containers
1	MS-08	1-Jul-17	15:45	Water	R	9

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C 12.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: K.Babin	Date: 2017-07-01 19:00	Time:	Received by:	Date:	Time:	Received by: DA	Date: 06/07/17	Time: 11:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Baffinland Iron Mine’s Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 06-JUL-17
Report Date: 31-JUL-17 12:37 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1954085
Project P.O. #: 4500027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Rick Hawthorne
Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1954085-1 MS-08							
Sampled By: BW/LM/LM on 04-JUL-17 @ 08:45							
Matrix: WATER							
Physical Tests							
Conductivity	192		3.0	umhos/cm		06-JUL-17	R3766944
Hardness (as CaCO3)	81		10	mg/L		10-JUL-17	
pH	7.08		0.10	pH units		06-JUL-17	R3766944
Total Suspended Solids	13.6		2.0	mg/L	10-JUL-17	11-JUL-17	R3769023
Total Dissolved Solids	127	DLDS	13	mg/L		07-JUL-17	R3768452
Anions and Nutrients							
Acidity (as CaCO3)	2.8		2.0	mg/L		12-JUL-17	R3771213
Alkalinity, Total (as CaCO3)	<10		10	mg/L		07-JUL-17	R3767567
Ammonia, Total (as N)	0.114		0.020	mg/L		10-JUL-17	R3768532
Chloride (Cl)	0.89		0.50	mg/L		10-JUL-17	R3768966
Fluoride (F)	<0.020		0.020	mg/L		10-JUL-17	R3768966
Nitrate (as N)	0.658		0.020	mg/L		10-JUL-17	R3768966
Total Kjeldahl Nitrogen	0.26		0.15	mg/L	12-JUL-17	12-JUL-17	R3770346
Phosphorus, Total	0.0158		0.0030	mg/L	11-JUL-17	12-JUL-17	R3769758
Sulfate (SO4)	70.6		0.30	mg/L		10-JUL-17	R3768966
Cyanides							
Cyanide, Total	<0.0020		0.0020	mg/L		07-JUL-17	R3768496
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<0.50		0.50	mg/L		30-JUL-17	R3785432
Total Organic Carbon	0.97		0.50	mg/L		28-JUL-17	R3785176
Total Metals							
Aluminum (Al)-Total	0.342		0.0050	mg/L	07-JUL-17	07-JUL-17	R3767295
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Arsenic (As)-Total	0.00010		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Barium (Ba)-Total	0.00692		0.00020	mg/L	07-JUL-17	07-JUL-17	R3767295
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	07-JUL-17	07-JUL-17	R3767295
Boron (B)-Total	<0.010		0.010	mg/L	07-JUL-17	07-JUL-17	R3767295
Cadmium (Cd)-Total	0.000017		0.000010	mg/L	07-JUL-17	07-JUL-17	R3767295
Calcium (Ca)-Total	6.93		0.50	mg/L	07-JUL-17	07-JUL-17	R3767295
Cesium (Cs)-Total	0.000048		0.000010	mg/L	07-JUL-17	07-JUL-17	R3767295
Chromium (Cr)-Total	0.00105		0.00050	mg/L	07-JUL-17	07-JUL-17	R3767295
Cobalt (Co)-Total	0.00637		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Copper (Cu)-Total	0.0030		0.0010	mg/L	07-JUL-17	07-JUL-17	R3767295
Iron (Fe)-Total	0.857		0.050	mg/L	07-JUL-17	07-JUL-17	R3767295
Lead (Pb)-Total	0.000688		0.000050	mg/L	07-JUL-17	07-JUL-17	R3767295
Lithium (Li)-Total	0.0018		0.0010	mg/L	07-JUL-17	07-JUL-17	R3767295
Magnesium (Mg)-Total	16.8		0.050	mg/L	07-JUL-17	07-JUL-17	R3767295
Manganese (Mn)-Total	0.552		0.00050	mg/L	07-JUL-17	07-JUL-17	R3767295
Mercury (Hg)-Total	<0.000010		0.000010	mg/L		07-JUL-17	R3767195
Molybdenum (Mo)-Total	0.000083		0.000050	mg/L	07-JUL-17	07-JUL-17	R3767295
Nickel (Ni)-Total	0.00695		0.00050	mg/L	07-JUL-17	07-JUL-17	R3767295

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1954085-1 MS-08 Sampled By: BW/LM/LM on 04-JUL-17 @ 08:45 Matrix: WATER							
Total Metals							
Phosphorus (P)-Total	<0.050		0.050	mg/L	07-JUL-17	07-JUL-17	R3767295
Potassium (K)-Total	0.697		0.050	mg/L	07-JUL-17	07-JUL-17	R3767295
Rubidium (Rb)-Total	0.00192		0.00020	mg/L	07-JUL-17	07-JUL-17	R3767295
Selenium (Se)-Total	0.000323		0.000050	mg/L	07-JUL-17	07-JUL-17	R3767295
Silicon (Si)-Total	0.69		0.10	mg/L	07-JUL-17	07-JUL-17	R3767295
Silver (Ag)-Total	<0.000050		0.000050	mg/L	07-JUL-17	07-JUL-17	R3767295
Sodium (Na)-Total	<0.50		0.50	mg/L	07-JUL-17	07-JUL-17	R3767295
Strontium (Sr)-Total	0.0046		0.0010	mg/L	07-JUL-17	07-JUL-17	R3767295
Sulfur (S)-Total	26.6		0.50	mg/L	07-JUL-17	07-JUL-17	R3767295
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	07-JUL-17	07-JUL-17	R3767295
Thallium (Tl)-Total	0.000014		0.000010	mg/L	07-JUL-17	07-JUL-17	R3767295
Thorium (Th)-Total	0.00053		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Tin (Sn)-Total	<0.00010		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Titanium (Ti)-Total	0.0190		0.00030	mg/L	07-JUL-17	07-JUL-17	R3767295
Tungsten (W)-Total	<0.00010		0.00010	mg/L	07-JUL-17	07-JUL-17	R3767295
Uranium (U)-Total	0.000165		0.000010	mg/L	07-JUL-17	07-JUL-17	R3767295
Vanadium (V)-Total	0.00083		0.00050	mg/L	07-JUL-17	07-JUL-17	R3767295
Zinc (Zn)-Total	0.0046		0.0030	mg/L	07-JUL-17	07-JUL-17	R3767295
Zirconium (Zr)-Total	0.00035		0.00030	mg/L	07-JUL-17	07-JUL-17	R3767295
Dissolved Metals							
Dissolved Mercury Filtration Location	FIELD					07-JUL-17	R3767021
Dissolved Metals Filtration Location	FIELD					07-JUL-17	R3766902
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	07-JUL-17	09-JUL-17	R3768113
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Barium (Ba)-Dissolved	0.00419		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	07-JUL-17	09-JUL-17	R3768113
Boron (B)-Dissolved	<0.010		0.010	mg/L	07-JUL-17	09-JUL-17	R3768113
Cadmium (Cd)-Dissolved	0.000018		0.000010	mg/L	07-JUL-17	09-JUL-17	R3768113
Calcium (Ca)-Dissolved	6.98		0.050	mg/L	07-JUL-17	09-JUL-17	R3768113
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	07-JUL-17	09-JUL-17	R3768113
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	07-JUL-17	09-JUL-17	R3768113
Cobalt (Co)-Dissolved	0.00586		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Copper (Cu)-Dissolved	0.00100		0.00020	mg/L	07-JUL-17	09-JUL-17	R3768113
Iron (Fe)-Dissolved	0.160		0.010	mg/L	07-JUL-17	09-JUL-17	R3768113
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	07-JUL-17	09-JUL-17	R3768113
Lithium (Li)-Dissolved	0.0021		0.0010	mg/L	07-JUL-17	09-JUL-17	R3768113
Magnesium (Mg)-Dissolved	15.5		0.050	mg/L	07-JUL-17	09-JUL-17	R3768113
Manganese (Mn)-Dissolved	0.504		0.00050	mg/L	07-JUL-17	09-JUL-17	R3768113
Mercury (Hg)-Dissolved	<0.000010		0.000010	mg/L	07-JUL-17	07-JUL-17	R3767194

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1954085-1 MS-08							
Sampled By: BW/LM/LM on 04-JUL-17 @ 08:45							
Matrix: WATER							
Dissolved Metals							
Molybdenum (Mo)-Dissolved	0.000082		0.000050	mg/L	07-JUL-17	09-JUL-17	R3768113
Nickel (Ni)-Dissolved	0.00600		0.00050	mg/L	07-JUL-17	09-JUL-17	R3768113
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	07-JUL-17	09-JUL-17	R3768113
Potassium (K)-Dissolved	0.519		0.050	mg/L	07-JUL-17	09-JUL-17	R3768113
Rubidium (Rb)-Dissolved	0.00075		0.00020	mg/L	07-JUL-17	09-JUL-17	R3768113
Selenium (Se)-Dissolved	0.000335		0.000050	mg/L	07-JUL-17	09-JUL-17	R3768113
Silicon (Si)-Dissolved	0.164		0.050	mg/L	07-JUL-17	09-JUL-17	R3768113
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	07-JUL-17	09-JUL-17	R3768113
Sodium (Na)-Dissolved	<0.50		0.50	mg/L	07-JUL-17	09-JUL-17	R3768113
Strontium (Sr)-Dissolved	0.0047		0.0010	mg/L	07-JUL-17	09-JUL-17	R3768113
Sulfur (S)-Dissolved	25.8		0.50	mg/L	07-JUL-17	09-JUL-17	R3768113
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	07-JUL-17	09-JUL-17	R3768113
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	07-JUL-17	09-JUL-17	R3768113
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	07-JUL-17	09-JUL-17	R3768113
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	07-JUL-17	09-JUL-17	R3768113
Uranium (U)-Dissolved	0.000031		0.000010	mg/L	07-JUL-17	09-JUL-17	R3768113
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	07-JUL-17	09-JUL-17	R3768113
Zinc (Zn)-Dissolved	0.0028		0.0010	mg/L	07-JUL-17	09-JUL-17	R3768113
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	07-JUL-17	09-JUL-17	R3768113
Radiological Parameters							
Ra-226	0.012		0.0075	Bq/L	17-JUL-17	25-JUL-17	R3771237

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L1954085-1
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1954085-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1954085-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1954085-1
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1954085-1
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1954085-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1954085-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1954085-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1954085-1
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1954085-1
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1954085-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L1954085-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1954085-1
Matrix Spike	Silicon (Si)-Total	MS-B	L1954085-1

Sample Parameter Qualifier key listed:

Qualifier	Description
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.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-TITR-TB	Water	Acidity	APHA 2310 B modified

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALS Test Code	Matrix	Test Description	Method Reference**
C-DOC-HTC-WP	Water	Dissolved Organic Carbon by Combustion	APHA 5310 B-WP

Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.

ALS Test Code	Matrix	Test Description	Method Reference**
C-TOC-HTC-WP	Water	Total Organic Carbon by Combustion	APHA 5310 B-WP

Sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ALS Test Code	Matrix	Test Description	Method Reference**
CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

ALS Test Code	Matrix	Test Description	Method Reference**
EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ALS Test Code	Matrix	Test Description	Method Reference**
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

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.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-D-CVAA-WT	Water	Dissolved Mercury in Water by CVAAS	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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental

Reference Information

Protection Act (July 1, 2011).

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-D-CCMS-WT	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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-T-CCMS-WT	Water	Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-WT	Water	Ammonia, Total as N	EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

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

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

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

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5°C overnight and then 180–10°C for 1hr.

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
TB	ALS ENVIRONMENTAL - THUNDER BAY, ONTARIO, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
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 weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
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.

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACY-TITR-TB	**Water**							
Batch R3771213								
WG2568086-3 DUP		**L1954085-1**						
Acidity (as CaCO3)		2.8	2.6		mg/L	7.4	20	12-JUL-17
WG2568086-2 LCS								
Acidity (as CaCO3)			99.0		%		85-115	12-JUL-17
WG2568086-1 MB								
Acidity (as CaCO3)			<2.0		mg/L		2	12-JUL-17
ALK-WT	**Water**							
Batch R3767567								
WG2565313-7 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			94.1		%		80-120	07-JUL-17
WG2565313-8 DUP		**L1953941-10**						
Alkalinity, Total (as CaCO3)		29	27		mg/L	7.7	20	07-JUL-17
WG2565313-6 LCS								
Alkalinity, Total (as CaCO3)			96.6		%		85-115	07-JUL-17
WG2565313-5 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	07-JUL-17
C-DOC-HTC-WP	**Water**							
Batch R3785432								
WG2581537-3 DUP		**L1960980-1**						
Dissolved Organic Carbon		7.76	7.65		mg/L	1.4	20	30-JUL-17
WG2581537-2 LCS								
Dissolved Organic Carbon			101.1		%		80-120	30-JUL-17
WG2581537-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	30-JUL-17
WG2581537-4 MS		**L1961039-3**						
Dissolved Organic Carbon			101.2		%		70-130	30-JUL-17
C-TOC-HTC-WP	**Water**							
Batch R3785176								
WG2581247-3 DUP		**L1959457-4**						
Total Organic Carbon		11.0	10.9		mg/L	0.6	20	28-JUL-17
WG2581247-2 LCS								
Total Organic Carbon			101.4		%		80-120	28-JUL-17
WG2581247-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	28-JUL-17
WG2581247-4 MS		**L1959457-4**						
Total Organic Carbon			N/A	MS-B	%		-	28-JUL-17
CL-IC-N-WT	**Water**							

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	**Water**							
Batch R3768966								
WG2567009-4 DUP		**WG2567009-3**						
Chloride (Cl)		0.89	0.88		mg/L	0.2	20	10-JUL-17
WG2567009-2 LCS								
Chloride (Cl)			97.2		%		90-110	10-JUL-17
WG2567009-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	10-JUL-17
WG2567009-5 MS		**WG2567009-3**						
Chloride (Cl)			99.4		%		75-125	10-JUL-17
CN-TOT-WT	**Water**							
Batch R3768496								
WG2565366-7 DUP		**L1949980-1**						
Cyanide, Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	07-JUL-17
WG2565366-6 LCS								
Cyanide, Total			88.1		%		80-120	07-JUL-17
WG2565366-5 MB								
Cyanide, Total			<0.0020		mg/L		0.002	07-JUL-17
WG2565366-8 MS		**L1949980-1**						
Cyanide, Total			84.4		%		70-130	07-JUL-17
EC-WT	**Water**							
Batch R3766944								
WG2563956-20 DUP		**WG2563956-19**						
Conductivity		288	290		umhos/cm	0.7	10	06-JUL-17
WG2563956-17 LCS								
Conductivity			100.1		%		90-110	06-JUL-17
WG2563956-18 MB								
Conductivity			<3.0		umhos/cm		3	06-JUL-17
F-IC-N-WT	**Water**							
Batch R3768966								
WG2567009-4 DUP		**WG2567009-3**						
Fluoride (F)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	10-JUL-17
WG2567009-2 LCS								
Fluoride (F)			103.0		%		90-110	10-JUL-17
WG2567009-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	10-JUL-17
WG2567009-5 MS		**WG2567009-3**						
Fluoride (F)			107.2		%		75-125	10-JUL-17
HG-D-CVAA-WT	**Water**							

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-WT	**Water**							
Batch R3767194								
WG2565066-4 DUP		**WG2565066-3**						
Mercury (Hg)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-JUL-17
WG2565066-2 LCS								
Mercury (Hg)-Dissolved			97.8		%		80-120	07-JUL-17
WG2565066-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	07-JUL-17
WG2565066-6 MS		**WG2565066-5**						
Mercury (Hg)-Dissolved			90.4		%		70-130	07-JUL-17
HG-T-CVAA-WT	**Water**							
Batch R3767195								
WG2565062-3 DUP		**L1953941-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-JUL-17
WG2565062-2 LCS								
Mercury (Hg)-Total			99.7		%		80-120	07-JUL-17
WG2565062-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	07-JUL-17
WG2565062-4 MS		**L1953941-2**						
Mercury (Hg)-Total			91.9		%		70-130	07-JUL-17
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-4 DUP		**WG2564890-3**						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	09-JUL-17
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-JUL-17
Arsenic (As)-Dissolved		0.00070	0.00074		mg/L	5.6	20	09-JUL-17
Barium (Ba)-Dissolved		0.0534	0.0529		mg/L	1.0	20	09-JUL-17
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-JUL-17
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-JUL-17
Boron (B)-Dissolved		0.034	0.034		mg/L	0.2	20	09-JUL-17
Cadmium (Cd)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-JUL-17
Calcium (Ca)-Dissolved		125	131		mg/L	5.3	20	09-JUL-17
Cesium (Cs)-Dissolved		0.000029	0.000029		mg/L	0.7	20	09-JUL-17
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-JUL-17
Cobalt (Co)-Dissolved		0.00015	0.00015		mg/L	2.9	20	09-JUL-17
Copper (Cu)-Dissolved		0.00279	0.00290		mg/L	3.9	20	09-JUL-17
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	09-JUL-17
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-JUL-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-4 DUP		**WG2564890-3**						
Lithium (Li)-Dissolved		0.0101	0.0099		mg/L	1.6	20	09-JUL-17
Magnesium (Mg)-Dissolved		80.4	83.5		mg/L	3.8	20	09-JUL-17
Manganese (Mn)-Dissolved		0.595	0.614		mg/L	3.1	20	09-JUL-17
Molybdenum (Mo)-Dissolved		0.00166	0.00166		mg/L	0.2	20	09-JUL-17
Nickel (Ni)-Dissolved		0.00126	0.00123		mg/L	2.6	20	09-JUL-17
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	09-JUL-17
Potassium (K)-Dissolved		9.43	9.59		mg/L	1.7	20	09-JUL-17
Rubidium (Rb)-Dissolved		0.00144	0.00147		mg/L	1.9	20	09-JUL-17
Selenium (Se)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-JUL-17
Silicon (Si)-Dissolved		10.6	10.4		mg/L	2.1	20	09-JUL-17
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	09-JUL-17
Sodium (Na)-Dissolved		139	136		mg/L	2.1	20	09-JUL-17
Strontium (Sr)-Dissolved		0.835	0.869		mg/L	4.0	20	09-JUL-17
Sulfur (S)-Dissolved		32.9	31.9		mg/L	2.9	20	09-JUL-17
Tellurium (Te)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	09-JUL-17
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	09-JUL-17
Thorium (Th)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-JUL-17
Tin (Sn)-Dissolved		0.00019	0.00020		mg/L	4.8	20	09-JUL-17
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	09-JUL-17
Tungsten (W)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	09-JUL-17
Uranium (U)-Dissolved		0.00209	0.00238		mg/L	13	20	09-JUL-17
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	09-JUL-17
Zinc (Zn)-Dissolved		0.0019	0.0015	J	mg/L	0.0004	0.002	09-JUL-17
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	09-JUL-17
WG2564890-2 LCS								
Aluminum (Al)-Dissolved			103.1		%		80-120	09-JUL-17
Antimony (Sb)-Dissolved			103.9		%		80-120	09-JUL-17
Arsenic (As)-Dissolved			101.4		%		80-120	09-JUL-17
Barium (Ba)-Dissolved			105.6		%		80-120	09-JUL-17
Beryllium (Be)-Dissolved			101.5		%		80-120	09-JUL-17
Bismuth (Bi)-Dissolved			104.4		%		80-120	09-JUL-17
Boron (B)-Dissolved			101.5		%		80-120	09-JUL-17
Cadmium (Cd)-Dissolved			102.8		%		80-120	09-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-2 LCS								
Calcium (Ca)-Dissolved			102.1		%		80-120	09-JUL-17
Cesium (Cs)-Dissolved			105.6		%		80-120	09-JUL-17
Chromium (Cr)-Dissolved			101.1		%		80-120	09-JUL-17
Cobalt (Co)-Dissolved			101.8		%		80-120	09-JUL-17
Copper (Cu)-Dissolved			98.4		%		80-120	09-JUL-17
Iron (Fe)-Dissolved			101.6		%		80-120	09-JUL-17
Lead (Pb)-Dissolved			105.2		%		80-120	09-JUL-17
Lithium (Li)-Dissolved			104.9		%		80-120	09-JUL-17
Magnesium (Mg)-Dissolved			105.7		%		80-120	09-JUL-17
Manganese (Mn)-Dissolved			102.7		%		80-120	09-JUL-17
Molybdenum (Mo)-Dissolved			100.9		%		80-120	09-JUL-17
Nickel (Ni)-Dissolved			102.9		%		80-120	09-JUL-17
Phosphorus (P)-Dissolved			100.2		%		80-120	09-JUL-17
Potassium (K)-Dissolved			106.8		%		80-120	09-JUL-17
Rubidium (Rb)-Dissolved			102.5		%		80-120	09-JUL-17
Selenium (Se)-Dissolved			101.3		%		80-120	09-JUL-17
Silicon (Si)-Dissolved			116.2		%		60-140	09-JUL-17
Silver (Ag)-Dissolved			99.7		%		80-120	09-JUL-17
Sodium (Na)-Dissolved			100.4		%		80-120	09-JUL-17
Strontium (Sr)-Dissolved			109.1		%		80-120	09-JUL-17
Sulfur (S)-Dissolved			100.1		%		80-120	09-JUL-17
Tellurium (Te)-Dissolved			102.5		%		80-120	09-JUL-17
Thallium (Tl)-Dissolved			99.97		%		80-120	09-JUL-17
Thorium (Th)-Dissolved			104.9		%		80-120	09-JUL-17
Tin (Sn)-Dissolved			101.9		%		80-120	09-JUL-17
Titanium (Ti)-Dissolved			99.8		%		80-120	09-JUL-17
Tungsten (W)-Dissolved			106.4		%		80-120	09-JUL-17
Uranium (U)-Dissolved			104.8		%		80-120	09-JUL-17
Vanadium (V)-Dissolved			102.6		%		80-120	09-JUL-17
Zinc (Zn)-Dissolved			98.7		%		80-120	09-JUL-17
Zirconium (Zr)-Dissolved			101.4		%		80-120	09-JUL-17
WG2564890-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	09-JUL-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-1 MB								
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	09-JUL-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	09-JUL-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	09-JUL-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	09-JUL-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	09-JUL-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	09-JUL-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	09-JUL-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	09-JUL-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	09-JUL-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	09-JUL-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	09-JUL-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	09-JUL-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	09-JUL-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	09-JUL-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	09-JUL-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	09-JUL-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	09-JUL-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	09-JUL-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	09-JUL-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	09-JUL-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	09-JUL-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	09-JUL-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	09-JUL-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	09-JUL-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	09-JUL-17
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	09-JUL-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	09-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-1 MB								
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	09-JUL-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	09-JUL-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-JUL-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	09-JUL-17
WG2564890-5 MS		**WG2564890-3**						
Aluminum (Al)-Dissolved			101.1		%		70-130	09-JUL-17
Antimony (Sb)-Dissolved			106.6		%		70-130	09-JUL-17
Arsenic (As)-Dissolved			101.8		%		70-130	09-JUL-17
Barium (Ba)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Beryllium (Be)-Dissolved			101.4		%		70-130	09-JUL-17
Bismuth (Bi)-Dissolved			87.4		%		70-130	09-JUL-17
Boron (B)-Dissolved			99.2		%		70-130	09-JUL-17
Cadmium (Cd)-Dissolved			102.0		%		70-130	09-JUL-17
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Cesium (Cs)-Dissolved			107.9		%		70-130	09-JUL-17
Chromium (Cr)-Dissolved			96.3		%		70-130	09-JUL-17
Cobalt (Co)-Dissolved			95.2		%		70-130	09-JUL-17
Copper (Cu)-Dissolved			87.6		%		70-130	09-JUL-17
Iron (Fe)-Dissolved			95.5		%		70-130	09-JUL-17
Lead (Pb)-Dissolved			96.4		%		70-130	09-JUL-17
Lithium (Li)-Dissolved			107.8		%		70-130	09-JUL-17
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Molybdenum (Mo)-Dissolved			98.6		%		70-130	09-JUL-17
Nickel (Ni)-Dissolved			92.7		%		70-130	09-JUL-17
Phosphorus (P)-Dissolved			107.2		%		70-130	09-JUL-17
Potassium (K)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Rubidium (Rb)-Dissolved			99.9		%		70-130	09-JUL-17
Selenium (Se)-Dissolved			101.4		%		70-130	09-JUL-17
Silicon (Si)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Silver (Ag)-Dissolved			97.5		%		70-130	09-JUL-17
Sodium (Na)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Sulfur (S)-Dissolved			N/A	MS-B	%		-	09-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3768113								
WG2564890-5 MS		**WG2564890-3**						
Tellurium (Te)-Dissolved			99.9		%		70-130	09-JUL-17
Thallium (Tl)-Dissolved			94.6		%		70-130	09-JUL-17
Thorium (Th)-Dissolved			98.1		%		70-130	09-JUL-17
Tin (Sn)-Dissolved			102.4		%		70-130	09-JUL-17
Titanium (Ti)-Dissolved			104.1		%		70-130	09-JUL-17
Tungsten (W)-Dissolved			102.6		%		70-130	09-JUL-17
Uranium (U)-Dissolved			N/A	MS-B	%		-	09-JUL-17
Vanadium (V)-Dissolved			101.7		%		70-130	09-JUL-17
Zinc (Zn)-Dissolved			89.0		%		70-130	09-JUL-17
Zirconium (Zr)-Dissolved			98.8		%		70-130	09-JUL-17
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564892-4 DUP		**WG2564892-3**						
Aluminum (Al)-Total		0.0269	0.0250		mg/L	7.1	20	07-JUL-17
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-JUL-17
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-JUL-17
Barium (Ba)-Total		0.00394	0.00398		mg/L	1.1	20	07-JUL-17
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-JUL-17
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	07-JUL-17
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	07-JUL-17
Cadmium (Cd)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-JUL-17
Calcium (Ca)-Total		12.5	12.4		mg/L	0.7	20	07-JUL-17
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	07-JUL-17
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-JUL-17
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-JUL-17
Copper (Cu)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	07-JUL-17
Iron (Fe)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	07-JUL-17
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	07-JUL-17
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	07-JUL-17
Magnesium (Mg)-Total		5.87	5.77		mg/L	1.8	20	07-JUL-17
Manganese (Mn)-Total		0.00208	0.00215		mg/L	3.4	20	07-JUL-17
Molybdenum (Mo)-Total		0.000060	0.000060		mg/L	0.3	20	07-JUL-17
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	07-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564892-4 DUP		**WG2564892-3**						
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	07-JUL-17
Potassium (K)-Total		0.563	0.561		mg/L	0.4	20	07-JUL-17
Rubidium (Rb)-Total		0.00058	0.00053		mg/L	8.9	20	07-JUL-17
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	07-JUL-17
Silicon (Si)-Total		0.47	0.50		mg/L	6.5	20	07-JUL-17
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	07-JUL-17
Sodium (Na)-Total		0.95	0.93		mg/L	1.7	20	07-JUL-17
Strontium (Sr)-Total		0.0083	0.0080		mg/L	3.8	20	07-JUL-17
Sulfur (S)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	25	07-JUL-17
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	07-JUL-17
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	07-JUL-17
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	07-JUL-17
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-JUL-17
Titanium (Ti)-Total		0.00109	0.00113		mg/L	4.1	20	07-JUL-17
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	07-JUL-17
Uranium (U)-Total		0.000233	0.000238		mg/L	2.3	20	07-JUL-17
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	07-JUL-17
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	07-JUL-17
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	07-JUL-17
WG2564892-2 LCS								
Aluminum (Al)-Total			103.5		%		80-120	07-JUL-17
Antimony (Sb)-Total			97.2		%		80-120	07-JUL-17
Arsenic (As)-Total			100.6		%		80-120	07-JUL-17
Barium (Ba)-Total			106.6		%		80-120	07-JUL-17
Beryllium (Be)-Total			96.1		%		80-120	07-JUL-17
Bismuth (Bi)-Total			95.3		%		80-120	07-JUL-17
Boron (B)-Total			96.7		%		80-120	07-JUL-17
Cadmium (Cd)-Total			99.3		%		80-120	07-JUL-17
Calcium (Ca)-Total			100.3		%		80-120	07-JUL-17
Chromium (Cr)-Total			102.5		%		80-120	07-JUL-17
Cesium (Cs)-Total			101.0		%		80-120	07-JUL-17
Cobalt (Co)-Total			95.8		%		80-120	07-JUL-17
Copper (Cu)-Total			99.0		%		80-120	07-JUL-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564892-2 LCS								
Iron (Fe)-Total			102.0		%		80-120	07-JUL-17
Lead (Pb)-Total			100.7		%		80-120	07-JUL-17
Lithium (Li)-Total			106.5		%		80-120	07-JUL-17
Magnesium (Mg)-Total			99.3		%		80-120	07-JUL-17
Manganese (Mn)-Total			101.2		%		80-120	07-JUL-17
Molybdenum (Mo)-Total			98.3		%		80-120	07-JUL-17
Nickel (Ni)-Total			96.3		%		80-120	07-JUL-17
Phosphorus (P)-Total			97.8		%		70-130	07-JUL-17
Potassium (K)-Total			106.4		%		80-120	07-JUL-17
Rubidium (Rb)-Total			103.1		%		80-120	07-JUL-17
Selenium (Se)-Total			99.96		%		80-120	07-JUL-17
Silicon (Si)-Total			117.0		%		60-140	07-JUL-17
Silver (Ag)-Total			103.6		%		80-120	07-JUL-17
Sodium (Na)-Total			107.2		%		80-120	07-JUL-17
Strontium (Sr)-Total			98.1		%		80-120	07-JUL-17
Sulfur (S)-Total			105.3		%		70-130	07-JUL-17
Thallium (Tl)-Total			99.7		%		80-120	07-JUL-17
Tellurium (Te)-Total			96.2		%		80-120	07-JUL-17
Thorium (Th)-Total			99.2		%		70-130	07-JUL-17
Tin (Sn)-Total			101.1		%		80-120	07-JUL-17
Titanium (Ti)-Total			98.7		%		80-120	07-JUL-17
Tungsten (W)-Total			101.4		%		80-120	07-JUL-17
Uranium (U)-Total			102.0		%		80-120	07-JUL-17
Vanadium (V)-Total			104.1		%		80-120	07-JUL-17
Zinc (Zn)-Total			92.0		%		80-120	07-JUL-17
Zirconium (Zr)-Total			92.6		%		80-120	07-JUL-17
WG2564892-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	07-JUL-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Barium (Ba)-Total			<0.00020		mg/L		0.0002	07-JUL-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	07-JUL-17
Boron (B)-Total			<0.010		mg/L		0.01	07-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564892-1 MB								
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	07-JUL-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	07-JUL-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	07-JUL-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	07-JUL-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	07-JUL-17
Iron (Fe)-Total			<0.050		mg/L		0.05	07-JUL-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	07-JUL-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	07-JUL-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	07-JUL-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	07-JUL-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	07-JUL-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	07-JUL-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	07-JUL-17
Potassium (K)-Total			<0.050		mg/L		0.05	07-JUL-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	07-JUL-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	07-JUL-17
Silicon (Si)-Total			<0.10		mg/L		0.1	07-JUL-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	07-JUL-17
Sodium (Na)-Total			<0.50		mg/L		0.5	07-JUL-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	07-JUL-17
Sulfur (S)-Total			<0.50		mg/L		0.5	07-JUL-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	07-JUL-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	07-JUL-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	07-JUL-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	07-JUL-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	07-JUL-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	07-JUL-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	07-JUL-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	07-JUL-17
WG2564892-5 MS		**WG2564892-3**						
Aluminum (Al)-Total			91.5		%		70-130	07-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564892-5 MS		**WG2564892-3**						
Antimony (Sb)-Total			101.3		%		70-130	07-JUL-17
Arsenic (As)-Total			98.0		%		70-130	07-JUL-17
Barium (Ba)-Total			99.0		%		70-130	07-JUL-17
Beryllium (Be)-Total			98.2		%		70-130	07-JUL-17
Bismuth (Bi)-Total			100.0		%		70-130	07-JUL-17
Boron (B)-Total			101.4		%		70-130	07-JUL-17
Cadmium (Cd)-Total			96.1		%		70-130	07-JUL-17
Calcium (Ca)-Total			N/A	MS-B	%		-	07-JUL-17
Chromium (Cr)-Total			98.5		%		70-130	07-JUL-17
Cesium (Cs)-Total			102.8		%		70-130	07-JUL-17
Cobalt (Co)-Total			94.1		%		70-130	07-JUL-17
Copper (Cu)-Total			93.2		%		70-130	07-JUL-17
Iron (Fe)-Total			86.7		%		70-130	07-JUL-17
Lead (Pb)-Total			103.4		%		70-130	07-JUL-17
Lithium (Li)-Total			116.2		%		70-130	07-JUL-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	07-JUL-17
Manganese (Mn)-Total			98.2		%		70-130	07-JUL-17
Molybdenum (Mo)-Total			100.0		%		70-130	07-JUL-17
Nickel (Ni)-Total			94.3		%		70-130	07-JUL-17
Phosphorus (P)-Total			105.1		%		70-130	07-JUL-17
Potassium (K)-Total			104.8		%		70-130	07-JUL-17
Rubidium (Rb)-Total			97.3		%		70-130	07-JUL-17
Selenium (Se)-Total			103.2		%		70-130	07-JUL-17
Silicon (Si)-Total			N/A	MS-B	%		-	07-JUL-17
Silver (Ag)-Total			104.9		%		70-130	07-JUL-17
Sodium (Na)-Total			101.9		%		70-130	07-JUL-17
Strontium (Sr)-Total			93.5		%		70-130	07-JUL-17
Sulfur (S)-Total			107.2		%		70-130	07-JUL-17
Thallium (Tl)-Total			99.2		%		70-130	07-JUL-17
Tellurium (Te)-Total			96.5		%		70-130	07-JUL-17
Thorium (Th)-Total			102.8		%		70-130	07-JUL-17
Tin (Sn)-Total			95.7		%		70-130	07-JUL-17
Titanium (Ti)-Total			96.6		%		70-130	07-JUL-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3767295								
WG2564892-5 MS		**WG2564892-3**						
Tungsten (W)-Total			104.0		%		70-130	07-JUL-17
Uranium (U)-Total			105.2		%		70-130	07-JUL-17
Vanadium (V)-Total			102.2		%		70-130	07-JUL-17
Zinc (Zn)-Total			89.5		%		70-130	07-JUL-17
Zirconium (Zr)-Total			93.3		%		70-130	07-JUL-17
NH3-WT	**Water**							
Batch R3768532								
WG2566361-15 DUP		**L1953941-7**						
Ammonia, Total (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	10-JUL-17
WG2566361-14 LCS								
Ammonia, Total (as N)			91.9		%		85-115	10-JUL-17
WG2566361-13 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	10-JUL-17
WG2566361-16 MS		**L1953941-7**						
Ammonia, Total (as N)			85.0		%		75-125	10-JUL-17
NO3-IC-WT	**Water**							
Batch R3768966								
WG2567009-4 DUP		**WG2567009-3**						
Nitrate (as N)		0.660	0.654		mg/L	0.9	25	10-JUL-17
WG2567009-2 LCS								
Nitrate (as N)			106.6		%		70-130	10-JUL-17
WG2567009-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	10-JUL-17
WG2567009-5 MS		**WG2567009-3**						
Nitrate (as N)			110.2		%		70-130	10-JUL-17
P-T-COL-WT	**Water**							
Batch R3769758								
WG2567493-3 DUP		**L1953941-9**						
Phosphorus, Total		0.0102	0.0106		mg/L	4.0	20	12-JUL-17
WG2567493-2 LCS								
Phosphorus, Total			95.6		%		80-120	12-JUL-17
WG2567493-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	12-JUL-17
WG2567493-4 MS		**L1953941-9**						
Phosphorus, Total			99.2		%		70-130	12-JUL-17
PH-WT	**Water**							

Quality Control Report

Workorder: L1954085 Report Date: 31-JUL-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT	**Water**							
Batch R3766944								
WG2563956-20 DUP		**WG2563956-19**						
pH		8.03	8.08	J	pH units	0.04	0.2	06-JUL-17
WG2563956-17 LCS								
pH			6.99		pH units		6.9-7.1	06-JUL-17
SO4-IC-N-WT	**Water**							
Batch R3768966								
WG2567009-4 DUP		**WG2567009-3**						
Sulfate (SO4)		70.7	70.5		mg/L	0.4	20	10-JUL-17
WG2567009-2 LCS								
Sulfate (SO4)			95.0		%		90-110	10-JUL-17
WG2567009-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	10-JUL-17
WG2567009-5 MS		**WG2567009-3**						
Sulfate (SO4)			94.7		%		75-125	10-JUL-17
SOLIDS-TDS-WT	**Water**							
Batch R3768452								
WG2564920-6 DUP		**L1954185-13**						
Total Dissolved Solids		62	57		mg/L	7.8	20	07-JUL-17
WG2564920-5 LCS								
Total Dissolved Solids			98.7		%		85-115	07-JUL-17
WG2564920-4 MB								
Total Dissolved Solids			<10		mg/L		10	07-JUL-17
SOLIDS-TSS-WT	**Water**							
Batch R3769023								
WG2566347-3 DUP		**L1953595-1**						
Total Suspended Solids		615	662		mg/L	7.2	20	11-JUL-17
WG2566347-2 LCS								
Total Suspended Solids			98.4		%		85-115	11-JUL-17
WG2566347-1 MB								
Total Suspended Solids			<2.0		mg/L		2	11-JUL-17
TKN-WT	**Water**							
Batch R3770346								
WG2568078-3 DUP		**L1953961-2**						
Total Kjeldahl Nitrogen		1.16	1.29		mg/L	11	20	12-JUL-17
WG2568078-2 LCS								
Total Kjeldahl Nitrogen			94.1		%		75-125	12-JUL-17
WG2568078-1 MB								

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Water**							
Batch **R3770346**								
WG2568078-1 **MB**								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	12-JUL-17
WG2568078-4 **MS**		**L1953961-2**						
Total Kjeldahl Nitrogen			107.8		%		70-130	12-JUL-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1954085-COFC

COC Number: 15 -

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	647-253-0596 EXT 6010
	Company address below will appear on the final report
Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	bimcore@alsglobal.com
Email 2	bimww@alsglobal.com
Email 3	
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@baffinland.com
Email 2	commercial@baffinland.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]	☑ Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days): 4 day [P4] ☐	EMERGENCY: 1 Business day [E1] ☐
3 day [P3] ☐	Same Day, Weekend or Statutory holiday [E0] ☐
2 day [P2] ☐	
Date and Time Required for all E&P TATs:	dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information	
ALS Account # / Quote #:	23642 /Q42455
Job #:	MS-08
PO / AFE:	4500027854
LSD:	
ALS Lab Work Order # (lab use only)	L1954085 BM

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler: BW/LM/LM

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	BIM-MMER-WT	Number of Containers
	MS-08	4-Jul-17	8:45	Water	R	9

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	
Are samples for human drinking water use? ☐ YES ☐ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐	SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐	Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐	
INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	12.4

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ben Widdowson	Date: 2017-07-04 10:40	Time:	Received by:	Date:	Time:	Received by: BM	Date: 6-JUL-17	Time: 1100

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

R

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 13-JUL-17
Report Date: 28-JUL-17 07:13 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1957684
Project P.O. #: 4500027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1957684-1 MS-08							
Sampled By: BW//LM on 11-JUL-17 @ 10:00							
Matrix: WATER							
Physical Tests							
Conductivity	486		3.0	umhos/cm		13-JUL-17	R3771077
pH	6.50		0.10	pH units		13-JUL-17	R3771077
Total Suspended Solids	2.3		2.0	mg/L	14-JUL-17	15-JUL-17	R3772925
Total Dissolved Solids	371	DLDS	20	mg/L		13-JUL-17	R3772562
Turbidity	7.81	PEHR	0.10	NTU		14-JUL-17	R3771643
Cyanides							
Cyanide, Total	<0.020	DLM	0.020	mg/L		18-JUL-17	R3777456
Total Metals							
Aluminum (Al)-Total	0.107		0.0050	mg/L	14-JUL-17	14-JUL-17	R3772363
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Arsenic (As)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Barium (Ba)-Total	0.00776		0.00020	mg/L	14-JUL-17	14-JUL-17	R3772363
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	14-JUL-17	14-JUL-17	R3772363
Boron (B)-Total	0.012		0.010	mg/L	14-JUL-17	14-JUL-17	R3772363
Cadmium (Cd)-Total	0.000049		0.000010	mg/L	14-JUL-17	14-JUL-17	R3772363
Calcium (Ca)-Total	16.8		0.50	mg/L	14-JUL-17	14-JUL-17	R3772363
Cesium (Cs)-Total	0.000015		0.000010	mg/L	14-JUL-17	14-JUL-17	R3772363
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	14-JUL-17	14-JUL-17	R3772363
Cobalt (Co)-Total	0.0196		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Copper (Cu)-Total	0.0024		0.0010	mg/L	14-JUL-17	14-JUL-17	R3772363
Iron (Fe)-Total	0.939		0.050	mg/L	14-JUL-17	14-JUL-17	R3772363
Lead (Pb)-Total	0.000354		0.000050	mg/L	14-JUL-17	14-JUL-17	R3772363
Lithium (Li)-Total	0.0040		0.0010	mg/L	14-JUL-17	14-JUL-17	R3772363
Magnesium (Mg)-Total	42.9		0.050	mg/L	14-JUL-17	14-JUL-17	R3772363
Manganese (Mn)-Total	1.54		0.00050	mg/L	14-JUL-17	14-JUL-17	R3772363
Molybdenum (Mo)-Total	0.000061		0.000050	mg/L	14-JUL-17	14-JUL-17	R3772363
Nickel (Ni)-Total	0.0211		0.00050	mg/L	14-JUL-17	14-JUL-17	R3772363
Phosphorus (P)-Total	<0.050		0.050	mg/L	14-JUL-17	14-JUL-17	R3772363
Potassium (K)-Total	1.01		0.050	mg/L	14-JUL-17	14-JUL-17	R3772363
Rubidium (Rb)-Total	0.00192		0.00020	mg/L	14-JUL-17	14-JUL-17	R3772363
Selenium (Se)-Total	0.000902		0.000050	mg/L	14-JUL-17	14-JUL-17	R3772363
Silicon (Si)-Total	0.56		0.10	mg/L	14-JUL-17	14-JUL-17	R3772363
Silver (Ag)-Total	<0.000050		0.000050	mg/L	14-JUL-17	14-JUL-17	R3772363
Sodium (Na)-Total	0.76		0.50	mg/L	14-JUL-17	14-JUL-17	R3772363
Strontium (Sr)-Total	0.0115		0.0010	mg/L	14-JUL-17	14-JUL-17	R3772363
Sulfur (S)-Total	74.3		0.50	mg/L	14-JUL-17	14-JUL-17	R3772363
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	14-JUL-17	17-JUL-17	R3772363
Thallium (Tl)-Total	0.000022		0.000010	mg/L	14-JUL-17	14-JUL-17	R3772363
Thorium (Th)-Total	0.00012		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Tin (Sn)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1957684-1 MS-08 Sampled By: BW//LM on 11-JUL-17 @ 10:00 Matrix: WATER							
Total Metals							
Titanium (Ti)-Total	<0.0060	DLUI	0.0060	mg/L	14-JUL-17	14-JUL-17	R3772363
Tungsten (W)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Uranium (U)-Total	0.000086		0.000010	mg/L	14-JUL-17	14-JUL-17	R3772363
Vanadium (V)-Total	<0.00050		0.00050	mg/L	14-JUL-17	14-JUL-17	R3772363
Zinc (Zn)-Total	0.0068		0.0030	mg/L	14-JUL-17	14-JUL-17	R3772363
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	14-JUL-17	14-JUL-17	R3772363
Radiological Parameters							
Ra-226	0.012		0.0045	Bq/L	17-JUL-17	25-JUL-17	R3771237
L1957684-2 MS-0801 Sampled By: BW//LM on 11-JUL-17 @ 10:00 Matrix: WATER							
Physical Tests							
Conductivity	486		3.0	umhos/cm		13-JUL-17	R3771077
pH	6.60		0.10	pH units		13-JUL-17	R3771077
Total Suspended Solids	4.6		2.0	mg/L	14-JUL-17	15-JUL-17	R3772925
Total Dissolved Solids	353	DLDS	20	mg/L		13-JUL-17	R3772562
Turbidity	7.66	PEHR	0.10	NTU		14-JUL-17	R3771643
Cyanides							
Cyanide, Total	0.0023		0.0020	mg/L		17-JUL-17	R3774806
Total Metals							
Aluminum (Al)-Total	0.0742		0.0050	mg/L	14-JUL-17	14-JUL-17	R3772363
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Arsenic (As)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Barium (Ba)-Total	0.00760		0.00020	mg/L	14-JUL-17	14-JUL-17	R3772363
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	14-JUL-17	14-JUL-17	R3772363
Boron (B)-Total	0.012		0.010	mg/L	14-JUL-17	14-JUL-17	R3772363
Cadmium (Cd)-Total	0.000053		0.000010	mg/L	14-JUL-17	14-JUL-17	R3772363
Calcium (Ca)-Total	16.2		0.50	mg/L	14-JUL-17	14-JUL-17	R3772363
Cesium (Cs)-Total	0.000012		0.000010	mg/L	14-JUL-17	14-JUL-17	R3772363
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	14-JUL-17	14-JUL-17	R3772363
Cobalt (Co)-Total	0.0195		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Copper (Cu)-Total	0.0024		0.0010	mg/L	14-JUL-17	14-JUL-17	R3772363
Iron (Fe)-Total	0.855		0.050	mg/L	14-JUL-17	14-JUL-17	R3772363
Lead (Pb)-Total	0.000762		0.000050	mg/L	14-JUL-17	14-JUL-17	R3772363
Lithium (Li)-Total	0.0039		0.0010	mg/L	14-JUL-17	14-JUL-17	R3772363
Magnesium (Mg)-Total	41.7		0.050	mg/L	14-JUL-17	14-JUL-17	R3772363
Manganese (Mn)-Total	1.53		0.00050	mg/L	14-JUL-17	14-JUL-17	R3772363
Molybdenum (Mo)-Total	0.000058		0.000050	mg/L	14-JUL-17	14-JUL-17	R3772363
Nickel (Ni)-Total	0.0206		0.00050	mg/L	14-JUL-17	14-JUL-17	R3772363
Phosphorus (P)-Total	<0.050		0.050	mg/L	14-JUL-17	14-JUL-17	R3772363
Potassium (K)-Total	1.00		0.050	mg/L	14-JUL-17	14-JUL-17	R3772363

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1957684-2 MS-0801 Sampled By: BW//LM on 11-JUL-17 @ 10:00 Matrix: WATER							
Total Metals							
Rubidium (Rb)-Total	0.00194		0.00020	mg/L	14-JUL-17	14-JUL-17	R3772363
Selenium (Se)-Total	0.000933		0.000050	mg/L	14-JUL-17	14-JUL-17	R3772363
Silicon (Si)-Total	0.50		0.10	mg/L	14-JUL-17	14-JUL-17	R3772363
Silver (Ag)-Total	<0.000050		0.000050	mg/L	14-JUL-17	14-JUL-17	R3772363
Sodium (Na)-Total	0.76		0.50	mg/L	14-JUL-17	14-JUL-17	R3772363
Strontium (Sr)-Total	0.0116		0.0010	mg/L	14-JUL-17	14-JUL-17	R3772363
Sulfur (S)-Total	76.4		0.50	mg/L	14-JUL-17	14-JUL-17	R3772363
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	14-JUL-17	14-JUL-17	R3772363
Thallium (Tl)-Total	0.000021		0.000010	mg/L	14-JUL-17	14-JUL-17	R3772363
Thorium (Th)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Tin (Sn)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Titanium (Ti)-Total	<0.0030	DLUI	0.0030	mg/L	14-JUL-17	14-JUL-17	R3772363
Tungsten (W)-Total	<0.00010		0.00010	mg/L	14-JUL-17	14-JUL-17	R3772363
Uranium (U)-Total	0.000081		0.000010	mg/L	14-JUL-17	14-JUL-17	R3772363
Vanadium (V)-Total	<0.00050		0.00050	mg/L	14-JUL-17	14-JUL-17	R3772363
Zinc (Zn)-Total	0.0080		0.0030	mg/L	14-JUL-17	14-JUL-17	R3772363
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	14-JUL-17	14-JUL-17	R3772363
Radiological Parameters							
Ra-226	<0.0067		0.0067	Bq/L	17-JUL-17	25-JUL-17	R3771237

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Total	MS-B	L1957684-1, -2
Matrix Spike	Calcium (Ca)-Total	MS-B	L1957684-1, -2
Matrix Spike	Iron (Fe)-Total	MS-B	L1957684-1, -2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1957684-1, -2
Matrix Spike	Manganese (Mn)-Total	MS-B	L1957684-1, -2
Matrix Spike	Silicon (Si)-Total	MS-B	L1957684-1, -2
Matrix Spike	Sodium (Na)-Total	MS-B	L1957684-1, -2
Matrix Spike	Strontium (Sr)-Total	MS-B	L1957684-1, -2
Matrix Spike	Sulfur (S)-Total	MS-B	L1957684-1, -2

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

MET-T-CCMS-WT	Water	Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5□C overnight and then 180–10□C for 1hr.

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1□C for a minimum of four hours or until a constant weight is achieved.

TURBIDITY-WT	Water	Turbidity	APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Reference Information

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

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 weight of sample

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

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.

ALS Environmental

Quality Control Report

Workorder: L1957684 Report Date: 28-JUL-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-TOT-WT	**Water**							
Batch R3774806								
WG2571579-11 DUP		**L1958279-1**						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-JUL-17
WG2571579-10 LCS								
Cyanide, Total			89.1		%		80-120	17-JUL-17
WG2571579-9 MB								
Cyanide, Total			<0.0020		mg/L		0.002	17-JUL-17
WG2571579-12 MS		**L1958279-1**						
Cyanide, Total			81.7		%		70-130	17-JUL-17
Batch R3777456								
WG2572086-3 DUP		**L1957483-1**						
Cyanide, Total		<0.020	<0.020	RPD-NA	mg/L	N/A	20	18-JUL-17
WG2572086-2 LCS								
Cyanide, Total			87.7		%		80-120	18-JUL-17
WG2572086-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	18-JUL-17
WG2572086-4 MS		**L1957483-1**						
Cyanide, Total			85.7		%		70-130	18-JUL-17
EC-WT	**Water**							
Batch R3771077								
WG2568970-16 DUP		**WG2568970-15**						
Conductivity		28.7	28.6		umhos/cm	0.4	10	13-JUL-17
WG2568970-13 LCS								
Conductivity			100.6		%		90-110	13-JUL-17
WG2568970-14 MB								
Conductivity			<3.0		umhos/cm		3	13-JUL-17
MET-T-CCMS-WT	**Water**							
Batch R3772363								
WG2569831-4 DUP		**WG2569831-3**						
Aluminum (Al)-Total		0.0428	0.0441		mg/L	2.9	20	14-JUL-17
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-JUL-17
Arsenic (As)-Total		0.00035	0.00036		mg/L	2.0	20	14-JUL-17
Barium (Ba)-Total		0.0365	0.0369		mg/L	1.1	20	14-JUL-17
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-JUL-17
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-JUL-17
Boron (B)-Total		0.012	0.012		mg/L	1.3	20	14-JUL-17
Cadmium (Cd)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-JUL-17

ALS Environmental

Quality Control Report

Workorder: L1957684 Report Date: 28-JUL-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3772363								
WG2569831-4 DUP		**WG2569831-3**						
Calcium (Ca)-Total		41.6	42.2		mg/L	1.6	20	14-JUL-17
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-JUL-17
Cesium (Cs)-Total		0.000010	0.000010		mg/L	2.9	20	14-JUL-17
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-JUL-17
Copper (Cu)-Total		0.0060	0.0062		mg/L	3.5	20	14-JUL-17
Iron (Fe)-Total		0.126	0.124		mg/L	1.6	20	14-JUL-17
Lead (Pb)-Total		0.000344	0.000347		mg/L	0.9	20	14-JUL-17
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	14-JUL-17
Magnesium (Mg)-Total		3.80	3.67		mg/L	3.6	20	14-JUL-17
Manganese (Mn)-Total		0.0338	0.0332		mg/L	1.7	20	14-JUL-17
Molybdenum (Mo)-Total		0.000267	0.000274		mg/L	2.3	20	14-JUL-17
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-JUL-17
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	14-JUL-17
Potassium (K)-Total		0.992	1.00		mg/L	1.0	20	14-JUL-17
Rubidium (Rb)-Total		0.00155	0.00152		mg/L	2.0	20	14-JUL-17
Selenium (Se)-Total		0.000077	0.000078		mg/L	1.4	20	14-JUL-17
Silicon (Si)-Total		1.76	1.53		mg/L	14	20	14-JUL-17
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-JUL-17
Sodium (Na)-Total		23.2	23.1		mg/L	0.4	20	14-JUL-17
Strontium (Sr)-Total		0.142	0.143		mg/L	1.0	20	14-JUL-17
Sulfur (S)-Total		3.09	2.50		mg/L	21	25	14-JUL-17
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-JUL-17
Tellurium (Te)-Total		0.00028	0.00029		mg/L	5.5	20	14-JUL-17
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	14-JUL-17
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-JUL-17
Titanium (Ti)-Total		0.00187	0.00171		mg/L	9.2	20	14-JUL-17
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-JUL-17
Uranium (U)-Total		0.000246	0.000245		mg/L	0.5	20	14-JUL-17
Vanadium (V)-Total		0.00057	0.00057		mg/L	0.4	20	14-JUL-17
Zinc (Zn)-Total		0.0051	0.0052		mg/L	0.2	20	14-JUL-17
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	14-JUL-17
WG2569831-2 LCS								
Aluminum (Al)-Total			99.9		%		80-120	14-JUL-17

Quality Control Report

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2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3772363								
WG2569831-2 LCS								
Antimony (Sb)-Total			105.4		%		80-120	14-JUL-17
Arsenic (As)-Total			100.2		%		80-120	14-JUL-17
Barium (Ba)-Total			98.1		%		80-120	14-JUL-17
Beryllium (Be)-Total			93.7		%		80-120	14-JUL-17
Bismuth (Bi)-Total			98.2		%		80-120	14-JUL-17
Boron (B)-Total			95.2		%		80-120	14-JUL-17
Cadmium (Cd)-Total			98.2		%		80-120	14-JUL-17
Calcium (Ca)-Total			101.8		%		80-120	14-JUL-17
Chromium (Cr)-Total			96.7		%		80-120	14-JUL-17
Cesium (Cs)-Total			104.2		%		80-120	14-JUL-17
Cobalt (Co)-Total			99.1		%		80-120	14-JUL-17
Copper (Cu)-Total			97.8		%		80-120	14-JUL-17
Iron (Fe)-Total			96.0		%		80-120	14-JUL-17
Lead (Pb)-Total			102.0		%		80-120	14-JUL-17
Lithium (Li)-Total			99.9		%		80-120	14-JUL-17
Magnesium (Mg)-Total			92.6		%		80-120	14-JUL-17
Manganese (Mn)-Total			101.5		%		80-120	14-JUL-17
Molybdenum (Mo)-Total			102.2		%		80-120	14-JUL-17
Nickel (Ni)-Total			97.6		%		80-120	14-JUL-17
Phosphorus (P)-Total			95.9		%		70-130	14-JUL-17
Potassium (K)-Total			96.5		%		80-120	14-JUL-17
Rubidium (Rb)-Total			101.8		%		80-120	14-JUL-17
Selenium (Se)-Total			98.3		%		80-120	14-JUL-17
Silicon (Si)-Total			123.5		%		60-140	14-JUL-17
Silver (Ag)-Total			103.1		%		80-120	14-JUL-17
Sodium (Na)-Total			100.0		%		80-120	14-JUL-17
Strontium (Sr)-Total			107.7		%		80-120	14-JUL-17
Sulfur (S)-Total			101.7		%		70-130	14-JUL-17
Thallium (Tl)-Total			100.3		%		80-120	14-JUL-17
Tellurium (Te)-Total			102.2		%		80-120	14-JUL-17
Thorium (Th)-Total			101.8		%		70-130	14-JUL-17
Tin (Sn)-Total			99.98		%		80-120	14-JUL-17
Titanium (Ti)-Total			99.98		%		80-120	14-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3772363								
WG2569831-2 LCS								
Tungsten (W)-Total			100.7		%		80-120	14-JUL-17
Uranium (U)-Total			102.0		%		80-120	14-JUL-17
Vanadium (V)-Total			100.3		%		80-120	14-JUL-17
Zinc (Zn)-Total			96.3		%		80-120	14-JUL-17
Zirconium (Zr)-Total			100.5		%		80-120	14-JUL-17
WG2569831-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	14-JUL-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	14-JUL-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	14-JUL-17
Barium (Ba)-Total			<0.00020		mg/L		0.0002	14-JUL-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	14-JUL-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	14-JUL-17
Boron (B)-Total			<0.010		mg/L		0.01	14-JUL-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	14-JUL-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	14-JUL-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	14-JUL-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	14-JUL-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	14-JUL-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	14-JUL-17
Iron (Fe)-Total			<0.050		mg/L		0.05	14-JUL-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	14-JUL-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	14-JUL-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	14-JUL-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	14-JUL-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	14-JUL-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	14-JUL-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	14-JUL-17
Potassium (K)-Total			<0.050		mg/L		0.05	14-JUL-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	14-JUL-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	14-JUL-17
Silicon (Si)-Total			<0.10		mg/L		0.1	14-JUL-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	14-JUL-17
Sodium (Na)-Total			<0.50		mg/L		0.5	14-JUL-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	14-JUL-17

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Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3772363								
WG2569831-1 MB								
Sulfur (S)-Total			<0.50		mg/L		0.5	14-JUL-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	14-JUL-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	17-JUL-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	14-JUL-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	14-JUL-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	14-JUL-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	14-JUL-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	14-JUL-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	14-JUL-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	14-JUL-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	14-JUL-17
WG2569831-5 MS		**WG2569831-3**						
Aluminum (Al)-Total			84.3		%		70-130	14-JUL-17
Antimony (Sb)-Total			104.6		%		70-130	14-JUL-17
Arsenic (As)-Total			97.7		%		70-130	14-JUL-17
Barium (Ba)-Total			N/A	MS-B	%		-	14-JUL-17
Beryllium (Be)-Total			90.3		%		70-130	14-JUL-17
Bismuth (Bi)-Total			94.6		%		70-130	14-JUL-17
Boron (B)-Total			92.1		%		70-130	14-JUL-17
Cadmium (Cd)-Total			97.9		%		70-130	14-JUL-17
Calcium (Ca)-Total			N/A	MS-B	%		-	14-JUL-17
Chromium (Cr)-Total			95.3		%		70-130	14-JUL-17
Cesium (Cs)-Total			106.1		%		70-130	14-JUL-17
Cobalt (Co)-Total			95.1		%		70-130	14-JUL-17
Copper (Cu)-Total			92.5		%		70-130	14-JUL-17
Iron (Fe)-Total			N/A	MS-B	%		-	14-JUL-17
Lead (Pb)-Total			100.8		%		70-130	14-JUL-17
Lithium (Li)-Total			88.6		%		70-130	14-JUL-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	14-JUL-17
Manganese (Mn)-Total			N/A	MS-B	%		-	14-JUL-17
Molybdenum (Mo)-Total			100.4		%		70-130	14-JUL-17
Nickel (Ni)-Total			93.8		%		70-130	14-JUL-17
Phosphorus (P)-Total			85.1		%		70-130	14-JUL-17
Potassium (K)-Total			96.3		%		70-130	14-JUL-17

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2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3772363								
WG2569831-5 MS		**WG2569831-3**						
Rubidium (Rb)-Total			97.2		%		70-130	14-JUL-17
Selenium (Se)-Total			99.3		%		70-130	14-JUL-17
Silicon (Si)-Total			N/A	MS-B	%		-	14-JUL-17
Silver (Ag)-Total			101.9		%		70-130	14-JUL-17
Sodium (Na)-Total			N/A	MS-B	%		-	14-JUL-17
Strontium (Sr)-Total			N/A	MS-B	%		-	14-JUL-17
Sulfur (S)-Total			N/A	MS-B	%		-	14-JUL-17
Thallium (Tl)-Total			98.3		%		70-130	14-JUL-17
Tellurium (Te)-Total			98.5		%		70-130	14-JUL-17
Thorium (Th)-Total			94.3		%		70-130	14-JUL-17
Tin (Sn)-Total			99.5		%		70-130	14-JUL-17
Titanium (Ti)-Total			92.0		%		70-130	14-JUL-17
Tungsten (W)-Total			101.5		%		70-130	14-JUL-17
Uranium (U)-Total			97.8		%		70-130	14-JUL-17
Vanadium (V)-Total			99.0		%		70-130	14-JUL-17
Zinc (Zn)-Total			93.7		%		70-130	14-JUL-17
Zirconium (Zr)-Total			98.4		%		70-130	14-JUL-17
PH-WT	**Water**							
Batch R3771077								
WG2568970-16 DUP		**WG2568970-15**						
pH		7.26	7.27	J	pH units	0.01	0.2	13-JUL-17
WG2568970-13 LCS								
pH			6.99		pH units		6.9-7.1	13-JUL-17
SOLIDS-TDS-WT	**Water**							
Batch R3772562								
WG2569387-3 DUP		**L1956563-1**						
Total Dissolved Solids		136	136		mg/L	0.0	20	13-JUL-17
WG2569387-2 LCS								
Total Dissolved Solids			99.1		%		85-115	13-JUL-17
WG2569387-1 MB								
Total Dissolved Solids			<10		mg/L		10	13-JUL-17
SOLIDS-TSS-WT	**Water**							

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Oakville ON L6H 0C3
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TSS-WT	**Water**							
Batch R3772925								
WG2569987-3 DUP		**WG2569987-4**						
Total Suspended Solids		20.8	19.2		mg/L	7.7	20	15-JUL-17
WG2569987-2 LCS								
Total Suspended Solids			102.2		%		85-115	15-JUL-17
WG2569987-1 MB								
Total Suspended Solids			<2.0		mg/L		2	15-JUL-17
TURBIDITY-WT	**Water**							
Batch R3771643								
WG2569986-3 DUP		**L1956563-1**						
Turbidity		0.14	0.23	J	NTU	0.090	0.2	14-JUL-17
WG2569986-2 LCS								
Turbidity			108.0		%		85-115	14-JUL-17
WG2569986-1 MB								
Turbidity			<0.10		NTU		0.1	14-JUL-17

Client: Baffinland Iron Mine’s Corporation (Oakville)
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Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1957684 Report Date: 28-JUL-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity							
	1	11-JUL-17 10:00	14-JUL-17 00:00	48	62	hours	EHTR
	2	11-JUL-17 10:00	14-JUL-17 00:00	48	62	hours	EHTR

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1957684 were received on 13-JUL-17 10:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Wednesday, July 26, 2017

Rick Hawthorne
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1707199
Project Name:
Project Number: L1957684

Dear Mr. Hawthorne:

Two water samples were received from ALS Environmental, on 7/14/2017. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1707199

Radium-226:
The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1707199
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1957684
Client PO Number: L1957684

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1957684-1	1707199-1		WATER	11-Jul-17	
L1957684-2	1707199-2		WATER	11-Jul-17	

ALS Environmental

1707199

L1957684

WATERLOO

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# *L1957684*
ALS requires QC data to be provided with your final results.

Please see enclosed 2 **sample(s) in** 2 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1957684-1 MS-08		7/ 11/ 2017	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/7/2017	
L1957684-2 MS-0801		7/ 11/ 2017	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/7/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ____________ Date Shipped: ____________

Received By: [signature] Date Received: 7/14/17 @1440

Verified By: ____________ Date Verified: ____________

Temperature: ____________

Sample Integrity Issues: ____________

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS WATER100 Workorder No: 1707199

Project Manager: SJS Initials: JA Date: 7/14/17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are Custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5. Are the COC and bottle labels complete and legible?		YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		YES	NO
12. Are all samples within holding times for the requested analyses?		YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	N/A	YES	NO
15. Do any water samples contain sediment? Amount. Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	NO
16. Were the samples shipped on ice?		YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	NO

Cooler #:	1							
Temperature (°C):	14.8							
No. of custody seals on cooler:	0							
External µR/hr reading:	10							
Background µR/hr reading:	10							

DOT Survey/ Acceptance Information

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

If applicable, was the client contacted? YES / NO / NA Contact: ______ Date/Time: ______

Project Manager Signature / Date: [signature]

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

1707199

EXPRESS WORLDWIDE / WPX DHL

2017-07-13 WSI 3.23.00 / "88-1411"

From : ALS Environmental
Ed Hill
60 Northland Rd
Unit 1
N2V 2B8 WATERLOO, ON
Canada

14:40

Origin:
YHM

Contact: Ph : 15198866910235

To: ALS Environmental Fort Collins
Sample Login
225 Commerce Drive
80524 FORT COLLINS CO
United States Of America

Contact:
Ph :18004431611

US – DEN – DEN

C

Day Time

Pce/Shpt Weight 13.20/13.2 lbs

Piece 1/1

10-0

Contents:Samples for testing – wa

10

WAYBILL 32 2012 4902

14.8°

(2L)US80524+48000001

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*26-Jul-17*
Project:	L1957684	**Work Order:**	1707199
Sample ID:	L1957684-1	**Lab ID:**	1707199-1
Legal Location:		**Matrix:**	WATER
Collection Date:	7/11/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **7/17/2017**	PrepBy: **HCJ**
Ra-226	**0.012 (+/- 0.0064)**		**0.0045**	**BQ/l**	NA	7/25/2017 12:01
Carr: BARIUM	*100*		*40-110*	*%REC*	DL = NA	7/25/2017 12:01

SAMPLE SUMMARY REPORT

Client:	ALS Environmental		**Date:**	*26-Jul-17*
Project:	L1957684		**Work Order:**	1707199
Sample ID:	L1957684-2		**Lab ID:**	1707199-2
Legal Location:			**Matrix:**	WATER
Collection Date:	7/11/2017		**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **7/17/2017**	PrepBy: **HCJ**
Ra-226	0.0053 (+/- 0.0047)	Y1,U	0.0067	BQ/l	NA	7/25/2017 12:01
Carr: BARIUM	*101*	Y1	*40-110*	*%REC*	DL = NA	7/25/2017 12:01

Client:	ALS Environmental	**Date:**	*26-Jul-17*
Project:	L1957684	**Work Order:**	1707199
Sample ID:	L1957684-2	**Lab ID:**	1707199-2
Legal Location:		**Matrix:**	WATER
Collection Date:	7/11/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Date: *7/26/2017 1:58:*

Client: ALS Environmental
Work Order: 1707199
Project: L1957684

QC BATCH REPORT

Batch ID: **RE170717-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170717-1** Units: **BQ/l** Analysis Date: **7/25/2017 12:35**
Client ID: Run ID: **RE170717-1B** Prep Date: **7/17/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.61 (+/- 0.399)	0.00757	1.715		93.8	67-120					P,Y1
Carr: BARIUM	16300		16290		100	40-110					Y1

LCSD Sample ID: **RE170717-1** Units: **BQ/l** Analysis Date: **7/25/2017 12:35**
Client ID: Run ID: **RE170717-1B** Prep Date: **7/17/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.69 (+/- 0.418)	0.00926	1.715		98.4	67-120		1.61	0.1	2.1	P
Carr: BARIUM	16300		16290		99.9	40-110		16300			

MB Sample ID: **RE170717-1** Units: **BQ/l** Analysis Date: **7/25/2017 12:01**
Client ID: Run ID: **RE170717-1B** Prep Date: **7/17/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.0044 (+/- 0.0039)	0.0046									U
Carr: BARIUM	16000		16290		98.1	40-110					

The following samples were analyzed in this batch: 1707199-1 1707199-2

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Daphnia magna

Work Order : 233948
Sample Number : 51686

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	BW/LM
Location :	Waterloo ON	Time Collected :	10:00
Job Number :	L1957684	Date Collected :	2017-07-11
Substance :	MS-08	Date Received :	2017-07-13
Sampling Method :	Not provided	Date Tested :	2017-07-15
Sample Description :	Clear, yellow, odourless.	Temp. on arrival :	22.0° C

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	Dm17-16		
Date Tested (yyyy/mm/dd) :	2017-07-05	Historical Mean LC50 :	5.8 g/L
LC50 (95% Confidence Limits) :	5.6 g/L (5.2 - 6.0)	Warning Limits (± 2SD) :	5.2 - 6.4 g/L
Statistical Method :	Linear Regression (MLE)	Analyst(s) :	CZN, AW, JF

Daphnia magna CULTURE HEALTH DATA

Time to First Brood :	7.2 days	Mean Young Per Brood :	29.6
Culture Mortality :	5.7% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Test Organisms / Replicate :	10
Test Aeration :	None	Total Organisms / Test Level :	30
Organism Batch :	Dm17-16	Organism Loading Rate :	15.0 mL/organism
		Test Method Deviation(s) :	None

Date: 2017-07-21
yyyy-mm-dd

Approved by: [signature]
Project Manager

AQUATOX

TOXICITY TEST REPORT
Daphnia magna

Work Order: 233948
Sample Number: 51686

	Hardness (mg/L as $CaCO_3$)	Hardness Adjustment	pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*	Total Pre-Aeration Time (h) @ 30 mL/min/L
Initial Water Chemistry:	230	None	7.5	9.0	487	21.0	106	0:30

0 hours

Date & Time 2017-07-15 10:25
Technician: AW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*	Hardness
100A	0	0	7.7	8.7	497	21.0	101	230
100B	0	0	7.7	8.7	497	21.0	101	230
100C	0	0	7.7	8.7	497	21.0	101	230
Control A	0	0	8.5	8.4	524	21.0	99	240
Control B	0	0	8.5	8.4	524	21.0	99	240
Control C	0	0	8.5	8.4	524	21.0	99	240

Notes:

24 hours

Date & Time 2017-07-16 10:25
Technician: AW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	–	0	–		–	21.0
100B	–	0	–	–	–	21.0
100C	–	0	–	–	–	21.0
Control A	–	0	–		–	21.0
Control B	–	0	–	–	–	21.0
Control C	–	0		–	–	21.0

Notes:

48 hours

Date & Time 2017-07-17 10:25
Technician: CZN

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	0	0	7.6	8.4	492	21.0
100B	0	0	7.6	8.4	491	21.0
100C	0	0	7.5	8.4	491	21.0
Control A	0	0	8.4	8.4	538	21.0
Control B	0	0	8.5	8.4	534	21.0
Control C	0	0	8.5	8.5	534	21.0

Notes:

Control organisms showing stress: 0
Organism Batch : Dm17-16

Number immobile does not include number of mortalities.

– = not measured/not required
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2017-07-20

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 233948
Sample Number : 51686

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	BW/LM
Location :	Waterloo ON	Time Collected :	10:00
Job Number :	L1957684	Date Collected :	2017-07-11
Substance :	MS-08	Date Received :	2017-07-13
Sampling Method :	Not provided	Date Tested :	2017-07-14
Sample Description :	Clear, yellow, odourless.	Temp. on arrival :	22.0°C

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T17-10		
Date Tested (yyyy-mm-dd) :	2017-07-10	Historical Mean LC50 :	3643 mg/L
LC50 (95% Confidence Limits) :	4173 mg/L (3648 - 4591)	Warning Limits (± 2SD) :	3111 - 4266 mg/L
Statistical Method :	Linear Regression (MLE)	Analyst(s) :	NL, SV

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0.4 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.49 ± 0.16 g	Mean Fish Fork Length (± 2 SD) :	37.6 ± 4.0 mm
Range of Weights :	0.37 - 0.58 g	Range of Fork Lengths (mm) :	35 - 40 mm
Fish Loading Rate :	0.3 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	17
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2017-07-21
yyyy-mm-dd

Approved by: [signature]
Project Manager

AQUATOX

TOXICITY TEST REPORT
Rainbow Trout

Work Order: 233948
Sample Number: 51686

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	**Initial Water Chemistry:**	6.6	9.4	471	14.5	–
	Chemistry after 30min air:	6.6	9.5	467	15.0	99

0 hours

Date & Time 2017-07-14 9:50
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	6.6	9.5	467	15.0	99
Control	0	0	8.3	9.7	738	14.0	100

Notes:

24 hours

Date & Time 2017-07-15 9:50
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	·		–	14.5
Control	0	0	–	–	–	14.5

Notes:

48 hours

Date & Time 2017-07-16 9:50
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.5
Control	0	0	–	–	·	14.5

Notes:

72 hours

Date & Time 2017-07-17 9:50
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–		14.5
Control	0	0	–	–	–	14.5

Notes:

96 hours

Date & Time 2017-07-18 9:50
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	6.9	9.6	473	14.5
Control	0	0	8.3	9.6	679	14.5

Notes:

Control organisms showing stress: 0
Organism Batch : T17-10

"–" – not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2017-07-19

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 233948

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	4500017476
Field Sampler Name (print):	BW / LM
Signature:	
Affiliation:	ALS ENV
Sample Storage (prior to shipping):	
Custody Relinquished by:	RH
Date/Time Shipped:	12 Jul 17

Client:	ALS Environmental Waterloo Q# 162705399-15
Phone:	519 - 886 - 6910
Fax:	519 - 886 - 9047
Contact:	Wayne Smith / Rick Hawthorne

Sample Identification					Analyses Requested									Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	L1957684-1 Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2017-07-11	1000	MS-08	51686	22.0	X		X									1 Pail

For Lab Use Only

Received By:	N. Kreager
Date:	2017-07-13
Time:	16:00
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions:
Regular Baffinland Toxicity Tests

Standard COC rev 3 2016 09 01 TC

ALS Environmental

L1957684

WATERLOO

Subcontract Request Form

Subcontract To:

AQUATOX TESTING AND CONSULTING
11B NICHOLAS BEAVER ROAD
RR3
GUELPH,ON N1H 6H9

NOTES: Please reference on final report and invoice: PO# L1957684
ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 0 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1957684-1 MS-08		7/ 11/ 2017	
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	8/2/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	7/27/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910
Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______________ Date Shipped: ______________

Received By: ______________ Date Received: ______________

Verified By: ______________ Date Verified: ______________

Temperature: ______________

Sample Integrity Issues: ______________

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1957684-COFC

COC Number: 15 -

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	647-253-0596 EXT 6010
	Company address below will appear on the final report
Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	bimcore@alsglobal.com
Email 2	bimww@alsglobal.com
Email 3	
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@baffinland.com
Email 2	commercial@baffinland.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4]	☐	1 Business day [E1]	☐
3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☐
2 day [P2]	☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

Project Information	
ALS Account # / Quote #:	23642 /Q42455
Job #:	MS-08
PO / AFE:	4500027854
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only) L1957684 [initials] Jul 13

ALS Contact:

Sampler: BW/LM/LM

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	BIM-MMER-DEL	Group 3	Number of Containers
1	MS-08	11-Jul-17	10:00	Water	R	R	6
2	MS-0801	11-Jul-17	10:00	Water	R		5

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐		SIF Observations	Yes ☐ No ☐
Ice Packs ☐	Ice Cubes ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated ☐			

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C: 15.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ben Widdowson	Date: 2017-07-11 11:18	Time:	Received by:	Date:	Time:	Received by: [initials]	Date: 13 Jul 17	Time: 10:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 24-JUL-17
Report Date: 11-AUG-17 09:31 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1963051

Project P.O. #: 4500027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1963051-1 MS-08							
Sampled By: LM/OJ/BW on 18-JUL-17 @ 10:15							
Matrix: WATER							
Physical Tests							
Conductivity	608		3.0	umhos/cm		24-JUL-17	R3781248
pH	6.93	PEHR	0.10	pH units		24-JUL-17	R3781248
Total Suspended Solids	5.8		2.0	mg/L	24-JUL-17	25-JUL-17	R3781543
Total Dissolved Solids	446	HTD	20	mg/L		26-JUL-17	R3782501
Turbidity	10.1	PEHR	0.10	NTU		26-JUL-17	R3782335
Cyanides							
Cyanide, Total	<0.0020		0.0020	mg/L		28-JUL-17	R3785390
Total Metals							
Aluminum (Al)-Total	0.167		0.0050	mg/L	25-JUL-17	25-JUL-17	R3782225
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	25-JUL-17	25-JUL-17	R3782225
Arsenic (As)-Total	<0.00010		0.00010	mg/L	25-JUL-17	25-JUL-17	R3782225
Barium (Ba)-Total	0.0104		0.00020	mg/L	25-JUL-17	25-JUL-17	R3782225
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	25-JUL-17	25-JUL-17	R3782225
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	25-JUL-17	25-JUL-17	R3782225
Boron (B)-Total	0.015		0.010	mg/L	25-JUL-17	25-JUL-17	R3782225
Cadmium (Cd)-Total	0.000058		0.000010	mg/L	25-JUL-17	25-JUL-17	R3782225
Calcium (Ca)-Total	20.8		0.50	mg/L	25-JUL-17	25-JUL-17	R3782225
Cesium (Cs)-Total	0.000028		0.000010	mg/L	25-JUL-17	25-JUL-17	R3782225
Chromium (Cr)-Total	0.00059		0.00050	mg/L	25-JUL-17	25-JUL-17	R3782225
Cobalt (Co)-Total	0.0231		0.00010	mg/L	25-JUL-17	25-JUL-17	R3782225
Copper (Cu)-Total	0.0026		0.0010	mg/L	25-JUL-17	25-JUL-17	R3782225
Iron (Fe)-Total	0.910		0.050	mg/L	25-JUL-17	25-JUL-17	R3782225
Lead (Pb)-Total	0.000329		0.000050	mg/L	25-JUL-17	25-JUL-17	R3782225
Lithium (Li)-Total	0.0046		0.0010	mg/L	25-JUL-17	25-JUL-17	R3782225
Magnesium (Mg)-Total	57.7		0.050	mg/L	25-JUL-17	25-JUL-17	R3782225
Manganese (Mn)-Total	1.94		0.00050	mg/L	25-JUL-17	25-JUL-17	R3782225
Molybdenum (Mo)-Total	0.000064		0.000050	mg/L	25-JUL-17	25-JUL-17	R3782225
Nickel (Ni)-Total	0.0266		0.00050	mg/L	25-JUL-17	25-JUL-17	R3782225
Phosphorus (P)-Total	<0.050		0.050	mg/L	25-JUL-17	25-JUL-17	R3782225
Potassium (K)-Total	1.22		0.050	mg/L	25-JUL-17	25-JUL-17	R3782225
Rubidium (Rb)-Total	0.00260		0.00020	mg/L	25-JUL-17	25-JUL-17	R3782225
Selenium (Se)-Total	0.00117		0.000050	mg/L	25-JUL-17	25-JUL-17	R3782225
Silicon (Si)-Total	0.75		0.10	mg/L	25-JUL-17	25-JUL-17	R3782225
Silver (Ag)-Total	<0.000050		0.000050	mg/L	25-JUL-17	25-JUL-17	R3782225
Sodium (Na)-Total	0.96		0.50	mg/L	25-JUL-17	25-JUL-17	R3782225
Strontium (Sr)-Total	0.0154		0.0010	mg/L	25-JUL-17	25-JUL-17	R3782225
Sulfur (S)-Total	94.6		0.50	mg/L	25-JUL-17	25-JUL-17	R3782225
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	25-JUL-17	25-JUL-17	R3782225
Thallium (Tl)-Total	0.000025		0.000010	mg/L	25-JUL-17	25-JUL-17	R3782225
Thorium (Th)-Total	0.00020		0.00010	mg/L	25-JUL-17	25-JUL-17	R3782225
Tin (Sn)-Total	<0.00010		0.00010	mg/L	25-JUL-17	25-JUL-17	R3782225

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1963051-1 MS-08 Sampled By: LM/OJ/BW on 18-JUL-17 @ 10:15 Matrix: WATER							
Total Metals							
Titanium (Ti)-Total	0.00963		0.00030	mg/L	25-JUL-17	25-JUL-17	R3782225
Tungsten (W)-Total	<0.00010		0.00010	mg/L	25-JUL-17	25-JUL-17	R3782225
Uranium (U)-Total	0.000110		0.000010	mg/L	25-JUL-17	25-JUL-17	R3782225
Vanadium (V)-Total	<0.00050		0.00050	mg/L	25-JUL-17	25-JUL-17	R3782225
Zinc (Zn)-Total	0.0067		0.0030	mg/L	25-JUL-17	25-JUL-17	R3782225
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	25-JUL-17	25-JUL-17	R3782225
Radiological Parameters							
Ra-226	0.012		0.0069	Bq/L	27-JUL-17	04-AUG-17	R3786631

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Total	MS-B	L1963051-1
Matrix Spike	Boron (B)-Total	MS-B	L1963051-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L1963051-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1963051-1
Matrix Spike	Manganese (Mn)-Total	MS-B	L1963051-1
Matrix Spike	Potassium (K)-Total	MS-B	L1963051-1
Matrix Spike	Silicon (Si)-Total	MS-B	L1963051-1
Matrix Spike	Sodium (Na)-Total	MS-B	L1963051-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L1963051-1
Matrix Spike	Sulfur (S)-Total	MS-B	L1963051-1
Matrix Spike	Uranium (U)-Total	MS-B	L1963051-1

Sample Parameter Qualifier key listed:

Qualifier	Description
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

ALS Test Code	Matrix	Test Description	Method Reference**
EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ALS Test Code	Matrix	Test Description	Method Reference**
MET-T-CCMS-WT	Water	Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ALS Test Code	Matrix	Test Description	Method Reference**
PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

ALS Test Code	Matrix	Test Description	Method Reference**
RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5□C overnight and then 180–10□C for 1hr.

ALS Test Code	Matrix	Test Description	Method Reference**
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1□C for a minimum of four hours or until a constant weight is achieved.

ALS Test Code	Matrix	Test Description	Method Reference**
TURBIDITY-WT	Water	Turbidity	APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Reference Information

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

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 weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
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.

ALS Environmental

Quality Control Report

Workorder: L1963051 Report Date: 11-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-TOT-WT	**Water**							
Batch R3785390								
WG2580452-3 DUP		**L1963021-1**						
Cyanide, Total		0.0268	0.0270		mg/L	0.7	20	28-JUL-17
WG2580452-2 LCS								
Cyanide, Total			88.1		%		80-120	28-JUL-17
WG2580452-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	28-JUL-17
WG2580452-4 MS		**L1963021-1**						
Cyanide, Total			75.8		%		70-130	28-JUL-17
EC-WT	**Water**							
Batch R3781248								
WG2576387-12 DUP		**WG2576387-11**						
Conductivity		713	713		umhos/cm	0.0	10	24-JUL-17
WG2576387-9 LCS								
Conductivity			100.4		%		90-110	24-JUL-17
WG2576387-10 MB								
Conductivity			<3.0		umhos/cm		3	24-JUL-17
MET-T-CCMS-WT	**Water**							
Batch R3782225								
WG2577061-4 DUP		**WG2577061-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	25-JUL-17
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-JUL-17
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-JUL-17
Barium (Ba)-Total		0.126	0.130		mg/L	3.2	20	25-JUL-17
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-JUL-17
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	25-JUL-17
Boron (B)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	25-JUL-17
Cadmium (Cd)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	25-JUL-17
Calcium (Ca)-Total		138	144		mg/L	4.5	20	25-JUL-17
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	25-JUL-17
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	25-JUL-17
Cobalt (Co)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-JUL-17
Copper (Cu)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	25-JUL-17
Iron (Fe)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	25-JUL-17
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	25-JUL-17
Lithium (Li)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	25-JUL-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3782225								
WG2577061-4 DUP		**WG2577061-3**						
Magnesium (Mg)-Total		37.9	38.6		mg/L	1.9	20	25-JUL-17
Manganese (Mn)-Total		0.115	0.119		mg/L	3.3	20	25-JUL-17
Molybdenum (Mo)-Total		0.00075	0.00075		mg/L	0.7	20	25-JUL-17
Nickel (Ni)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	25-JUL-17
Phosphorus (P)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	25-JUL-17
Potassium (K)-Total		5.95	6.14		mg/L	3.2	20	25-JUL-17
Rubidium (Rb)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	25-JUL-17
Selenium (Se)-Total		0.00080	0.00080		mg/L	0.1	20	25-JUL-17
Silicon (Si)-Total		4.8	5.1		mg/L	4.1	20	25-JUL-17
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	25-JUL-17
Sodium (Na)-Total		351	367		mg/L	4.3	20	25-JUL-17
Strontium (Sr)-Total		0.438	0.462		mg/L	5.3	20	25-JUL-17
Sulfur (S)-Total		25.4	26.6		mg/L	4.6	25	25-JUL-17
Thallium (Tl)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	25-JUL-17
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	25-JUL-17
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	25-JUL-17
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-JUL-17
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	25-JUL-17
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-JUL-17
Uranium (U)-Total		0.00592	0.00604		mg/L	2.0	20	25-JUL-17
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	25-JUL-17
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	25-JUL-17
Zirconium (Zr)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	25-JUL-17
WG2577061-2 LCS								
Aluminum (Al)-Total			93.9		%		80-120	25-JUL-17
Antimony (Sb)-Total			99.8		%		80-120	25-JUL-17
Arsenic (As)-Total			92.8		%		80-120	25-JUL-17
Barium (Ba)-Total			95.6		%		80-120	25-JUL-17
Beryllium (Be)-Total			97.4		%		80-120	25-JUL-17
Bismuth (Bi)-Total			102.6		%		80-120	25-JUL-17
Boron (B)-Total			93.2		%		80-120	25-JUL-17
Cadmium (Cd)-Total			92.4		%		80-120	25-JUL-17
Calcium (Ca)-Total			99.5		%		80-120	25-JUL-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3782225								
WG2577061-2 LCS								
Chromium (Cr)-Total			94.1		%		80-120	25-JUL-17
Cesium (Cs)-Total			102.0		%		80-120	25-JUL-17
Cobalt (Co)-Total			92.2		%		80-120	25-JUL-17
Copper (Cu)-Total			92.3		%		80-120	25-JUL-17
Iron (Fe)-Total			97.3		%		80-120	25-JUL-17
Lead (Pb)-Total			104.8		%		80-120	25-JUL-17
Lithium (Li)-Total			104.3		%		80-120	25-JUL-17
Magnesium (Mg)-Total			93.7		%		80-120	25-JUL-17
Manganese (Mn)-Total			93.4		%		80-120	25-JUL-17
Molybdenum (Mo)-Total			98.9		%		80-120	25-JUL-17
Nickel (Ni)-Total			93.5		%		80-120	25-JUL-17
Phosphorus (P)-Total			94.4		%		70-130	25-JUL-17
Potassium (K)-Total			92.7		%		80-120	25-JUL-17
Rubidium (Rb)-Total			94.9		%		80-120	25-JUL-17
Selenium (Se)-Total			99.9		%		80-120	25-JUL-17
Silicon (Si)-Total			111.5		%		60-140	25-JUL-17
Silver (Ag)-Total			98.9		%		80-120	25-JUL-17
Sodium (Na)-Total			94.9		%		80-120	25-JUL-17
Strontium (Sr)-Total			107.4		%		80-120	25-JUL-17
Sulfur (S)-Total			96.2		%		70-130	25-JUL-17
Thallium (Tl)-Total			101.0		%		80-120	25-JUL-17
Tellurium (Te)-Total			96.3		%		80-120	25-JUL-17
Thorium (Th)-Total			101.8		%		70-130	25-JUL-17
Tin (Sn)-Total			92.6		%		80-120	25-JUL-17
Titanium (Ti)-Total			87.9		%		80-120	25-JUL-17
Tungsten (W)-Total			105.6		%		80-120	25-JUL-17
Uranium (U)-Total			106.6		%		80-120	25-JUL-17
Vanadium (V)-Total			94.6		%		80-120	25-JUL-17
Zinc (Zn)-Total			85.2		%		80-120	25-JUL-17
Zirconium (Zr)-Total			94.6		%		80-120	25-JUL-17
WG2577061-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	25-JUL-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	25-JUL-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	25-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3782225								
WG2577061-1 MB								
Barium (Ba)-Total			<0.00020		mg/L		0.0002	25-JUL-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	25-JUL-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	25-JUL-17
Boron (B)-Total			<0.010		mg/L		0.01	25-JUL-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	25-JUL-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	25-JUL-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	25-JUL-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	25-JUL-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	25-JUL-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	25-JUL-17
Iron (Fe)-Total			<0.050		mg/L		0.05	25-JUL-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	25-JUL-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	25-JUL-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	25-JUL-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	25-JUL-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	25-JUL-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	25-JUL-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	25-JUL-17
Potassium (K)-Total			<0.050		mg/L		0.05	25-JUL-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	25-JUL-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	25-JUL-17
Silicon (Si)-Total			<0.10		mg/L		0.1	25-JUL-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	25-JUL-17
Sodium (Na)-Total			<0.50		mg/L		0.5	25-JUL-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	25-JUL-17
Sulfur (S)-Total			<0.50		mg/L		0.5	25-JUL-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	25-JUL-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	25-JUL-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	25-JUL-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	25-JUL-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	25-JUL-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	25-JUL-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	25-JUL-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3782225								
WG2577061-1 MB								
Vanadium (V)-Total			<0.00050		mg/L		0.0005	25-JUL-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	25-JUL-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	25-JUL-17
WG2577061-5 MS		**WG2577061-3**						
Aluminum (Al)-Total			99.3		%		70-130	25-JUL-17
Antimony (Sb)-Total			99.4		%		70-130	25-JUL-17
Arsenic (As)-Total			99.4		%		70-130	25-JUL-17
Barium (Ba)-Total			N/A	MS-B	%		-	25-JUL-17
Beryllium (Be)-Total			94.0		%		70-130	25-JUL-17
Bismuth (Bi)-Total			101.1		%		70-130	25-JUL-17
Boron (B)-Total			N/A	MS-B	%		-	25-JUL-17
Cadmium (Cd)-Total			97.8		%		70-130	25-JUL-17
Calcium (Ca)-Total			N/A	MS-B	%		-	25-JUL-17
Chromium (Cr)-Total			97.8		%		70-130	25-JUL-17
Cesium (Cs)-Total			101.8		%		70-130	25-JUL-17
Cobalt (Co)-Total			95.1		%		70-130	25-JUL-17
Copper (Cu)-Total			95.2		%		70-130	25-JUL-17
Iron (Fe)-Total			97.1		%		70-130	25-JUL-17
Lead (Pb)-Total			99.1		%		70-130	25-JUL-17
Lithium (Li)-Total			84.0		%		70-130	25-JUL-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	25-JUL-17
Manganese (Mn)-Total			N/A	MS-B	%		-	25-JUL-17
Molybdenum (Mo)-Total			96.0		%		70-130	25-JUL-17
Nickel (Ni)-Total			95.6		%		70-130	25-JUL-17
Potassium (K)-Total			N/A	MS-B	%		-	25-JUL-17
Rubidium (Rb)-Total			98.7		%		70-130	25-JUL-17
Selenium (Se)-Total			99.4		%		70-130	25-JUL-17
Silicon (Si)-Total			N/A	MS-B	%		-	25-JUL-17
Silver (Ag)-Total			94.7		%		70-130	25-JUL-17
Sodium (Na)-Total			N/A	MS-B	%		-	25-JUL-17
Strontium (Sr)-Total			N/A	MS-B	%		-	25-JUL-17
Sulfur (S)-Total			N/A	MS-B	%		-	25-JUL-17
Thallium (Tl)-Total			98.3		%		70-130	25-JUL-17
Tellurium (Te)-Total			95.7		%		70-130	25-JUL-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3782225								
WG2577061-5 MS		**WG2577061-3**						
Thorium (Th)-Total			93.5		%		70-130	25-JUL-17
Tin (Sn)-Total			98.1		%		70-130	25-JUL-17
Titanium (Ti)-Total			92.7		%		70-130	25-JUL-17
Tungsten (W)-Total			102.0		%		70-130	25-JUL-17
Uranium (U)-Total			N/A	MS-B	%		-	25-JUL-17
Vanadium (V)-Total			101.4		%		70-130	25-JUL-17
Zinc (Zn)-Total			93.5		%		70-130	25-JUL-17
Zirconium (Zr)-Total			91.5		%		70-130	25-JUL-17
PH-WT	**Water**							
Batch R3781248								
WG2576387-12 DUP		**WG2576387-11**						
pH		8.13	8.13	J	pH units	0.01	0.2	24-JUL-17
WG2576387-9 LCS								
pH			6.99		pH units		6.9-7.1	24-JUL-17
SOLIDS-TDS-WT	**Water**							
Batch R3782501								
WG2578289-3 DUP		**L1963051-1**						
Total Dissolved Solids		446	431		mg/L	3.4	20	26-JUL-17
WG2578289-2 LCS								
Total Dissolved Solids			98.5		%		85-115	26-JUL-17
WG2578289-1 MB								
Total Dissolved Solids			<10		mg/L		10	26-JUL-17
SOLIDS-TSS-WT	**Water**							
Batch R3781543								
WG2576631-2 LCS								
Total Suspended Solids			99.2		%		85-115	25-JUL-17
WG2576631-1 MB								
Total Suspended Solids			<2.0		mg/L		2	25-JUL-17
TURBIDITY-WT	**Water**							
Batch R3782335								
WG2578083-3 DUP		**L1964077-4**						
Turbidity		2.02	1.93		NTU	4.6	15	26-JUL-17
WG2578083-2 LCS								
Turbidity			104.0		%		85-115	26-JUL-17
WG2578083-1 MB								

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-WT	**Water**							
Batch R3782335								
WG2578083-1 MB								
Turbidity			<0.10		NTU		0.1	26-JUL-17

Quality Control Report

Workorder: L1963051 Report Date: 11-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Total Dissolved Solids							
	1	18-JUL-17 10:15	26-JUL-17 00:00	7	8	days	EHT
Turbidity							
	1	18-JUL-17 10:15	26-JUL-17 08:00	48	190	hours	EHTR
pH							
	1	18-JUL-17 10:15	24-JUL-17 00:00	4	6	days	EHTR

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1963051 were received on 24-JUL-17 09:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Tuesday, August 08, 2017

Rick Hawthorne
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1707390
Project Name:
Project Number: L1963051

Dear Mr. Hawthorne:

One water sample was received from ALS Environmental, on 7/25/2017. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1707390

Radium-226:
The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1707390
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1963051
Client PO Number: L1963051

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1963051-1	1707390-1		WATER	18-Jul-17	

ALS Environmental

1707390

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES:	Please reference on final report and invoice: PO# *L1963051* ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 1 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1963051-1 MS-08		7/ 18/ 2017	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/16/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: DHL Date Shipped:

Received By: Date Received: 7/25/17 1300

Verified By: Date Verified:

Temperature:

Sample Integrity Issues:

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS CA   Workorder No: 1707390

Project Manager: ______   Initials: JNS   Date: 7/25/17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	NO	
2. Are custody seals on shipping containers intact?	NONE	YES	NO	
3. Are Custody seals on sample containers intact?	NONE	YES	NO	
4. Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO	
5. Are the COC and bottle labels complete and legible?		YES	NO	
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO	
7. Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO	
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO	
9. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO	
10. Is there sufficient sample for the requested analyses?		YES	NO	
11. Were all samples placed in the proper containers for the requested analyses?		YES	NO	
12. Are all samples within holding times for the requested analyses?		YES	NO	
13. Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO	
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	N/A	YES	NO	
15. Do any water samples contain sediment? Amount of sediment: ____ dusting ____ moderate ____ heavy	Amount	N/A	YES	NO
16. Were the samples shipped on ice?		YES	NO	
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	NO	

Cooler #:	1
Temperature (°C):	amb
No. of custody seals on cooler:	Ø
External µR/hr reading:	10
Background µR/hr reading:	10

DOT Survey/ Acceptance Information

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

If applicable, was the client contacted? YES / NO / NA Contact: ______ Date/Time: ______

Project Manager Signature / Date: ______

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

1707390

EXPRESS WORLDWIDE

2017-07-24 WAI 3.23.00 / *80-1411*

WPX

DHL

From: ALS Environmental
60 Northland Rd
Unit 1
N2V 2B8 WATERLOO ON
Canada

Origin:
YHM

Contact: Ph : 15198866910235

To: ALS Environmental Fort Collins
Sample Login
225 Commerce Drive
80524 FORT COLLINS CO
United States Of America

Contact:
Ph :18004431511

US-DEN-DEN

C

Day Time

Pce/Shpt Weight
11.00/11.0 lbs

Piece
1/1

Contents:Soil and Water Samples for Testing

WAYBILL 66 5290 7666

(2L)US80524+48000001

Client:	ALS Environmental	**Date:**	*08-Aug-17*
Project:	L1963051	**Work Order:**	1707390
Sample ID:	L1963051-1	**Lab ID:**	1707390-1
Legal Location:		**Matrix:**	WATER
Collection Date:	7/18/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **7/27/2017**	PrepBy: **LAD**
Ra-226	**0.012 (+/- 0.0067)**		**0.0069**	**BQ/l**	NA	8/4/2017 12:35
Carr: BARIUM	*96.2*		*40-110*	*%REC*	DL = NA	8/4/2017 12:35

Client:	ALS Environmental	**Date:**	*08-Aug-17*
Project:	L1963051	**Work Order:**	1707390
Sample ID:	L1963051-1	**Lab ID:**	1707390-1
Legal Location:		**Matrix:**	WATER
Collection Date:	7/18/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Client: ALS Environmental

Work Order: 1707390

Project: L1963051

QC BATCH REPORT

Batch ID: **RE170727-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170727-1** Units: **BQ/l** Analysis Date: **8/4/2017 13:07**

Client ID: Run ID: **RE170727-1B** Prep Date: **7/27/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.86 (+/- 0.461)	0.0105	1.715		109	67-120					P,M3
Carr: BARIUM	15500		16450		94.2	40-110					

LCSD Sample ID: **RE170727-1** Units: **BQ/l** Analysis Date: **8/4/2017 13:07**

Client ID: Run ID: **RE170727-1B** Prep Date: **7/27/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.77 (+/- 0.437)	0.00573	1.715		103	67-120		1.86	0.1	2.1	P
Carr: BARIUM	15500		16450		94.2	40-110		15500			

MB Sample ID: **RE170727-1** Units: **BQ/l** Analysis Date: **8/4/2017 13:07**

Client ID: Run ID: **RE170727-1B** Prep Date: **7/27/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.00092 (+/- 0.0032)	0.006									U
Carr: BARIUM	15700		16450		95.5	40-110					

The following samples were analyzed in this batch: 1707390-1

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1963051-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	647-253-0596 EXT 6010
	Company address below will appear on the final report
Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bimcore@alsglobal.com

Email 2 bimww@alsglobal.com

Email 3

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)			EMERGENCY	
4 day [P4]	☐		1 Business day [E1]	☐
3 day [P3]	☐		Same Day, Weekend or Statutory holiday [E0]	☐
2 day [P2]	☐			

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To		
Same as Report To	☑ YES	☐ NO
Copy of Invoice with Report	☐ YES	☑ NO
Company:		
Contact:		

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com

Email 2 commercial@baffinland.com

Project Information

ALS Account # / Quote #:	23642 /Q42455
Job #:	MS-08
PO / AFE:	4500027854
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only) L1963051 8N

ALS Contact: Sampler: LM/OJ/BW

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	BIM-MMER-DEL	Number of Containers
	MS-08	18-Jul-17	10:15	Water	R	4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C: 10.0

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: C. Devereaux	Date: July 18, 2017	Time: 12:30	Received by:	Date:	Time:	Received by: SN	Date: 24-JUL-17	Time: 930

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 22-JUL-17
Report Date: 16-AUG-17 16:10 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1965122
Project P.O. #: 4800027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965122-1 MS-08 Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 11:15 Matrix: WATER							
Physical Tests							
Conductivity	656		3.0	umhos/cm		31-JUL-17	R3787050
Hardness (as CaCO3)	318	HTC	10	mg/L		04-AUG-17	
pH	6.92	PEHT	0.10	pH units		31-JUL-17	R3787050
Total Suspended Solids	<2.0	PEHT	2.0	mg/L	31-JUL-17	01-AUG-17	R3786162
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	10		10	mg/L		01-AUG-17	R3787014
Ammonia, Total (as N)	0.431		0.020	mg/L		02-AUG-17	R3788046
Chloride (Cl)	2.59		0.50	mg/L		01-AUG-17	R3788270
Fluoride (F)	0.024		0.020	mg/L		01-AUG-17	R3788270
Nitrate (as N)	2.46		0.020	mg/L		01-AUG-17	R3788270
Total Kjeldahl Nitrogen	0.62		0.15	mg/L	01-AUG-17	01-AUG-17	R3786504
Phosphorus, Total	<0.015	DLM	0.015	mg/L	04-AUG-17	08-AUG-17	R3792610
Sulfate (SO4)	308		0.30	mg/L		01-AUG-17	R3788270
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<1.0		1.0	mg/L		01-AUG-17	R3789506
Total Organic Carbon	<1.0		1.0	mg/L		02-AUG-17	R3791127
Total Metals							
Aluminum (Al)-Total	0.0363		0.0050	mg/L	01-AUG-17	01-AUG-17	R3786922
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Arsenic (As)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Barium (Ba)-Total	0.0101		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Boron (B)-Total	0.014		0.010	mg/L	01-AUG-17	01-AUG-17	R3786922
Cadmium (Cd)-Total	0.000057		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Calcium (Ca)-Total	22.6		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Cobalt (Co)-Total	0.0249		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Copper (Cu)-Total	0.0070		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Iron (Fe)-Total	0.477		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Lead (Pb)-Total	0.000485		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Lithium (Li)-Total	0.0045		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Magnesium (Mg)-Total	63.5		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Manganese (Mn)-Total	2.12		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Nickel (Ni)-Total	0.0283		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Phosphorus (P)-Total	<0.050		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Potassium (K)-Total	1.23		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Rubidium (Rb)-Total	0.00214		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Selenium (Se)-Total	0.00119		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Silicon (Si)-Total	0.55		0.10	mg/L	01-AUG-17	01-AUG-17	R3786922

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965122-1 MS-08 Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 11:15 Matrix: WATER							
Total Metals							
Silver (Ag)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Sodium (Na)-Total	0.97		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Strontium (Sr)-Total	0.0155		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Sulfur (S)-Total	107		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Thallium (Tl)-Total	0.000020		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Thorium (Th)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Tin (Sn)-Total	0.00042		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Titanium (Ti)-Total	<0.002	DLUI	0.0020	mg/L	01-AUG-17	01-AUG-17	R3786922
Tungsten (W)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Uranium (U)-Total	0.000055		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Vanadium (V)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Zinc (Zn)-Total	0.0100		0.0030	mg/L	01-AUG-17	01-AUG-17	R3786922
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	01-AUG-17	01-AUG-17	R3786922
Radiological Parameters							
Ra-226	0.0100		0.0052	Bq/L	03-AUG-17	15-AUG-17	R3801347
L1965122-2 MS-0802 Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 11:15 Matrix: WATER							
Physical Tests							
Conductivity	<3.0		3.0	umhos/cm		31-JUL-17	R3787050
Hardness (as CaCO3)	<10	HTC	10	mg/L		04-AUG-17	
pH	6.21	PEHT	0.10	pH units		31-JUL-17	R3787050
Total Suspended Solids	<2.0	PEHT	2.0	mg/L	31-JUL-17	01-AUG-17	R3786162
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	<10		10	mg/L		01-AUG-17	R3787014
Ammonia, Total (as N)	<0.020		0.020	mg/L		01-AUG-17	R3786458
Chloride (Cl)	<0.50		0.50	mg/L		01-AUG-17	R3788270
Fluoride (F)	<0.020		0.020	mg/L		01-AUG-17	R3788270
Nitrate (as N)	<0.020		0.020	mg/L		01-AUG-17	R3788270
Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	01-AUG-17	01-AUG-17	R3786504
Phosphorus, Total	<0.0030		0.0030	mg/L	01-AUG-17	02-AUG-17	R3787003
Sulfate (SO4)	<0.30		0.30	mg/L		01-AUG-17	R3788270
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<1.0		1.0	mg/L		01-AUG-17	R3789506
Total Organic Carbon	<1.0		1.0	mg/L		02-AUG-17	R3791127
Total Metals							
Aluminum (Al)-Total	0.0393		0.0050	mg/L	01-AUG-17	01-AUG-17	R3786922
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Arsenic (As)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Barium (Ba)-Total	0.00055		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965122-2 MS-0802 Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 11:15 Matrix: WATER							
Total Metals							
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Boron (B)-Total	<0.010		0.010	mg/L	01-AUG-17	01-AUG-17	R3786922
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Calcium (Ca)-Total	0.52		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Copper (Cu)-Total	<0.0010		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Iron (Fe)-Total	<0.050		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Lead (Pb)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Lithium (Li)-Total	<0.0010		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Magnesium (Mg)-Total	<0.050		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Manganese (Mn)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Phosphorus (P)-Total	<0.050		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Potassium (K)-Total	<0.050		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Rubidium (Rb)-Total	<0.00020		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Selenium (Se)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Silicon (Si)-Total	2.4	DLHC	1.0	mg/L	01-AUG-17	01-AUG-17	R3786922
Silver (Ag)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Sodium (Na)-Total	0.64		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Strontium (Sr)-Total	<0.0010		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Sulfur (S)-Total	<0.50		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Thorium (Th)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Tin (Sn)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Titanium (Ti)-Total	<0.00030		0.00030	mg/L	01-AUG-17	01-AUG-17	R3786922
Tungsten (W)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Uranium (U)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Vanadium (V)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	01-AUG-17	01-AUG-17	R3786922
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	01-AUG-17	01-AUG-17	R3786922
Radiological Parameters							
Ra-226	<0.0066		0.0066	Bq/L	03-AUG-17	15-AUG-17	R3801347
L1965122-3 MS-08-US01 Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 17:18 Matrix: WATER							
Physical Tests							
Conductivity	49.8		3.0	umhos/cm		31-JUL-17	R3787050
Hardness (as CaCO3)	23	HTC	10	mg/L		04-AUG-17	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965122-3 MS-08-US01							
Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 17:18							
Matrix: WATER							
Physical Tests							
pH	7.55	PEHT	0.10	pH units		31-JUL-17	R3787050
Total Suspended Solids	<2.0	PEHT	2.0	mg/L	31-JUL-17	01-AUG-17	R3786162
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	24		10	mg/L		01-AUG-17	R3787014
Ammonia, Total (as N)	<0.020		0.020	mg/L		01-AUG-17	R3786458
Chloride (Cl)	0.98		0.50	mg/L		01-AUG-17	R3788270
Fluoride (F)	<0.020		0.020	mg/L		01-AUG-17	R3788270
Nitrate (as N)	<0.020		0.020	mg/L		01-AUG-17	R3788270
Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	01-AUG-17	01-AUG-17	R3786504
Phosphorus, Total	0.0310		0.0030	mg/L	01-AUG-17	02-AUG-17	R3787003
Sulfate (SO4)	0.61		0.30	mg/L		01-AUG-17	R3788270
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<1.0		1.0	mg/L		01-AUG-17	R3789506
Total Organic Carbon	<1.0		1.0	mg/L		02-AUG-17	R3791127
Total Metals							
Aluminum (Al)-Total	0.0894		0.0050	mg/L	01-AUG-17	01-AUG-17	R3786922
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Arsenic (As)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Barium (Ba)-Total	0.00384		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Boron (B)-Total	<0.010		0.010	mg/L	01-AUG-17	01-AUG-17	R3786922
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Calcium (Ca)-Total	4.58		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Cesium (Cs)-Total	0.000015		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Copper (Cu)-Total	<0.0010		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Iron (Fe)-Total	0.088		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Lead (Pb)-Total	0.000089		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Lithium (Li)-Total	<0.0010		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Magnesium (Mg)-Total	2.77		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Manganese (Mn)-Total	0.00146		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Molybdenum (Mo)-Total	0.000107		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Phosphorus (P)-Total	<0.050		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Potassium (K)-Total	0.474		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Rubidium (Rb)-Total	0.00089		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Selenium (Se)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Silicon (Si)-Total	0.64		0.10	mg/L	01-AUG-17	01-AUG-17	R3786922
Silver (Ag)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Sodium (Na)-Total	0.68		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965122-3 MS-08-US01 Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 17:18 Matrix: WATER							
Total Metals							
Strontium (Sr)-Total	0.0045		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Sulfur (S)-Total	<0.50		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Thorium (Th)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Tin (Sn)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Titanium (Ti)-Total	0.00525		0.00030	mg/L	01-AUG-17	01-AUG-17	R3786922
Tungsten (W)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Uranium (U)-Total	0.000274		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Vanadium (V)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	01-AUG-17	01-AUG-17	R3786922
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	01-AUG-17	01-AUG-17	R3786922
Radiological Parameters							
Ra-226	<0.0084		0.0084	Bq/L	03-AUG-17	15-AUG-17	R3801347
L1965122-4 MS-08-US Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 17:18 Matrix: WATER							
Physical Tests							
Conductivity	49.8		3.0	umhos/cm		31-JUL-17	R3787050
Hardness (as CaCO3)	22	HTC	10	mg/L		04-AUG-17	
pH	7.62	PEHT	0.10	pH units		31-JUL-17	R3787050
Total Suspended Solids	3.4	PEHT	2.0	mg/L	31-JUL-17	01-AUG-17	R3786177
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	24		10	mg/L		01-AUG-17	R3787014
Ammonia, Total (as N)	<0.020		0.020	mg/L		01-AUG-17	R3786458
Chloride (Cl)	1.05		0.50	mg/L		01-AUG-17	R3788270
Fluoride (F)	<0.020		0.020	mg/L		01-AUG-17	R3788270
Nitrate (as N)	<0.020		0.020	mg/L		01-AUG-17	R3788270
Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	01-AUG-17	01-AUG-17	R3786504
Phosphorus, Total	0.0065		0.0030	mg/L	01-AUG-17	02-AUG-17	R3787003
Sulfate (SO4)	0.62		0.30	mg/L		01-AUG-17	R3788270
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<1.0		1.0	mg/L		01-AUG-17	R3789506
Total Organic Carbon	<1.0		1.0	mg/L		03-AUG-17	R3791157
Total Metals							
Aluminum (Al)-Total	0.0908		0.0050	mg/L	01-AUG-17	01-AUG-17	R3786922
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Arsenic (As)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Barium (Ba)-Total	0.00386		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Boron (B)-Total	<0.010		0.010	mg/L	01-AUG-17	01-AUG-17	R3786922

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965122-4 MS-08-US Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 17:18 Matrix: WATER							
Total Metals							
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Calcium (Ca)-Total	4.58		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Cesium (Cs)-Total	0.000014		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Copper (Cu)-Total	<0.0010		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Iron (Fe)-Total	0.090		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Lead (Pb)-Total	0.000112		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Lithium (Li)-Total	<0.0010		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Magnesium (Mg)-Total	2.67		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Manganese (Mn)-Total	0.00164		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Molybdenum (Mo)-Total	0.000089		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Nickel (Ni)-Total	0.00060		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Phosphorus (P)-Total	<0.050		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Potassium (K)-Total	0.469		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Rubidium (Rb)-Total	0.00085		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Selenium (Se)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Silicon (Si)-Total	0.64		0.10	mg/L	01-AUG-17	01-AUG-17	R3786922
Silver (Ag)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Sodium (Na)-Total	0.68		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Strontium (Sr)-Total	0.0045		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Sulfur (S)-Total	<0.50		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Thorium (Th)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Tin (Sn)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Titanium (Ti)-Total	0.00504		0.00030	mg/L	01-AUG-17	01-AUG-17	R3786922
Tungsten (W)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Uranium (U)-Total	0.000275		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Vanadium (V)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	01-AUG-17	01-AUG-17	R3786922
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	01-AUG-17	01-AUG-17	R3786922
Radiological Parameters							
Ra-226	<0.0083		0.0083	Bq/L	03-AUG-17	15-AUG-17	R3801347
L1965122-5 MS-08-DS Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 17:45 Matrix: WATER							
Physical Tests							
Conductivity	52.9		3.0	umhos/cm		31-JUL-17	R3787050
Hardness (as CaCO3)	24	HTC	10	mg/L		04-AUG-17	
pH	7.63	PEHT	0.10	pH units		31-JUL-17	R3787050
Total Suspended Solids	3.6	PEHT	2.0	mg/L	31-JUL-17	01-AUG-17	R3786177

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965122-5 MS-08-DS							
Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 17:45							
Matrix: WATER							
Physical Tests							
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	24		10	mg/L		01-AUG-17	R3787014
Ammonia, Total (as N)	<0.020		0.020	mg/L		01-AUG-17	R3786458
Chloride (Cl)	1.52		0.50	mg/L		01-AUG-17	R3788270
Fluoride (F)	<0.020		0.020	mg/L		01-AUG-17	R3788270
Nitrate (as N)	0.075		0.020	mg/L		01-AUG-17	R3788270
Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	01-AUG-17	01-AUG-17	R3786504
Phosphorus, Total	0.0110		0.0030	mg/L	01-AUG-17	02-AUG-17	R3787003
Sulfate (SO4)	0.73		0.30	mg/L		01-AUG-17	R3788270
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<1.0		1.0	mg/L		02-AUG-17	R3791123
Total Organic Carbon	<1.0		1.0	mg/L		03-AUG-17	R3791157
Total Metals							
Aluminum (Al)-Total	0.0948		0.0050	mg/L	01-AUG-17	01-AUG-17	R3786922
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Arsenic (As)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Barium (Ba)-Total	0.00367		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Boron (B)-Total	<0.010		0.010	mg/L	01-AUG-17	01-AUG-17	R3786922
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Calcium (Ca)-Total	4.78		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Cesium (Cs)-Total	0.000015		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Copper (Cu)-Total	0.0024		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Iron (Fe)-Total	0.102		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Lead (Pb)-Total	0.000095		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Lithium (Li)-Total	<0.0010		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Magnesium (Mg)-Total	2.96		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Manganese (Mn)-Total	0.00163		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Molybdenum (Mo)-Total	0.000089		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Phosphorus (P)-Total	<0.050		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Potassium (K)-Total	0.455		0.050	mg/L	01-AUG-17	01-AUG-17	R3786922
Rubidium (Rb)-Total	0.00085		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Selenium (Se)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Silicon (Si)-Total	0.64		0.10	mg/L	01-AUG-17	01-AUG-17	R3786922
Silver (Ag)-Total	<0.000050		0.000050	mg/L	01-AUG-17	01-AUG-17	R3786922
Sodium (Na)-Total	0.62		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922
Strontium (Sr)-Total	0.0044		0.0010	mg/L	01-AUG-17	01-AUG-17	R3786922
Sulfur (S)-Total	<0.50		0.50	mg/L	01-AUG-17	01-AUG-17	R3786922

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965122-5 MS-08-DS Sampled By: BL/LM/CD/TB on 21-JUL-17 @ 17:45 Matrix: WATER							
Total Metals							
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	01-AUG-17	01-AUG-17	R3786922
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Thorium (Th)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Tin (Sn)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Titanium (Ti)-Total	0.00538		0.00030	mg/L	01-AUG-17	01-AUG-17	R3786922
Tungsten (W)-Total	<0.00010		0.00010	mg/L	01-AUG-17	01-AUG-17	R3786922
Uranium (U)-Total	0.000269		0.000010	mg/L	01-AUG-17	01-AUG-17	R3786922
Vanadium (V)-Total	<0.00050		0.00050	mg/L	01-AUG-17	01-AUG-17	R3786922
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	01-AUG-17	01-AUG-17	R3786922
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	01-AUG-17	01-AUG-17	R3786922
Radiological Parameters							
Ra-226	<0.0067		0.0067	Bq/L	03-AUG-17	15-AUG-17	R3801347

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Aluminum (Al)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Barium (Ba)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Cobalt (Co)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Copper (Cu)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Iron (Fe)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Manganese (Mn)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Phosphorus (P)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Potassium (K)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Rubidium (Rb)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Silicon (Si)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Sodium (Na)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Strontium (Sr)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Sulfur (S)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Zinc (Zn)-Total	MS-B	L1965122-1, -2, -3, -4, -5
Matrix Spike	Ammonia, Total (as N)	MS-B	L1965122-1
Matrix Spike	Phosphorus, Total	MS-B	L1965122-1

Sample Parameter Qualifier key listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
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-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-WT	Water	Dissolved Organic Carbon	APHA 5310 B-INSTRUMENTAL

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ALS Test Code	Matrix	Test Description	Method Reference**
EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ALS Test Code	Matrix	Test Description	Method Reference**
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

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.

ALS Test Code	Matrix	Test Description	Method Reference**
MET-T-CCMS-WT	Water	Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ALS Test Code	Matrix	Test Description	Method Reference**
		Ammonia, Total as N	EPA 350.1

Reference Information

NH3-WT	Water		

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

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

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

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

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1C for a minimum of four hours or until a constant weight is achieved.

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
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 weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
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.

Quality Control Report

Workorder: L1965122 Report Date: 16-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-WT	**Water**							
Batch R3787014								
WG2582336-7 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			100.8		%		80-120	01-AUG-17
WG2582336-8 DUP		**L1963241-14**						
Alkalinity, Total (as CaCO3)		43	44		mg/L	1.8	20	01-AUG-17
WG2582336-6 LCS								
Alkalinity, Total (as CaCO3)			98.5		%		85-115	01-AUG-17
WG2582336-5 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	01-AUG-17
C-DIS-ORG-WT	**Water**							
Batch R3789506								
WG2583294-3 DUP		**L1963242-1**						
Dissolved Organic Carbon		1.7	1.7		mg/L	1.4	20	01-AUG-17
WG2583294-2 LCS								
Dissolved Organic Carbon			99.5		%		80-120	01-AUG-17
WG2583294-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	01-AUG-17
WG2583294-4 MS		**L1963242-1**						
Dissolved Organic Carbon			102.1		%		70-130	01-AUG-17
Batch R3791123								
WG2584223-3 DUP		**L1965122-5**						
Dissolved Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	02-AUG-17
WG2584223-2 LCS								
Dissolved Organic Carbon			96.9		%		80-120	02-AUG-17
WG2584223-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	02-AUG-17
WG2584223-4 MS		**L1965122-5**						
Dissolved Organic Carbon			100.3		%		70-130	02-AUG-17
CL-IC-N-WT	**Water**							
Batch R3788270								
WG2582498-9 DUP		**WG2582498-10**						
Chloride (Cl)		3.10	3.08		mg/L	0.7	20	01-AUG-17
WG2582498-7 LCS								
Chloride (Cl)			102.6		%		90-110	01-AUG-17
WG2582498-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	01-AUG-17
WG2582498-8 MS		**WG2582498-10**						
Chloride (Cl)			99.4		%		75-125	01-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Water**							
Batch R3787050								
WG2581627-20 DUP		**WG2581627-19**						
Conductivity		784	784		umhos/cm	0.0	10	31-JUL-17
WG2581627-17 LCS								
Conductivity			101.3		%		90-110	31-JUL-17
WG2581627-18 MB								
Conductivity			<3.0		umhos/cm		3	31-JUL-17
F-IC-N-WT	**Water**							
Batch R3788270								
WG2582498-9 DUP		**WG2582498-10**						
Fluoride (F)		0.022	0.023		mg/L	2.2	20	01-AUG-17
WG2582498-7 LCS								
Fluoride (F)			100.3		%		90-110	01-AUG-17
WG2582498-6 MB								
Fluoride (F)			<0.020		mg/L		0.02	01-AUG-17
WG2582498-8 MS		**WG2582498-10**						
Fluoride (F)			99.4		%		75-125	01-AUG-17
MET-T-CCMS-WT	**Water**							
Batch R3786922								
WG2582323-4 DUP		**WG2582323-3**						
Aluminum (Al)-Total		0.131	0.149		mg/L	12	20	01-AUG-17
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-AUG-17
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-AUG-17
Barium (Ba)-Total		0.0425	0.0441		mg/L	3.9	20	01-AUG-17
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-AUG-17
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-AUG-17
Boron (B)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	01-AUG-17
Cadmium (Cd)-Total		0.00030	0.00029		mg/L	4.1	20	01-AUG-17
Calcium (Ca)-Total		68.4	71.8		mg/L	4.9	20	01-AUG-17
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	01-AUG-17
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-AUG-17
Cobalt (Co)-Total		0.0149	0.0153		mg/L	3.1	20	01-AUG-17
Copper (Cu)-Total		0.104	0.108		mg/L	3.6	20	01-AUG-17
Iron (Fe)-Total		2.36	2.43		mg/L	2.8	20	01-AUG-17
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-AUG-17
Lithium (Li)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3786922								
WG2582323-4 DUP		**WG2582323-3**						
Magnesium (Mg)-Total		22.6	22.2		mg/L	1.4	20	01-AUG-17
Manganese (Mn)-Total		0.136	0.149		mg/L	8.7	20	01-AUG-17
Molybdenum (Mo)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-AUG-17
Nickel (Ni)-Total		0.0239	0.0248		mg/L	3.9	20	01-AUG-17
Phosphorus (P)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	01-AUG-17
Potassium (K)-Total		78.4	82.7		mg/L	5.4	20	01-AUG-17
Rubidium (Rb)-Total		0.0202	0.0215		mg/L	5.9	20	01-AUG-17
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-AUG-17
Silicon (Si)-Total		2.8	2.9		mg/L	5.0	20	01-AUG-17
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-AUG-17
Sodium (Na)-Total		364	382		mg/L	4.8	20	01-AUG-17
Strontium (Sr)-Total		0.193	0.196		mg/L	1.5	20	01-AUG-17
Sulfur (S)-Total		212	214		mg/L	1.3	25	01-AUG-17
Thallium (Tl)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-AUG-17
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	01-AUG-17
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	01-AUG-17
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-AUG-17
Titanium (Ti)-Total		0.0046	0.0047		mg/L	3.1	20	01-AUG-17
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-AUG-17
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-AUG-17
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	01-AUG-17
Zinc (Zn)-Total		0.071	0.073		mg/L	3.1	20	01-AUG-17
Zirconium (Zr)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	01-AUG-17
WG2582323-2 LCS								
Aluminum (Al)-Total			102.3		%		80-120	01-AUG-17
Antimony (Sb)-Total			102.1		%		80-120	01-AUG-17
Arsenic (As)-Total			97.9		%		80-120	01-AUG-17
Barium (Ba)-Total			100.9		%		80-120	01-AUG-17
Beryllium (Be)-Total			100.4		%		80-120	01-AUG-17
Bismuth (Bi)-Total			98.7		%		80-120	01-AUG-17
Boron (B)-Total			99.2		%		80-120	01-AUG-17
Cadmium (Cd)-Total			99.0		%		80-120	01-AUG-17
Calcium (Ca)-Total			102.4		%		80-120	01-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3786922								
WG2582323-2 LCS								
Chromium (Cr)-Total			98.0		%		80-120	01-AUG-17
Cesium (Cs)-Total			105.3		%		80-120	01-AUG-17
Cobalt (Co)-Total			98.9		%		80-120	01-AUG-17
Copper (Cu)-Total			98.9		%		80-120	01-AUG-17
Iron (Fe)-Total			101.8		%		80-120	01-AUG-17
Lead (Pb)-Total			101.4		%		80-120	01-AUG-17
Lithium (Li)-Total			101.5		%		80-120	01-AUG-17
Magnesium (Mg)-Total			102.9		%		80-120	01-AUG-17
Manganese (Mn)-Total			98.8		%		80-120	01-AUG-17
Molybdenum (Mo)-Total			99.4		%		80-120	01-AUG-17
Nickel (Ni)-Total			99.6		%		80-120	01-AUG-17
Phosphorus (P)-Total			104.3		%		70-130	01-AUG-17
Potassium (K)-Total			101.3		%		80-120	01-AUG-17
Rubidium (Rb)-Total			97.4		%		80-120	01-AUG-17
Selenium (Se)-Total			97.0		%		80-120	01-AUG-17
Silicon (Si)-Total			115.1		%		60-140	01-AUG-17
Silver (Ag)-Total			104.8		%		80-120	01-AUG-17
Sodium (Na)-Total			103.3		%		80-120	01-AUG-17
Strontium (Sr)-Total			104.6		%		80-120	01-AUG-17
Sulfur (S)-Total			98.1		%		70-130	01-AUG-17
Thallium (Tl)-Total			94.0		%		80-120	01-AUG-17
Tellurium (Te)-Total			104.1		%		80-120	01-AUG-17
Thorium (Th)-Total			97.5		%		70-130	01-AUG-17
Tin (Sn)-Total			98.2		%		80-120	01-AUG-17
Titanium (Ti)-Total			97.4		%		80-120	01-AUG-17
Tungsten (W)-Total			97.6		%		80-120	01-AUG-17
Uranium (U)-Total			98.6		%		80-120	01-AUG-17
Vanadium (V)-Total			100.3		%		80-120	01-AUG-17
Zinc (Zn)-Total			94.5		%		80-120	01-AUG-17
Zirconium (Zr)-Total			99.3		%		80-120	01-AUG-17
WG2582323-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	01-AUG-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	01-AUG-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	01-AUG-17

Quality Control Report

Client: Baffinland Iron Mine’s Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3786922								
WG2582323-1 MB								
Barium (Ba)-Total			<0.00020		mg/L		0.0002	01-AUG-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	01-AUG-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	01-AUG-17
Boron (B)-Total			<0.010		mg/L		0.01	01-AUG-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	01-AUG-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	01-AUG-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	01-AUG-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	01-AUG-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	01-AUG-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	01-AUG-17
Iron (Fe)-Total			<0.050		mg/L		0.05	01-AUG-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	01-AUG-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	01-AUG-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	01-AUG-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	01-AUG-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	01-AUG-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	01-AUG-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	01-AUG-17
Potassium (K)-Total			<0.050		mg/L		0.05	01-AUG-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	01-AUG-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	01-AUG-17
Silicon (Si)-Total			<0.10		mg/L		0.1	01-AUG-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	01-AUG-17
Sodium (Na)-Total			<0.50		mg/L		0.5	01-AUG-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	01-AUG-17
Sulfur (S)-Total			<0.50		mg/L		0.5	01-AUG-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	01-AUG-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	01-AUG-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	01-AUG-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	01-AUG-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	01-AUG-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	01-AUG-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	01-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3786922								
WG2582323-1 MB								
Vanadium (V)-Total			<0.00050		mg/L		0.0005	01-AUG-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	01-AUG-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	01-AUG-17
WG2582323-5 MS		**WG2582323-3**						
Aluminum (Al)-Total			N/A	MS-B	%		-	01-AUG-17
Antimony (Sb)-Total			102.5		%		70-130	01-AUG-17
Arsenic (As)-Total			95.9		%		70-130	01-AUG-17
Barium (Ba)-Total			N/A	MS-B	%		-	01-AUG-17
Beryllium (Be)-Total			90.7		%		70-130	01-AUG-17
Bismuth (Bi)-Total			96.5		%		70-130	01-AUG-17
Boron (B)-Total			93.7		%		70-130	01-AUG-17
Cadmium (Cd)-Total			95.1		%		70-130	01-AUG-17
Calcium (Ca)-Total			N/A	MS-B	%		-	01-AUG-17
Chromium (Cr)-Total			92.3		%		70-130	01-AUG-17
Cesium (Cs)-Total			102.7		%		70-130	01-AUG-17
Cobalt (Co)-Total			N/A	MS-B	%		-	01-AUG-17
Copper (Cu)-Total			N/A	MS-B	%		-	01-AUG-17
Iron (Fe)-Total			N/A	MS-B	%		-	01-AUG-17
Lead (Pb)-Total			97.3		%		70-130	01-AUG-17
Lithium (Li)-Total			96.7		%		70-130	01-AUG-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	01-AUG-17
Manganese (Mn)-Total			N/A	MS-B	%		-	01-AUG-17
Molybdenum (Mo)-Total			98.4		%		70-130	01-AUG-17
Nickel (Ni)-Total			86.8		%		70-130	01-AUG-17
Phosphorus (P)-Total			N/A	MS-B	%		-	01-AUG-17
Potassium (K)-Total			N/A	MS-B	%		-	01-AUG-17
Rubidium (Rb)-Total			N/A	MS-B	%		-	01-AUG-17
Selenium (Se)-Total			95.7		%		70-130	01-AUG-17
Silicon (Si)-Total			N/A	MS-B	%		-	01-AUG-17
Silver (Ag)-Total			98.5		%		70-130	01-AUG-17
Sodium (Na)-Total			N/A	MS-B	%		-	01-AUG-17
Strontium (Sr)-Total			N/A	MS-B	%		-	01-AUG-17
Sulfur (S)-Total			N/A	MS-B	%		-	01-AUG-17
Thallium (Tl)-Total			91.5		%		70-130	01-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3786922								
WG2582323-5 MS		**WG2582323-3**						
Tellurium (Te)-Total			102.3		%		70-130	01-AUG-17
Thorium (Th)-Total			71.3		%		70-130	01-AUG-17
Tin (Sn)-Total			93.2		%		70-130	01-AUG-17
Titanium (Ti)-Total			94.9		%		70-130	01-AUG-17
Tungsten (W)-Total			97.6		%		70-130	01-AUG-17
Uranium (U)-Total			99.2		%		70-130	01-AUG-17
Vanadium (V)-Total			96.1		%		70-130	01-AUG-17
Zinc (Zn)-Total			N/A	MS-B	%		-	01-AUG-17
Zirconium (Zr)-Total			79.6		%		70-130	01-AUG-17
NH3-WT	**Water**							
Batch R3786458								
WG2582368-11 DUP		**L1965122-2**						
Ammonia, Total (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	01-AUG-17
WG2582368-7 DUP		**L1965106-8**						
Ammonia, Total (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	01-AUG-17
WG2582368-10 LCS								
Ammonia, Total (as N)			101.0		%		85-115	01-AUG-17
WG2582368-6 LCS								
Ammonia, Total (as N)			98.5		%		85-115	01-AUG-17
WG2582368-5 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	01-AUG-17
WG2582368-9 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	01-AUG-17
WG2582368-12 MS		**L1965122-2**						
Ammonia, Total (as N)			88.7		%		75-125	01-AUG-17
WG2582368-8 MS		**L1965106-8**						
Ammonia, Total (as N)			96.9		%		75-125	01-AUG-17
Batch R3788046								
WG2583387-3 DUP		**L1965122-1**						
Ammonia, Total (as N)		0.431	0.417		mg/L	3.4	20	02-AUG-17
WG2583387-2 LCS								
Ammonia, Total (as N)			98.9		%		85-115	02-AUG-17
WG2583387-1 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	02-AUG-17
WG2583387-4 MS		**L1965122-1**						
Ammonia, Total (as N)			N/A	MS-B	%		-	02-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R3788270								
WG2582498-9 DUP		**WG2582498-10**						
Nitrate (as N)		0.030	0.032		mg/L	3.6	25	01-AUG-17
WG2582498-7 LCS								
Nitrate (as N)			101.3		%		70-130	01-AUG-17
WG2582498-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	01-AUG-17
WG2582498-8 MS		**WG2582498-10**						
Nitrate (as N)			98.5		%		70-130	01-AUG-17
P-T-COL-WT	**Water**							
Batch R3787003								
WG2582543-3 DUP		**L1963242-3**						
Phosphorus, Total		0.0045	0.0044		mg/L	0.7	20	02-AUG-17
WG2582543-2 LCS								
Phosphorus, Total			96.3		%		80-120	02-AUG-17
WG2582543-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	02-AUG-17
WG2582543-4 MS		**L1963242-3**						
Phosphorus, Total			88.7		%		70-130	02-AUG-17
Batch R3792610								
WG2586068-3 DUP		**L1967692-4**						
Phosphorus, Total		0.137	0.127		mg/L	7.9	20	08-AUG-17
WG2586068-2 LCS								
Phosphorus, Total			97.7		%		80-120	08-AUG-17
WG2586068-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	08-AUG-17
WG2586068-4 MS		**L1967692-4**						
Phosphorus, Total			N/A	MS-B	%		-	08-AUG-17
PH-WT	**Water**							
Batch R3787050								
WG2581627-20 DUP		**WG2581627-19**						
pH		8.04	8.04	J	pH units	0.00	0.2	31-JUL-17
WG2581627-17 LCS								
pH			6.97		pH units		6.9-7.1	31-JUL-17
SO4-IC-N-WT	**Water**							

Quality Control Report

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Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT	**Water**							
Batch R3788270								
WG2582498-9 DUP		**WG2582498-10**						
Sulfate (SO4)		4.49	4.46		mg/L	0.6	20	01-AUG-17
WG2582498-7 LCS								
Sulfate (SO4)			102.9		%		90-110	01-AUG-17
WG2582498-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	01-AUG-17
WG2582498-8 MS		**WG2582498-10**						
Sulfate (SO4)			98.8		%		75-125	01-AUG-17
SOLIDS-TSS-WT	**Water**							
Batch R3786162								
WG2581832-3 DUP		**L1965127-1**						
Total Suspended Solids		34.3	33.7		mg/L	2.0	20	01-AUG-17
WG2581832-2 LCS								
Total Suspended Solids			101.2		%		85-115	01-AUG-17
WG2581832-1 MB								
Total Suspended Solids			<2.0		mg/L		2	01-AUG-17
Batch R3786177								
WG2581838-3 DUP		**L1966976-1**						
Total Suspended Solids		1840	1840		mg/L	0.0	20	01-AUG-17
WG2581838-2 LCS								
Total Suspended Solids			100.8		%		85-115	01-AUG-17
WG2581838-1 MB								
Total Suspended Solids			<2.0		mg/L		2	01-AUG-17
TKN-WT	**Water**							
Batch R3786504								
WG2582447-3 DUP		**L1963242-2**						
Total Kjeldahl Nitrogen		<0.15	<0.15	RPD-NA	mg/L	N/A	20	01-AUG-17
WG2582447-2 LCS								
Total Kjeldahl Nitrogen			95.3		%		75-125	01-AUG-17
WG2582447-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	01-AUG-17
WG2582447-4 MS		**L1963242-2**						
Total Kjeldahl Nitrogen			102.0		%		70-130	01-AUG-17
TOC-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
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Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TOC-WT	**Water**							
Batch R3791127								
WG2584226-7 DUP		**L1964421-1**						
Total Organic Carbon		1.7	1.8		mg/L	3.7	20	02-AUG-17
WG2584226-6 LCS								
Total Organic Carbon			97.8		%		80-120	02-AUG-17
WG2584226-5 MB								
Total Organic Carbon			<1.0		mg/L		1	02-AUG-17
WG2584226-8 MS		**L1964421-1**						
Total Organic Carbon			102.2		%		70-130	02-AUG-17
Batch R3791157								
WG2585219-3 DUP		**L1965122-5**						
Total Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	03-AUG-17
WG2585219-2 LCS								
Total Organic Carbon			102.5		%		80-120	03-AUG-17
WG2585219-1 MB								
Total Organic Carbon			<1.0		mg/L		1	03-AUG-17
WG2585219-4 MS		**L1965122-5**						
Total Organic Carbon			102.7		%		70-130	03-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Suspended solids							
	1	21-JUL-17 11:15	01-AUG-17 00:00	7	11	days	EHT
	2	21-JUL-17 11:15	01-AUG-17 00:00	7	11	days	EHT
	3	21-JUL-17 17:18	01-AUG-17 00:00	7	10	days	EHT
	4	21-JUL-17 17:18	01-AUG-17 00:00	7	10	days	EHT
	5	21-JUL-17 17:45	01-AUG-17 00:00	7	10	days	EHT
pH							
	1	21-JUL-17 11:15	31-JUL-17 00:00	4	10	days	EHT
	2	21-JUL-17 11:15	31-JUL-17 00:00	4	10	days	EHT
	3	21-JUL-17 17:18	31-JUL-17 00:00	4	9	days	EHT
	4	21-JUL-17 17:18	31-JUL-17 00:00	4	9	days	EHT
	5	21-JUL-17 17:45	31-JUL-17 00:00	4	9	days	EHT
Leachable Anions & Nutrients							
Nitrate in Water by IC							
	1	21-JUL-17 11:15	01-AUG-17 15:18	7	11	days	EHT
	2	21-JUL-17 11:15	01-AUG-17 15:18	7	11	days	EHT
	3	21-JUL-17 17:18	01-AUG-17 15:18	7	11	days	EHT
	4	21-JUL-17 17:18	01-AUG-17 15:18	7	11	days	EHT
	5	21-JUL-17 17:45	01-AUG-17 15:18	7	11	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1965122 were received on 22-JUL-17 13:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Wednesday, August 16, 2017

Rick Hawthorne
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1708024
Project Name:
Project Number: L1965122

Dear Mr. Hawthorne:

Five water samples were received from ALS Environmental, on 8/1/2017. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1708024

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1708024
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1965122
Client PO Number: L1965122

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1965122-1	1708024-1		WATER	21-Jul-17	
L1965122-2	1708024-2		WATER	21-Jul-17	
L1965122-3	1708024-3		WATER	21-Jul-17	
L1965122-4	1708024-4		WATER	21-Jul-17	
L1965122-5	1708024-5		WATER	21-Jul-17	

ALS Environmental

1708024

L1965122
WATERLOO

5x950mL P

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# L1965122
ALS requires QC data to be provided with your final results.

Please see enclosed 5 sample(s) in 5 Container(s)

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
1 **L1965122-1 MS-08**		**7/21/2017**	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/16/2017	
2 **L1965122-2 MS-0802**		**7/21/2017**	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/16/2017	
3 **L1965122-3 MS-08-US01**		**7/21/2017**	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/16/2017	
4 **L1965122-4 MS-08-US**		**7/21/2017**	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/16/2017	
5 **L1965122-5 MS-08-DS**		**7/21/2017**	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/16/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910
Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: Rick.Hawthorne@alsglobal.com

Shipped By: ______ Date Shipped: ______

Received By: C Trumble Date Received: 8-1-17 0950

Verified By: ______ Date Verified: ______

Temperature: ______

Sample Integrity Issues: ______

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS- Water100 Workorder No: 1708024

Project Manager: SS Initials: CDF Date: 8-1-17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are Custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5. Are the COC and bottle labels complete and legible?		YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		YES	NO
12. Are all samples within holding times for the requested analyses?		YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	N/A	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	NO
16. Were the samples shipped on ice?		YES	~~NO~~ 8-1-17
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	NO

Cooler #: 1

Temperature (°C): Amb

No. of custody seals on cooler: 0

DOT Survey/ Acceptance Information

External µR/hr reading: 10

Background µR/hr reading: 10

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

The ice was all melted and room temp.

If applicable, was the client contacted? YES / NO / NA Contact: ____________ Date/Time: ________

Project Manager Signature / Date: [signature]

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

1708024

EXPRESS 12:00 **TDY** DHL

2017-07-31 WBI 8.22.90 / *50-1411*

Origin: **YHM**

From : ALS Environmental
Ed Hill
60 Northland Rd
Unit.1
N2V 2B8 WA[illegible]RLOO ON
Canada

Contact: Ph : [illegible]19886910236

Contact:
Ph [illegible]43[illegible]11

To : **ALS En[illegible]ronmental For[illegible] Collins**
Sample [illegible]gin
225 Comm[illegible]e Drive
80524 FOR[illegible] COLLINS CO
United States Of America

US – DEN – DEN

Day | Time **X12**

C

Pce/Shpt Weight 19.80/19.8 lbs | Piece **1/1**

Contents:Water Samples for testing

WAYBILL 43 2293 3263

(2L)US80524+50002001

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*16-Aug-17*
Project:	L1965122	**Work Order:**	1708024
Sample ID:	L1965122-1	**Lab ID:**	1708024-1
Legal Location:		**Matrix:**	WATER
Collection Date:	7/21/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **8/3/2017**	PrepBy: **HCJ**
Ra-226	**0.010 (+/- 0.0053)**	Y1	**0.0052**	**BQ/l**	NA	8/15/2017 12:27
Carr: BARIUM	*104*	Y1	*40-110*	*%REC*	DL = NA	8/15/2017 12:27

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*16-Aug-17*
Project:	L1965122	**Work Order:**	1708024
Sample ID:	L1965122-2	**Lab ID:**	1708024-2
Legal Location:		**Matrix:**	WATER
Collection Date:	7/21/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**		Prep Date: **8/3/2017**		PrepBy: **HCJ**
Ra-226	-0.00050 (+/- 0.0030)	Y1,U	0.0066	BQ/l	NA	8/15/2017 12:27
Carr: BARIUM	*100*	Y1	*40-110*	*%REC*	DL = NA	8/15/2017 12:27

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*16-Aug-17*
Project:	L1965122	**Work Order:**	1708024
Sample ID:	L1965122-3	**Lab ID:**	1708024-3
Legal Location:		**Matrix:**	WATER
Collection Date:	7/21/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**		Prep Date: **8/3/2017**		PrepBy: **HCJ**
Ra-226	0.0056 (+/- 0.0056)	U	0.0084	BQ/l	NA	8/15/2017 12:27
Carr: BARIUM	*98.5*		*40-110*	*%REC*	DL = NA	8/15/2017 12:27

Client: ALS Environmental
Project: L1965122
Sample ID: L1965122-4
Legal Location:
Collection Date: 7/21/2017

Date: *16-Aug-17*
Work Order: 1708024
Lab ID: 1708024-4
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**		Prep Date: **8/3/2017**		PrepBy: **HCJ**
Ra-226	0.0030 (+/- 0.0050)	U	0.0083	BQ/l	NA	8/15/2017 12:27
Carr: BARIUM	*96.2*		*40-110*	*%REC*	DL = NA	8/15/2017 12:27

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*16-Aug-17*
Project:	L1965122	**Work Order:**	1708024
Sample ID:	L1965122-5	**Lab ID:**	1708024-5
Legal Location:		**Matrix:**	WATER
Collection Date:	7/21/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **8/3/2017**	PrepBy: **HCJ**
Ra-226	0.0055 (+/- 0.0048)	U	0.0067	BQ/l	NA	8/15/2017 12:27
Carr: BARIUM	*98.3*		*40-110*	*%REC*	DL = NA	8/15/2017 12:27

Client:	ALS Environmental	**Date:**	*16-Aug-17*
Project:	L1965122	**Work Order:**	1708024
Sample ID:	L1965122-5	**Lab ID:**	1708024-5
Legal Location:		**Matrix:**	WATER
Collection Date:	7/21/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Date: *8/16/2017 6:58:*

Client: ALS Environmental
Work Order: 1708024
Project: L1965122

QC BATCH REPORT

Batch ID: **RE170803-2-1** Instrument ID: **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170803-2** Units: **BQ/l** Analysis Date: **8/15/2017 13:13**
Client ID: Run ID: **RE170803-2A** Prep Date: **8/3/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.65 (+/- 0.407)	0.0049	1.715		96.2	67-120					P
Carr: BARIUM	15500		15520		99.7	40-110					

LCSD Sample ID: **RE170803-2** Units: **BQ/l** Analysis Date: **8/15/2017 13:13**
Client ID: Run ID: **RE170803-2A** Prep Date: **8/3/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.54 (+/- 0.381)	0.00657	1.715		89.8	67-120		1.65	0.2	2.1	P
Carr: BARIUM	15300		15520		98.7	40-110		15500			

MB Sample ID: **RE170803-2** Units: **BQ/l** Analysis Date: **8/15/2017 13:13**
Client ID: Run ID: **RE170803-2A** Prep Date: **8/3/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.0017 (+/- 0.0027)	0.0045									Y1,U
Carr: BARIUM	15600		15520		101	40-110					Y1

The following samples were analyzed in this batch:

1708024-1	1708024-2	1708024-3
1708024-4	1708024-5	

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1965122-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	647-253-0596 EXT 6010
	Company address below will appear on the final report
Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: bimcore@alsglobal.com

Email 2: bimww@alsglobal.com

Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: ap@baffinland.com

Email 2: commercial@baffinland.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐; 3 day [P3] ☐; 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐; Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	23642 /Q42455
Job #:	MS-08
PO / AFE:	4500027654
LSD:	
ALS Lab Work Order # (lab use only)	L1965122 RH

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler: BL/LM/CD/TB

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	BIM-MMER-EFF	Number of Containers
1 ✓	MS-08	21-Jul-17	11:15	Water	R	5
2 ✓	MS-0802	21-Jul-17	11:15	Water	R	5
3 ✓	MS-08-US01	21-Jul-17	17:18	Water	R	5
4 ✓	MS-08-US	21-Jul-17	17:18	Water	R	5
5 ✓	MS-08-DS	21-Jul-17	17:45	Water	R	5

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C: 2.5

FINAL COOLER TEMPERATURES °C: 20.4

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: C. Devereaux	Date: July 21 2017	Time: 21:00	Received by: Fortunata Khalil	Date: 22 Jul 17	Time: 13:22	Received by: [signature]	Date: 31/07/17	Time: 9:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 25-JUL-17
Report Date: 31-AUG-17 06:10 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1965132

Project P.O. #: 4500027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Rick Hawthorne
Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965132-1 MS-08 Sampled By: LM/BL on 25-JUL-17 @ 09:20 Matrix: WATER							
Physical Tests							
Conductivity	695		3.0	umhos/cm		28-JUL-17	R3784341
Hardness (as CaCO3)	338		10	mg/L		31-JUL-17	
pH	6.98		0.10	pH units		28-JUL-17	R3784341
Total Suspended Solids	<2.0		2.0	mg/L	28-JUL-17	29-JUL-17	R3785393
Total Dissolved Solids	527	DLDS	20	mg/L		30-JUL-17	R3786449
Anions and Nutrients							
Acidity (as CaCO3)	3.3		2.0	mg/L		01-AUG-17	R3787303
Alkalinity, Total (as CaCO3)	12		10	mg/L		30-JUL-17	R3785374
Ammonia, Total (as N)	0.414		0.020	mg/L		31-JUL-17	R3785748
Chloride (Cl)	2.73		0.50	mg/L		28-JUL-17	R3785731
Fluoride (F)	0.030		0.020	mg/L		28-JUL-17	R3785731
Nitrate (as N)	2.61		0.020	mg/L		28-JUL-17	R3785731
Total Kjeldahl Nitrogen	0.57		0.15	mg/L	31-JUL-17	31-JUL-17	R3785776
Phosphorus, Total	<0.0030		0.0030	mg/L	28-JUL-17	31-JUL-17	R3785375
Sulfate (SO4)	334		0.30	mg/L		28-JUL-17	R3785731
Cyanides							
Cyanide, Total	<0.0020		0.0020	mg/L		28-JUL-17	R3785390
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<1.0		1.0	mg/L		01-AUG-17	R3789505
Total Organic Carbon	<1.0		1.0	mg/L		01-AUG-17	R3787012
Total Metals							
Aluminum (Al)-Total	0.0322		0.0050	mg/L	28-JUL-17	28-JUL-17	R3785481
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	28-JUL-17	28-JUL-17	R3785481
Arsenic (As)-Total	<0.00010		0.00010	mg/L	28-JUL-17	28-JUL-17	R3785481
Barium (Ba)-Total	0.0108		0.00020	mg/L	28-JUL-17	28-JUL-17	R3785481
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	28-JUL-17	28-JUL-17	R3785481
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	28-JUL-17	28-JUL-17	R3785481
Boron (B)-Total	0.014		0.010	mg/L	28-JUL-17	28-JUL-17	R3785481
Cadmium (Cd)-Total	0.000056		0.000010	mg/L	28-JUL-17	28-JUL-17	R3785481
Calcium (Ca)-Total	24.8		0.50	mg/L	28-JUL-17	28-JUL-17	R3785481
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	28-JUL-17	28-JUL-17	R3785481
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	28-JUL-17	28-JUL-17	R3785481
Cobalt (Co)-Total	0.0240		0.00010	mg/L	28-JUL-17	28-JUL-17	R3785481
Copper (Cu)-Total	0.0013		0.0010	mg/L	28-JUL-17	28-JUL-17	R3785481
Iron (Fe)-Total	0.393		0.050	mg/L	28-JUL-17	28-JUL-17	R3785481
Lead (Pb)-Total	0.000143		0.000050	mg/L	28-JUL-17	28-JUL-17	R3785481
Lithium (Li)-Total	0.0049		0.0010	mg/L	28-JUL-17	28-JUL-17	R3785481
Magnesium (Mg)-Total	58.1		0.050	mg/L	28-JUL-17	28-JUL-17	R3785481
Manganese (Mn)-Total	2.31	DLHC	0.0050	mg/L	28-JUL-17	31-JUL-17	R3785481
Mercury (Hg)-Total	<0.000010		0.000010	mg/L		28-JUL-17	R3784344
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L	28-JUL-17	28-JUL-17	R3785481
Nickel (Ni)-Total	0.0267		0.00050	mg/L	28-JUL-17	28-JUL-17	R3785481

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965132-1 MS-08 Sampled By: LM/BL on 25-JUL-17 @ 09:20 Matrix: WATER							
Total Metals							
Phosphorus (P)-Total	<0.050		0.050	mg/L	28-JUL-17	28-JUL-17	R3785481
Potassium (K)-Total	1.14		0.050	mg/L	28-JUL-17	28-JUL-17	R3785481
Rubidium (Rb)-Total	0.00218		0.00020	mg/L	28-JUL-17	28-JUL-17	R3785481
Selenium (Se)-Total	0.00128		0.000050	mg/L	28-JUL-17	28-JUL-17	R3785481
Silicon (Si)-Total	0.51		0.10	mg/L	28-JUL-17	28-JUL-17	R3785481
Silver (Ag)-Total	<0.000050		0.000050	mg/L	28-JUL-17	28-JUL-17	R3785481
Sodium (Na)-Total	0.86		0.50	mg/L	28-JUL-17	28-JUL-17	R3785481
Strontium (Sr)-Total	0.0169		0.0010	mg/L	28-JUL-17	28-JUL-17	R3785481
Sulfur (S)-Total	106		0.50	mg/L	28-JUL-17	28-JUL-17	R3785481
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	28-JUL-17	28-JUL-17	R3785481
Thallium (Tl)-Total	0.000024		0.000010	mg/L	28-JUL-17	28-JUL-17	R3785481
Thorium (Th)-Total	<0.00010		0.00010	mg/L	28-JUL-17	28-JUL-17	R3785481
Tin (Sn)-Total	<0.00010		0.00010	mg/L	28-JUL-17	28-JUL-17	R3785481
Titanium (Ti)-Total	0.00134		0.00030	mg/L	28-JUL-17	28-JUL-17	R3785481
Tungsten (W)-Total	<0.00010		0.00010	mg/L	28-JUL-17	28-JUL-17	R3785481
Uranium (U)-Total	0.000057		0.000010	mg/L	28-JUL-17	28-JUL-17	R3785481
Vanadium (V)-Total	<0.00050		0.00050	mg/L	28-JUL-17	28-JUL-17	R3785481
Zinc (Zn)-Total	0.0048		0.0030	mg/L	28-JUL-17	28-JUL-17	R3785481
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	28-JUL-17	28-JUL-17	R3785481
Dissolved Metals							
Dissolved Mercury Filtration Location	FIELD					28-JUL-17	R3784175
Dissolved Metals Filtration Location	FIELD					29-JUL-17	R3785084
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	29-JUL-17	29-JUL-17	R3785152
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	29-JUL-17	29-JUL-17	R3785152
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	29-JUL-17	29-JUL-17	R3785152
Barium (Ba)-Dissolved	0.0108		0.00010	mg/L	29-JUL-17	29-JUL-17	R3785152
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	29-JUL-17	29-JUL-17	R3785152
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	29-JUL-17	29-JUL-17	R3785152
Boron (B)-Dissolved	0.014		0.010	mg/L	29-JUL-17	29-JUL-17	R3785152
Cadmium (Cd)-Dissolved	0.000061		0.000010	mg/L	29-JUL-17	29-JUL-17	R3785152
Calcium (Ca)-Dissolved	24.6		0.050	mg/L	29-JUL-17	29-JUL-17	R3785152
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	29-JUL-17	29-JUL-17	R3785152
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	29-JUL-17	29-JUL-17	R3785152
Cobalt (Co)-Dissolved	0.0256		0.00010	mg/L	29-JUL-17	29-JUL-17	R3785152
Copper (Cu)-Dissolved	0.00026		0.00020	mg/L	29-JUL-17	29-JUL-17	R3785152
Iron (Fe)-Dissolved	0.087		0.010	mg/L	29-JUL-17	29-JUL-17	R3785152
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	29-JUL-17	29-JUL-17	R3785152
Lithium (Li)-Dissolved	0.0047		0.0010	mg/L	29-JUL-17	29-JUL-17	R3785152
Magnesium (Mg)-Dissolved	67.1		0.050	mg/L	29-JUL-17	29-JUL-17	R3785152
Manganese (Mn)-Dissolved	2.46	DLHC	0.0050	mg/L	29-JUL-17	29-JUL-17	R3785152
Mercury (Hg)-Dissolved	<0.000010		0.000010	mg/L	28-JUL-17	28-JUL-17	R3784347

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1965132-1 MS-08 Sampled By: LM/BL on 25-JUL-17 @ 09:20 Matrix: WATER							
Dissolved Metals							
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L	29-JUL-17	29-JUL-17	R3785152
Nickel (Ni)-Dissolved	0.0286		0.00050	mg/L	29-JUL-17	29-JUL-17	R3785152
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	29-JUL-17	29-JUL-17	R3785152
Potassium (K)-Dissolved	1.31		0.050	mg/L	29-JUL-17	29-JUL-17	R3785152
Rubidium (Rb)-Dissolved	0.00221		0.00020	mg/L	29-JUL-17	29-JUL-17	R3785152
Selenium (Se)-Dissolved	0.00135		0.000050	mg/L	29-JUL-17	29-JUL-17	R3785152
Silicon (Si)-Dissolved	0.490		0.050	mg/L	29-JUL-17	29-JUL-17	R3785152
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	29-JUL-17	29-JUL-17	R3785152
Sodium (Na)-Dissolved	1.07		0.50	mg/L	29-JUL-17	29-JUL-17	R3785152
Strontium (Sr)-Dissolved	0.0160		0.0010	mg/L	29-JUL-17	29-JUL-17	R3785152
Sulfur (S)-Dissolved	113		0.50	mg/L	29-JUL-17	29-JUL-17	R3785152
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	29-JUL-17	29-JUL-17	R3785152
Thallium (Tl)-Dissolved	0.000022		0.000010	mg/L	29-JUL-17	29-JUL-17	R3785152
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	29-JUL-17	29-JUL-17	R3785152
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	29-JUL-17	29-JUL-17	R3785152
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	29-JUL-17	29-JUL-17	R3785152
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	29-JUL-17	29-JUL-17	R3785152
Uranium (U)-Dissolved	0.000024		0.000010	mg/L	29-JUL-17	29-JUL-17	R3785152
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	29-JUL-17	29-JUL-17	R3785152
Zinc (Zn)-Dissolved	0.0051		0.0010	mg/L	29-JUL-17	29-JUL-17	R3785152
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	29-JUL-17	29-JUL-17	R3785152
Radiological Parameters							
Ra-226	0.0077		0.0067	Bq/L	03-AUG-17	14-AUG-17	R3786631

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1965132-1
Matrix Spike	Cobalt (Co)-Dissolved	MS-B	L1965132-1
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1965132-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1965132-1
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1965132-1
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L1965132-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1965132-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1965132-1
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1965132-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L1965132-1
Matrix Spike	Cobalt (Co)-Total	MS-B	L1965132-1
Matrix Spike	Iron (Fe)-Total	MS-B	L1965132-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1965132-1
Matrix Spike	Manganese (Mn)-Total	MS-B	L1965132-1
Matrix Spike	Nickel (Ni)-Total	MS-B	L1965132-1
Matrix Spike	Silicon (Si)-Total	MS-B	L1965132-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L1965132-1
Matrix Spike	Sulfur (S)-Total	MS-B	L1965132-1
Matrix Spike	Nitrate (as N)	MS-B	L1965132-1
Matrix Spike	Phosphorus, Total	MS-B	L1965132-1
Matrix Spike	Sulfate (SO4)	MS-B	L1965132-1

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-TITR-TB	Water	Acidity	APHA 2310 B modified

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-WT	Water	Dissolved Organic Carbon	APHA 5310 B-INSTRUMENTAL

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ALS Test Code	Matrix	Test Description	Method Reference**
CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

ALS Test Code	Matrix	Test Description	Method Reference**
EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ALS Test Code	Matrix	Test Description	Method Reference**
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Reference Information

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-WT | Water | Dissolved Mercury in Water by CVAAS | 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-T-CVAA-WT | Water | Total Mercury in Water by CVAAS | EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-D-CCMS-WT | 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-T-CCMS-WT | Water | Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-WT | Water | Ammonia, Total as N | EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO3-IC-WT | Water | Nitrate in Water by IC | EPA 300.1 (mod)

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

P-T-COL-WT | Water | Total P in Water by Colour | APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PH-WT | Water | pH | APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

RA226-MMER-FC | Water | Ra226 by Alpha Scint, MDC=0.01 Bq/L | EPA 903.1

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

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

SOLIDS-TDS-WT | Water | Total Dissolved Solids | APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5°C overnight and then 180–10°C for 1hr.

SOLIDS-TSS-WT | Water | Suspended solids | APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TKN-WT | Water | Total Kjeldahl Nitrogen | APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

TOC-WT | Water | Total Organic Carbon | APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** 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

Reference Information

WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
TB	ALS ENVIRONMENTAL - THUNDER BAY, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

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 weight of sample

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

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.

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACY-TITR-TB	**Water**							
Batch R3787303								
WG2582597-6 DUP		**L1965132-1**						
Acidity (as CaCO3)		3.3	2.8		mg/L	16	20	01-AUG-17
WG2582597-5 LCS								
Acidity (as CaCO3)			101.4		%		85-115	01-AUG-17
WG2582597-4 MB								
Acidity (as CaCO3)			<2.0		mg/L		2	01-AUG-17
ALK-WT	**Water**							
Batch R3785374								
WG2581484-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			102.9		%		80-120	30-JUL-17
WG2581484-4 DUP		**L1965132-1**						
Alkalinity, Total (as CaCO3)		12	12		mg/L	3.9	20	30-JUL-17
WG2581484-2 LCS								
Alkalinity, Total (as CaCO3)			101.6		%		85-115	30-JUL-17
WG2581484-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	30-JUL-17
C-DIS-ORG-WT	**Water**							
Batch R3789505								
WG2583293-3 DUP		**L1965132-1**						
Dissolved Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	01-AUG-17
WG2583293-2 LCS								
Dissolved Organic Carbon			97.2		%		80-120	01-AUG-17
WG2583293-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	01-AUG-17
WG2583293-4 MS		**L1965132-1**						
Dissolved Organic Carbon			99.4		%		70-130	01-AUG-17
CL-IC-N-WT	**Water**							
Batch R3785731								
WG2580673-14 DUP		**WG2580673-15**						
Chloride (Cl)		2.73	2.71		mg/L	0.6	20	28-JUL-17
WG2580673-12 LCS								
Chloride (Cl)			101.4		%		90-110	28-JUL-17
WG2580673-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	28-JUL-17
WG2580673-13 MS		**WG2580673-15**						
Chloride (Cl)			101.8		%		75-125	28-JUL-17
CN-TOT-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-TOT-WT	**Water**							
Batch R3785390								
WG2580452-11 DUP		**L1963579-2**						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	28-JUL-17
WG2580452-10 LCS								
Cyanide, Total			87.0		%		80-120	28-JUL-17
WG2580452-9 MB								
Cyanide, Total			<0.0020		mg/L		0.002	28-JUL-17
WG2580452-12 MS		**L1963579-2**						
Cyanide, Total			87.2		%		70-130	28-JUL-17
EC-WT	**Water**							
Batch R3784341								
WG2580206-7 DUP		**WG2580206-6**						
Conductivity		522	524		umhos/cm	0.4	10	28-JUL-17
WG2580206-5 LCS								
Conductivity			100.4		%		90-110	28-JUL-17
WG2580206-8 MB								
Conductivity			<3.0		umhos/cm		3	28-JUL-17
F-IC-N-WT	**Water**							
Batch R3785731								
WG2580673-14 DUP		**WG2580673-15**						
Fluoride (F)		0.030	0.031		mg/L	4.6	20	28-JUL-17
WG2580673-12 LCS								
Fluoride (F)			101.0		%		90-110	28-JUL-17
WG2580673-11 MB								
Fluoride (F)			<0.020		mg/L		0.02	28-JUL-17
WG2580673-13 MS		**WG2580673-15**						
Fluoride (F)			95.9		%		75-125	28-JUL-17
HG-D-CVAA-WT	**Water**							
Batch R3784347								
WG2580172-4 DUP		**WG2580172-3**						
Mercury (Hg)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	28-JUL-17
WG2580172-2 LCS								
Mercury (Hg)-Dissolved			92.8		%		80-120	28-JUL-17
WG2580172-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	28-JUL-17
WG2580172-6 MS		**WG2580172-5**						
Mercury (Hg)-Dissolved			91.9		%		70-130	28-JUL-17
HG-T-CVAA-WT	**Water**							

ALS Environmental

Quality Control Report

Workorder: L1965132 Report Date: 31-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R3784344								
WG2580171-3 DUP		**L1965677-4**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	28-JUL-17
WG2580171-2 LCS								
Mercury (Hg)-Total			92.2		%		80-120	28-JUL-17
WG2580171-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	28-JUL-17
WG2580171-4 MS		**L1965677-5**						
Mercury (Hg)-Total			91.2		%		70-130	28-JUL-17
MET-D-CCMS-WT	**Water**							
Batch R3785152								
WG2581164-4 DUP		**WG2581164-3**						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	29-JUL-17
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUL-17
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUL-17
Barium (Ba)-Dissolved		0.0108	0.0111		mg/L	2.2	20	29-JUL-17
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUL-17
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-JUL-17
Boron (B)-Dissolved		0.014	0.014		mg/L	0.9	20	29-JUL-17
Cadmium (Cd)-Dissolved		0.000061	0.000067		mg/L	9.2	20	29-JUL-17
Calcium (Ca)-Dissolved		24.6	25.0		mg/L	1.5	20	29-JUL-17
Cesium (Cs)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-JUL-17
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	29-JUL-17
Cobalt (Co)-Dissolved		0.0256	0.0259		mg/L	1.4	20	29-JUL-17
Copper (Cu)-Dissolved		0.00026	0.00027		mg/L	0.8	20	29-JUL-17
Iron (Fe)-Dissolved		0.087	0.089		mg/L	1.7	20	29-JUL-17
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-JUL-17
Lithium (Li)-Dissolved		0.0047	0.0045		mg/L	4.8	20	29-JUL-17
Magnesium (Mg)-Dissolved		67.1	68.9		mg/L	2.7	20	29-JUL-17
Manganese (Mn)-Dissolved		2.46	2.39		mg/L	2.7	20	29-JUL-17
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-JUL-17
Nickel (Ni)-Dissolved		0.0286	0.0293		mg/L	2.4	20	29-JUL-17
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	29-JUL-17
Potassium (K)-Dissolved		1.31	1.31		mg/L	0.3	20	29-JUL-17
Rubidium (Rb)-Dissolved		0.00221	0.00228		mg/L	2.9	20	29-JUL-17
Selenium (Se)-Dissolved		0.00135	0.00132		mg/L	2.3	20	29-JUL-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3785152								
WG2581164-4 DUP		**WG2581164-3**						
Silicon (Si)-Dissolved		0.490	0.492		mg/L	0.5	20	29-JUL-17
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-JUL-17
Sodium (Na)-Dissolved		1.07	1.10		mg/L	2.7	20	29-JUL-17
Strontium (Sr)-Dissolved		0.0160	0.0169		mg/L	5.4	20	29-JUL-17
Sulfur (S)-Dissolved		113	116		mg/L	2.0	20	29-JUL-17
Tellurium (Te)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	29-JUL-17
Thallium (Tl)-Dissolved		0.000022	0.000022		mg/L	0.9	20	29-JUL-17
Thorium (Th)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUL-17
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUL-17
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	29-JUL-17
Tungsten (W)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-JUL-17
Uranium (U)-Dissolved		0.000024	0.000026		mg/L	6.9	20	29-JUL-17
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	29-JUL-17
Zinc (Zn)-Dissolved		0.0051	0.0051		mg/L	0.0	20	29-JUL-17
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	29-JUL-17
WG2581164-2 LCS								
Aluminum (Al)-Dissolved			103.2		%		80-120	29-JUL-17
Antimony (Sb)-Dissolved			96.3		%		80-120	29-JUL-17
Arsenic (As)-Dissolved			99.1		%		80-120	29-JUL-17
Barium (Ba)-Dissolved			104.4		%		80-120	29-JUL-17
Beryllium (Be)-Dissolved			101.7		%		80-120	29-JUL-17
Bismuth (Bi)-Dissolved			93.7		%		80-120	29-JUL-17
Boron (B)-Dissolved			98.0		%		80-120	29-JUL-17
Cadmium (Cd)-Dissolved			102.4		%		80-120	29-JUL-17
Calcium (Ca)-Dissolved			102.5		%		80-120	29-JUL-17
Cesium (Cs)-Dissolved			101.1		%		80-120	29-JUL-17
Chromium (Cr)-Dissolved			100.0		%		80-120	29-JUL-17
Cobalt (Co)-Dissolved			98.9		%		80-120	29-JUL-17
Copper (Cu)-Dissolved			96.5		%		80-120	29-JUL-17
Iron (Fe)-Dissolved			99.9		%		80-120	29-JUL-17
Lead (Pb)-Dissolved			97.3		%		80-120	29-JUL-17
Lithium (Li)-Dissolved			103.2		%		80-120	29-JUL-17
Magnesium (Mg)-Dissolved			101.4		%		80-120	29-JUL-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3785152								
WG2581164-2 LCS								
Manganese (Mn)-Dissolved			101.9		%		80-120	29-JUL-17
Molybdenum (Mo)-Dissolved			98.9		%		80-120	29-JUL-17
Nickel (Ni)-Dissolved			98.1		%		80-120	29-JUL-17
Phosphorus (P)-Dissolved			110.1		%		80-120	29-JUL-17
Potassium (K)-Dissolved			100.8		%		80-120	29-JUL-17
Rubidium (Rb)-Dissolved			99.7		%		80-120	29-JUL-17
Selenium (Se)-Dissolved			97.8		%		80-120	29-JUL-17
Silicon (Si)-Dissolved			117.8		%		60-140	29-JUL-17
Silver (Ag)-Dissolved			99.96		%		80-120	29-JUL-17
Sodium (Na)-Dissolved			104.5		%		80-120	29-JUL-17
Strontium (Sr)-Dissolved			105.2		%		80-120	29-JUL-17
Sulfur (S)-Dissolved			98.4		%		80-120	29-JUL-17
Tellurium (Te)-Dissolved			97.9		%		80-120	29-JUL-17
Thallium (Tl)-Dissolved			95.3		%		80-120	29-JUL-17
Thorium (Th)-Dissolved			98.3		%		80-120	29-JUL-17
Tin (Sn)-Dissolved			98.4		%		80-120	29-JUL-17
Titanium (Ti)-Dissolved			97.6		%		80-120	29-JUL-17
Tungsten (W)-Dissolved			98.0		%		80-120	29-JUL-17
Uranium (U)-Dissolved			101.7		%		80-120	29-JUL-17
Vanadium (V)-Dissolved			102.8		%		80-120	29-JUL-17
Zinc (Zn)-Dissolved			94.3		%		80-120	29-JUL-17
Zirconium (Zr)-Dissolved			100.0		%		80-120	29-JUL-17
WG2581164-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	29-JUL-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	29-JUL-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	29-JUL-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	29-JUL-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	29-JUL-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	29-JUL-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-JUL-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	29-JUL-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	29-JUL-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	29-JUL-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	29-JUL-17

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Oakville ON L6H 0C3
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3785152								
WG2581164-1 MB								
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	29-JUL-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	29-JUL-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-JUL-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	29-JUL-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	29-JUL-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	29-JUL-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	29-JUL-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	29-JUL-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	29-JUL-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	29-JUL-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	29-JUL-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	29-JUL-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	29-JUL-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	29-JUL-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	29-JUL-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	29-JUL-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	29-JUL-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	29-JUL-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	29-JUL-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	29-JUL-17
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	29-JUL-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	29-JUL-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	29-JUL-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	29-JUL-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	29-JUL-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	29-JUL-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	29-JUL-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	29-JUL-17
WG2581164-5 MS		**WG2581164-3**						
Aluminum (Al)-Dissolved			99.5		%		70-130	29-JUL-17
Antimony (Sb)-Dissolved			94.9		%		70-130	29-JUL-17
Arsenic (As)-Dissolved			103.4		%		70-130	29-JUL-17
Barium (Ba)-Dissolved			103.3		%		70-130	29-JUL-17
Beryllium (Be)-Dissolved			99.8		%		70-130	29-JUL-17

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3785152								
WG2581164-5 MS		**WG2581164-3**						
Bismuth (Bi)-Dissolved			84.9		%		70-130	29-JUL-17
Boron (B)-Dissolved			95.3		%		70-130	29-JUL-17
Cadmium (Cd)-Dissolved			104.4		%		70-130	29-JUL-17
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	29-JUL-17
Cesium (Cs)-Dissolved			99.1		%		70-130	29-JUL-17
Chromium (Cr)-Dissolved			99.0		%		70-130	29-JUL-17
Cobalt (Co)-Dissolved			N/A	MS-B	%		-	29-JUL-17
Copper (Cu)-Dissolved			96.9		%		70-130	29-JUL-17
Iron (Fe)-Dissolved			N/A	MS-B	%		-	29-JUL-17
Lead (Pb)-Dissolved			95.6		%		70-130	29-JUL-17
Lithium (Li)-Dissolved			100.2		%		70-130	29-JUL-17
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	29-JUL-17
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	29-JUL-17
Molybdenum (Mo)-Dissolved			97.6		%		70-130	29-JUL-17
Nickel (Ni)-Dissolved			N/A	MS-B	%		-	29-JUL-17
Phosphorus (P)-Dissolved			119.6		%		70-130	29-JUL-17
Potassium (K)-Dissolved			104.6		%		70-130	29-JUL-17
Rubidium (Rb)-Dissolved			98.7		%		70-130	29-JUL-17
Selenium (Se)-Dissolved			108.9		%		70-130	29-JUL-17
Silicon (Si)-Dissolved			N/A	MS-B	%		-	29-JUL-17
Silver (Ag)-Dissolved			88.5		%		70-130	29-JUL-17
Sodium (Na)-Dissolved			94.4		%		70-130	29-JUL-17
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	29-JUL-17
Sulfur (S)-Dissolved			N/A	MS-B	%		-	29-JUL-17
Tellurium (Te)-Dissolved			99.8		%		70-130	29-JUL-17
Thallium (Tl)-Dissolved			94.4		%		70-130	29-JUL-17
Thorium (Th)-Dissolved			98.0		%		70-130	29-JUL-17
Tin (Sn)-Dissolved			95.2		%		70-130	29-JUL-17
Titanium (Ti)-Dissolved			99.2		%		70-130	29-JUL-17
Tungsten (W)-Dissolved			99.4		%		70-130	29-JUL-17
Uranium (U)-Dissolved			98.8		%		70-130	29-JUL-17
Vanadium (V)-Dissolved			103.8		%		70-130	29-JUL-17
Zinc (Zn)-Dissolved			95.5		%		70-130	29-JUL-17

Quality Control Report

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Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3785152								
WG2581164-5 MS		**WG2581164-3**						
Zirconium (Zr)-Dissolved			97.7		%		70-130	29-JUL-17
MET-T-CCMS-WT	**Water**							
Batch R3785481								
WG2580580-4 DUP		**WG2580580-3**						
Aluminum (Al)-Total		0.0322	0.0330		mg/L	2.5	20	28-JUL-17
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-JUL-17
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-JUL-17
Barium (Ba)-Total		0.0108	0.0112		mg/L	3.5	20	28-JUL-17
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-JUL-17
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	28-JUL-17
Boron (B)-Total		0.014	0.015		mg/L	0.3	20	28-JUL-17
Cadmium (Cd)-Total		0.000056	0.000070	J	mg/L	0.000015	0.00002	28-JUL-17
Calcium (Ca)-Total		24.8	24.7		mg/L	0.4	20	28-JUL-17
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	28-JUL-17
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	28-JUL-17
Cobalt (Co)-Total		0.0240	0.0257		mg/L	7.0	20	28-JUL-17
Copper (Cu)-Total		0.0013	0.0016		mg/L	18	20	28-JUL-17
Iron (Fe)-Total		0.393	0.405		mg/L	3.1	20	28-JUL-17
Lead (Pb)-Total		0.000143	0.000148		mg/L	3.7	20	28-JUL-17
Lithium (Li)-Total		0.0049	0.0045		mg/L	7.3	20	28-JUL-17
Magnesium (Mg)-Total		58.1	63.6		mg/L	9.0	20	28-JUL-17
Manganese (Mn)-Total		2.11	2.22		mg/L	5.1	20	28-JUL-17
Molybdenum (Mo)-Total		<0.000050	0.000054	RPD-NA	mg/L	N/A	20	28-JUL-17
Nickel (Ni)-Total		0.0267	0.0288		mg/L	7.5	20	28-JUL-17
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	28-JUL-17
Potassium (K)-Total		1.14	1.26		mg/L	9.9	20	28-JUL-17
Rubidium (Rb)-Total		0.00218	0.00245		mg/L	12	20	28-JUL-17
Selenium (Se)-Total		0.00128	0.00128		mg/L	0.0	20	28-JUL-17
Silicon (Si)-Total		0.51	0.53		mg/L	3.6	20	28-JUL-17
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	28-JUL-17
Sodium (Na)-Total		0.86	0.95		mg/L	9.2	20	28-JUL-17
Strontium (Sr)-Total		0.0169	0.0172		mg/L	1.8	20	28-JUL-17

ALS Environmental

Quality Control Report

Workorder: L1965132 Report Date: 31-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3785481								
WG2580580-4 DUP		**WG2580580-3**						
Sulfur (S)-Total		106	111		mg/L	4.6	25	28-JUL-17
Thallium (Tl)-Total		0.000024	0.000024		mg/L	2.4	20	28-JUL-17
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	28-JUL-17
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	28-JUL-17
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-JUL-17
Titanium (Ti)-Total		0.00134	0.00133		mg/L	0.6	20	28-JUL-17
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-JUL-17
Uranium (U)-Total		0.000057	0.000057		mg/L	0.9	20	28-JUL-17
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	28-JUL-17
Zinc (Zn)-Total		0.0048	0.0050		mg/L	5.5	20	28-JUL-17
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	28-JUL-17
WG2580580-2 LCS								
Aluminum (Al)-Total			94.0		%		80-120	28-JUL-17
Antimony (Sb)-Total			105.7		%		80-120	28-JUL-17
Arsenic (As)-Total			97.6		%		80-120	28-JUL-17
Barium (Ba)-Total			106.9		%		80-120	28-JUL-17
Beryllium (Be)-Total			101.4		%		80-120	28-JUL-17
Bismuth (Bi)-Total			101.7		%		80-120	28-JUL-17
Boron (B)-Total			97.3		%		80-120	28-JUL-17
Cadmium (Cd)-Total			99.1		%		80-120	28-JUL-17
Calcium (Ca)-Total			103.8		%		80-120	28-JUL-17
Chromium (Cr)-Total			96.4		%		80-120	28-JUL-17
Cesium (Cs)-Total			112.8		%		80-120	28-JUL-17
Cobalt (Co)-Total			97.3		%		80-120	28-JUL-17
Copper (Cu)-Total			95.6		%		80-120	28-JUL-17
Iron (Fe)-Total			97.1		%		80-120	28-JUL-17
Lead (Pb)-Total			106.5		%		80-120	28-JUL-17
Lithium (Li)-Total			100.6		%		80-120	28-JUL-17
Magnesium (Mg)-Total			96.1		%		80-120	28-JUL-17
Manganese (Mn)-Total			97.7		%		80-120	28-JUL-17
Molybdenum (Mo)-Total			106.5		%		80-120	28-JUL-17
Nickel (Ni)-Total			95.4		%		80-120	28-JUL-17
Phosphorus (P)-Total			88.2		%		70-130	28-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3785481								
WG2580580-2 LCS								
Potassium (K)-Total			96.4		%		80-120	28-JUL-17
Rubidium (Rb)-Total			99.4		%		80-120	28-JUL-17
Selenium (Se)-Total			97.9		%		80-120	28-JUL-17
Silicon (Si)-Total			114.4		%		60-140	28-JUL-17
Silver (Ag)-Total			107.9		%		80-120	28-JUL-17
Sodium (Na)-Total			95.4		%		80-120	28-JUL-17
Strontium (Sr)-Total			110.4		%		80-120	28-JUL-17
Sulfur (S)-Total			98.4		%		70-130	28-JUL-17
Thallium (Tl)-Total			103.0		%		80-120	28-JUL-17
Tellurium (Te)-Total			103.1		%		80-120	28-JUL-17
Thorium (Th)-Total			111.9		%		70-130	28-JUL-17
Tin (Sn)-Total			100.6		%		80-120	28-JUL-17
Titanium (Ti)-Total			91.5		%		80-120	28-JUL-17
Tungsten (W)-Total			113.6		%		80-120	28-JUL-17
Uranium (U)-Total			111.1		%		80-120	28-JUL-17
Vanadium (V)-Total			97.1		%		80-120	28-JUL-17
Zinc (Zn)-Total			92.5		%		80-120	28-JUL-17
Zirconium (Zr)-Total			105.3		%		80-120	28-JUL-17
WG2580580-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	28-JUL-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	28-JUL-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	28-JUL-17
Barium (Ba)-Total			<0.00020		mg/L		0.0002	28-JUL-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	28-JUL-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	28-JUL-17
Boron (B)-Total			<0.010		mg/L		0.01	28-JUL-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	28-JUL-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	28-JUL-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	28-JUL-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	28-JUL-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	28-JUL-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	28-JUL-17
Iron (Fe)-Total			<0.050		mg/L		0.05	28-JUL-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	28-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3785481								
WG2580580-1 MB								
Lithium (Li)-Total			<0.0010		mg/L		0.001	28-JUL-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	28-JUL-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	28-JUL-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	28-JUL-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	28-JUL-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	28-JUL-17
Potassium (K)-Total			<0.050		mg/L		0.05	28-JUL-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	28-JUL-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	28-JUL-17
Silicon (Si)-Total			<0.10		mg/L		0.1	28-JUL-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	28-JUL-17
Sodium (Na)-Total			<0.50		mg/L		0.5	28-JUL-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	28-JUL-17
Sulfur (S)-Total			<0.50		mg/L		0.5	28-JUL-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	28-JUL-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	28-JUL-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	28-JUL-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	28-JUL-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	28-JUL-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	28-JUL-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	28-JUL-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	28-JUL-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	28-JUL-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	28-JUL-17
WG2580580-5 MS		**WG2580580-3**						
Aluminum (Al)-Total			88.6		%		70-130	28-JUL-17
Antimony (Sb)-Total			97.0		%		70-130	28-JUL-17
Arsenic (As)-Total			97.0		%		70-130	28-JUL-17
Barium (Ba)-Total			104.5		%		70-130	28-JUL-17
Beryllium (Be)-Total			84.4		%		70-130	28-JUL-17
Bismuth (Bi)-Total			94.0		%		70-130	28-JUL-17
Boron (B)-Total			84.1		%		70-130	28-JUL-17
Cadmium (Cd)-Total			95.3		%		70-130	28-JUL-17
Calcium (Ca)-Total			N/A	MS-B	%		-	28-JUL-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3785481								
WG2580580-5 MS		**WG2580580-3**						
Chromium (Cr)-Total			92.0		%		70-130	28-JUL-17
Cesium (Cs)-Total			104.1		%		70-130	28-JUL-17
Cobalt (Co)-Total			N/A	MS-B	%		-	28-JUL-17
Copper (Cu)-Total			91.7		%		70-130	28-JUL-17
Iron (Fe)-Total			N/A	MS-B	%		-	28-JUL-17
Lead (Pb)-Total			94.3		%		70-130	28-JUL-17
Lithium (Li)-Total			73.5		%		70-130	28-JUL-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	28-JUL-17
Manganese (Mn)-Total			N/A	MS-B	%		-	28-JUL-17
Molybdenum (Mo)-Total			99.3		%		70-130	28-JUL-17
Nickel (Ni)-Total			N/A	MS-B	%		-	28-JUL-17
Phosphorus (P)-Total			103.4		%		70-130	28-JUL-17
Potassium (K)-Total			94.2		%		70-130	28-JUL-17
Rubidium (Rb)-Total			100.2		%		70-130	28-JUL-17
Selenium (Se)-Total			101.3		%		70-130	28-JUL-17
Silicon (Si)-Total			N/A	MS-B	%		-	28-JUL-17
Silver (Ag)-Total			97.8		%		70-130	28-JUL-17
Sodium (Na)-Total			94.7		%		70-130	28-JUL-17
Strontium (Sr)-Total			N/A	MS-B	%		-	28-JUL-17
Sulfur (S)-Total			N/A	MS-B	%		-	28-JUL-17
Thallium (Tl)-Total			92.3		%		70-130	28-JUL-17
Tellurium (Te)-Total			95.2		%		70-130	28-JUL-17
Thorium (Th)-Total			103.2		%		70-130	28-JUL-17
Tin (Sn)-Total			96.5		%		70-130	28-JUL-17
Titanium (Ti)-Total			91.7		%		70-130	28-JUL-17
Tungsten (W)-Total			104.6		%		70-130	28-JUL-17
Uranium (U)-Total			99.97		%		70-130	28-JUL-17
Vanadium (V)-Total			95.9		%		70-130	28-JUL-17
Zinc (Zn)-Total			86.7		%		70-130	28-JUL-17
Zirconium (Zr)-Total			98.9		%		70-130	28-JUL-17
NH3-WT	**Water**							

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-WT	**Water**							
Batch R3785748								
WG2581615-16 DUP		**L1966769-1**						
Ammonia, Total (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	31-JUL-17
WG2581615-14 LCS								
Ammonia, Total (as N)			98.5		%		85-115	31-JUL-17
WG2581615-13 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	31-JUL-17
WG2581615-15 MS		**L1966769-1**						
Ammonia, Total (as N)			88.7		%		75-125	31-JUL-17
NO3-IC-WT	**Water**							
Batch R3785731								
WG2580673-14 DUP		**WG2580673-15**						
Nitrate (as N)		2.61	2.61		mg/L	0.2	25	28-JUL-17
WG2580673-12 LCS								
Nitrate (as N)			100.7		%		70-130	28-JUL-17
WG2580673-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	28-JUL-17
WG2580673-13 MS		**WG2580673-15**						
Nitrate (as N)			N/A	MS-B	%		-	28-JUL-17
P-T-COL-WT	**Water**							
Batch R3785375								
WG2580400-3 DUP		**L1964191-1**						
Phosphorus, Total		0.214	0.207		mg/L	3.0	20	31-JUL-17
WG2580400-2 LCS								
Phosphorus, Total			100.2		%		80-120	31-JUL-17
WG2580400-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	31-JUL-17
WG2580400-4 MS		**L1964191-1**						
Phosphorus, Total			N/A	MS-B	%		-	31-JUL-17
PH-WT	**Water**							
Batch R3784341								
WG2580206-7 DUP		**WG2580206-6**						
pH		7.93	7.93	J	pH units	0.00	0.2	28-JUL-17
WG2580206-5 LCS								
pH			6.99		pH units		6.9-7.1	28-JUL-17
SO4-IC-N-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT	**Water**							
Batch R3785731								
WG2580673-14 DUP		**WG2580673-15**						
Sulfate (SO4)		337	335		mg/L	0.7	20	28-JUL-17
WG2580673-12 LCS								
Sulfate (SO4)			101.2		%		90-110	28-JUL-17
WG2580673-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	28-JUL-17
WG2580673-13 MS		**WG2580673-15**						
Sulfate (SO4)			N/A	MS-B	%		-	28-JUL-17
SOLIDS-TDS-WT	**Water**							
Batch R3786449								
WG2581310-3 DUP		**L1965132-1**						
Total Dissolved Solids		527	527		mg/L	0.1	20	30-JUL-17
WG2581310-2 LCS								
Total Dissolved Solids			96.7		%		85-115	30-JUL-17
WG2581310-1 MB								
Total Dissolved Solids			<10		mg/L		10	30-JUL-17
SOLIDS-TSS-WT	**Water**							
Batch R3785393								
WG2580656-3 DUP		**L1965935-1**						
Total Suspended Solids		8.9	8.9		mg/L	0.0	20	29-JUL-17
WG2580656-2 LCS								
Total Suspended Solids			101.0		%		85-115	29-JUL-17
WG2580656-1 MB								
Total Suspended Solids			<2.0		mg/L		2	29-JUL-17
TKN-WT	**Water**							
Batch R3785776								
WG2581530-3 DUP		**L1964916-1**						
Total Kjeldahl Nitrogen		0.35	0.39		mg/L	11	20	31-JUL-17
WG2581530-2 LCS								
Total Kjeldahl Nitrogen			100.2		%		75-125	31-JUL-17
WG2581530-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	31-JUL-17
WG2581530-4 MS		**L1964916-1**						
Total Kjeldahl Nitrogen			102.6		%		70-130	31-JUL-17
TOC-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TOC-WT	**Water**							
Batch R3787012								
WG2583243-3 DUP		**L1960563-1**						
Total Organic Carbon		<1.0	<1.0	RPD-NA	mg/L	N/A	20	01-AUG-17
WG2583243-2 LCS								
Total Organic Carbon			97.8		%		80-120	01-AUG-17
WG2583243-1 MB								
Total Organic Carbon			<1.0		mg/L		1	01-AUG-17
WG2583243-4 MS		**L1960563-1**						
Total Organic Carbon			101.6		%		70-130	01-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

August 30, 2017

Rick Hawthorne
ALS Laboratory Group, Waterloo
60 Northland Road, Unit #1
Waterloo ON
N2V 2B8

Dear Rick,

Re: Report on Sublethal Toxicity Analysis of Wastewater for MMER - July 2017

Enclosed are the reports for sublethal testing conducted on the sample of L1965132-1 MS-08 collected 2017-07-25. Data are presented in electronic format. Please forward a copy to Environment and Climate Change Canada.

On the accompanying chain of custody, you have requested entry of the data into the RISS system. We would be pleased to enter this information on your behalf, for a fee, but will require your user name and pass code (supplied to you by Environment and Climate Change Canada) in order to access the data entry system. Please email this information to reporter@aquatox.ca. This information will be held on file at our facility in a secure and confidential manner. We will then enter the results on the RISS sublethal test data entry system and notify you of the submission by email. In the future, if you would prefer us enter the data automatically at the time the reports are issued, please indicate this in writing.

If you have any questions about the results, do not hesitate to contact me.

Sincerely,

AQUATOX TESTING & CONSULTING INC.

Martina Rendas
Project Manager

MR/jl

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Ceriodaphnia dubia
EPS 1/RM/21

Work Order : 234028
Sample Number : 51785

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo		
Location :	Waterloo ON	Sampled By :	LM/BL
Job Number :	L1965132	Date Collected :	2017-07-25
Substance :	L1965132-1 MS-08	Time Collected :	09:20
Sampling Method :	Not provided	Date Received :	2017-07-28
Temp. on arrival :	8.0°C	Time Received :	10:40
Sample Description :	Clear, colourless, odourless.	Date Tested :	2017-07-28

Test Method : Test of Reproduction and Survival using the Cladoceran *Ceriodaphnia dubia*. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/21, 2nd ed. (February 2007).

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
LC50	>100%	-	-
IC25 (Reproduction)	26.6%	2.71-76.9	Linear Interpolation (TOXSTAT) d

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2017-08-10		
Test Duration :	6 days	Analyst(s) :	NL, CN
IC25 Reproduction :	1.37 g/L	LC50 :	2.47 g/L
95% Confidence Limits :	1.24 - 1.51 g/L	95% Confidence Limits :	1.99 - 3.07 g/L
Statistical Method :	Linear Interpolation (CETIS)[a]	Statistical Method :	Spearman-Kärber (CETIS)[a]
Historical Mean IC25 :	1.37 g/L	Historical Mean LC50 :	2.22 g/L
Warning Limits (± 2SD) :	1.02 - 1.83 g/L	Warning Limits (± 2SD) :	1.92 - 2.58 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Sample Filtration :	None	Test Volume per Replicate :	15 mL
Test Aeration :	None	Test Vessel :	19 mL polystyrene vial
pH Adjustment :	None	Depth of Test Solution :	4.8 cm
Hardness Adjustment :	None	Organisms per Replicate :	1
Daily Renewal Method :	Transferred to fresh solutions	Number of Replicates :	10
Control/Dilution Water :	Well water (no chemicals added)	Test Method Deviation(s) :	None

COMMENTS

- All test validity criteria as specified in the test method cited above were satisfied.
- Statistical analysis could not be performed using non linear regression, since a suitable model could not be found. Therefore, test results were calculated using Linear Interpolation (Toxstat)[d].

Work Order :	234028
Sample Number :	51785

TEST ORGANISMS

Test Organism :	*Ceriodaphnia dubia*	Range of Age (at start of test) :	19:50 h - 23:05 h
Organism Batch :	Cd17-07	Mean Brood Organism Mortality :	10%
Organism Origin :	Single in-house mass culture	Ephippia in Culture :	No
Test Organism Origin :	Individual in-house cultures		

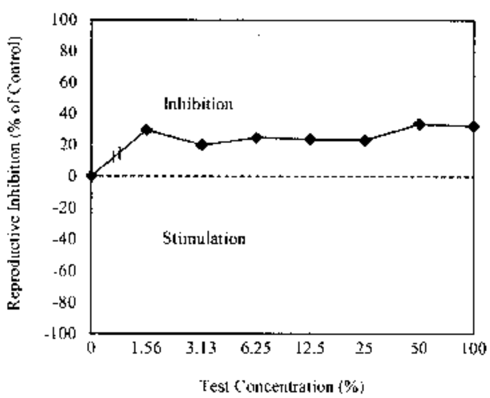
Brood Organism Neonate Production

Replicate :	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Mean**
Total (third or subsequent brood):	11	17	9	12	12	12	16	10	16	14	12.9
Total (first three broods):	24	26	29	20	28	24	27	24	28	27	25.7

No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.

TEST DATA

***Ceriodaphnia dubia* Reproductive Inhibition**



Cumulative Daily Test Organism Mortality (%)

		Test Concentration (%)							
Date	**Test Day**	Control	1.56	3.13	6.25	12.5	25	50	100
2017-07-29	1	0	0	0	0	0	0	0	0
2017-07-30	2	0	0	0	0	0	0	0	0
2017-07-31	3	0	0	0	0	0	0	0	0
2017-08-01	4	0	0	0	0	0	0	0	0
2017-08-02	5	0	0	0	0	0	0	10	0
2017-08-03	6	0	0	0	0	0	0	10	0
Total Mortality (%)		0	0	0	0	0	0	10	0

REFERENCES

[a] CETIS™, © 2000-2013. V.1.8.7.17. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[d] West, Inc. and D. Gulley. 1996. Toxstat Release 3.5. Western Ecosystems Technology. Cheyenne, WY, U.S.A.

Date : 2017-08-30
yyyy-mm-dd

Approved By : [signature]
Project Manager

AQUATOX

TOXICITY TEST REPORT

Ceriodaphnia dubia

EPS 1/RM/21

Work Order : 234028

Sample Number : 51785

Ceriodaphnia dubia Survival and Reproduction

Test Initiation Date : 2017-07-28

Initiation Time : 13:50

Test Completion Date : 2017-08-03

Concentration (%) Control	Day	1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)	Analyst(s)
2017-07-29	1	0	0	0	0	0	0	0	0	0	0	0	MR
2017-07-30	2	0	0	0	0	0	0	0	0	0	0	0	MR
2017-07-31	3	0	4	0	3	6	3	4	4	3	5	3.2	NL(MA)
2017-08-01	4	4	6	6	6	9	0	8	8	7	9	6.3	EJS
2017-08-02	5	6	0	6	0	0	6	0	0	0	0	1.8	SV
2017-08-03	6	9	8	4	8	15	6	9	5	6	7	7.7	MA
Total		**19**	**18**	**16**	**17**	**30**	**15**	**21**	**17**	**16**	**21**	**19.0 (±4.4)**	

Concentration (%) 12.5	Day	1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-07-29	1	0	0	0	0	0	0	0	0	0	0	0
2017-07-30	2	0	0	0	0	0	0	0	0	0	0	0
2017-07-31	3	4	1	0	3	5	1	4	0	0	3	2.1
2017-08-01	4	8	5	4	9	10	9	7	4	7	7	7
2017-08-02	5	0	0	6	0	0	0	0	0	0	0	0.6
2017-08-03	6	6	1	2	9	12	0	7	0	4	7	4.8
Total		**18**	**7**	**12**	**21**	**27**	**10**	**18**	**4**	**11**	**17**	**14.5 (±6.9)**

Concentration (%) 1.56	Day	1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-07-29	1	0	0	0	0	0	0	0	0	0	0	0
2017-07-30	2	0	0	0	0	0	0	0	0	0	0	0
2017-07-31	3	4	2	2	4	4	0	3	0	4	5	2.8
2017-08-01	4	0	5	0	8	8	0	6	5	7	6	4.5
2017-08-02	5	5	0	5	0	0	4	0	4	0	0	1.8
2017-08-03	6	5	3	0	7	8	6	8	0	2	4	4.3
Total		**14**	**10**	**7**	**19**	**20**	**10**	**17**	**9**	**13**	**15**	**13.4 (±4.4)**

Concentration (%) 25	Day	1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-07-29	1	0	0	0	0	0	0	0	0	0	0	0
2017-07-30	2	0	0	0	0	0	0	0	0	0	0	0
2017-07-31	3	4	5	0	3	4	2	2	0	3	3	2.6
2017-08-01	4	0	10	2	8	10	0	7	4	9	7	5.7
2017-08-02	5	5	0	4	0	0	6	0	3	0	0	1.8
2017-08-03	6	3	2	0	8	11	6	9	1	5	0	4.5
Total		**12**	**17**	**6**	**19**	**25**	**14**	**18**	**8**	**17**	**10**	**14.6 (±5.7)**

Concentration (%) 3.13	Day	1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-07-29	1	0	0	0	0	0	0	0	0	0	0	0
2017-07-30	2	0	0	0	0	0	0	0	0	0	0	0
2017-07-31	3	3	3	3	4	4	2	4	0	2	3	2.8
2017-08-01	4	0	8	8	8	7	0	8	5	6	9	5.9
2017-08-02	5	4	0	0	0	0	7	0	2	0	0	1.3
2017-08-03	6	4	7	7	6	8	0	9	0	4	7	5.2
Total		**11**	**18**	**18**	**18**	**19**	**9**	**21**	**7**	**12**	**19**	**15.2 (±4.9)**

Concentration (%) 50	Day	1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-07-29	1	0	0	0	0	0	0	0	0	0	0	0
2017-07-30	2	0	0	0	0	0	0	0	0	0	0	0
2017-07-31	3	2	1	0	1	5	2	4	0	2	4	2.1
2017-08-01	4	0	7	2	6	11	5	7	1	0	3	4.2
2017-08-02	5	6 x	0	4	0	0	0	0	0	7	0	1.7
2017-08-03	6	0	6	0	7	14	3	7	1	4	4	4.6
Total		**8**	**14**	**6**	**14**	**30**	**10**	**18**	**2**	**13**	**11**	**12.6 (±7.6)**

Concentration (%) 6.25	Day	1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-07-29	1	0	0	0	0	0	0	0	0	0	0	0
2017-07-30	2	0	0	0	0	0	0	0	0	0	0	0
2017-07-31	3	4	3	4	3	4	0	3	4	2	2	2.9
2017-08-01	4	0	6	0	9	9	4	7	7	8	6	5.6
2017-08-02	5	5	0	3	0	0	0	0	0	0	0	0.8
2017-08-03	6	0	7	1	9	12	4	7	5	5	0	5
Total		**9**	**16**	**8**	**21**	**25**	**8**	**17**	**16**	**15**	**8**	**14.3 (±6.0)**

Concentration (%) 100	Day	1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-07-29	1	0	0	0	0	0	0	0	0	0	0	0
2017-07-30	2	0	0	0	0	0	0	0	0	0	0	0
2017-07-31	3	2	3	0	4	4	0	1	0	4	4	2.2
2017-08-01	4	0	5	0	0	10	0	6	4	8	0	3.3
2017-08-02	5	3	0	5	7	0	0	0	3	0	7	2.5
2017-08-03	6	5	3	0	7	14	0	7	0	9	4	4.9
Total		**10**	**11**	**5**	**18**	**28**	**0**	**14**	**7**	**21**	**15**	**12.9 (±8.2)**

NOTES : •All young produced by a test organism during its fourth and subsequent broods were discarded and not included in the above counts. The presence of two or more neonates in any test chamber, during any given day of the test, constitutes a brood.

•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"x"= test organism mortality

"*"= accidental test organism mortality

"–"=4th brood (see 'NOTES')

Data Reviewed By : EJS

Date : 2017-08-30

Work Order : 234028
Sample Number: 51785

Ceriodaphnia dubia Water Chemistry Data

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	24.0	9.9	7.0	682	360

Date :		Day 0 - 1 2017-07-28	Day 1 - 2 2017-07-29	Day 2 - 3 2017-07-30	Day 3 - 4 2017-07-31	Day 4 - 5 2017-08-01	Day 5 - 6 2017-08-02
Sub-sample Used		1	1	1	2	2	3
Temperature (°C)		24.0	24.0	24.0	24.0	24.0	24.0
Dissolved Oxygen (mg/L)		9.9	9.5	9.8	9.4	9.5	9.5
Dissolved Oxygen % Sat.[3]		119	114	117	113	115	116
pH		7.0	7.0	7.1	7.1	7.1	7.2
Pre-aeration Time (min)[4]		20	20	20	20	20	20
Analyst(s)	Initial	NK	SEW	SEW	TL	JF(SF)	CZN
	Final	SEW	SEW	TL	EJS	SEW	NL
Control (0%)							
Temp. (°C)	Initial	24.0	24.0	24.0	24.0	24.0	24.0
	Final	25.0	25.0	24.0	24.0	24.0	24.0
DO % Sat.[3]	Initial	100	100	100	100	100	100
DO (mg/L)	Initial	8.2	8.2	8.2	8.3	8.3	8.3
	Final	7.7	7.7	7.8	7.6	7.6	7.7
pH	Initial	8.3	8.3	8.4	8.2	8.3	8.3
	Final	8.2	8.0	8.1	8.1	8.1	8.4
Cond. (µmhos)	Initial	667	663	648	642	667	671
1.56 %							
Temp. (°C)	Initial	24.0	24.0	24.0	24.0	24.0	24.0
	Final	25.0	25.0	24.0	24.0	24.0	24.0
DO (mg/L)	Initial	8.3	8.3	8.2	8.2	8.7	8.0
	Final	7.7	7.4	7.8	7.6	7.4	7.7
pH	Initial	8.2	8.4	8.3	8.1	8.1	8.3
	Final	8.2	8.0	8.1	8.0	8.0	8.1
Cond. (µmhos)	Initial	669	670	653	677	674	673
25 %							
Temp. (°C)	Initial	24.0	24.0	24.0	24.0	24.0	24.0
	Final	25.0	25.0	24.0	24.0	24.0	24.0
DO (mg/L)	Initial	8.4	8.4	8.2	8.2	8.3	8.2
	Final	7.7	7.4	7.7	7.6	7.5	7.8
pH	Initial	8.2	8.3	8.3	8.2	8.2	8.2
	Final	8.1	7.9	7.9	8.0	7.9	8.0
Cond. (µmhos)	Initial	673	674	665	672	684	682
100 %							
Temp. (°C)	Initial	24.0	24.0	24.0	24.0	24.0	24.0
	Final	25.0	25.0	24.0	24.0	24.0	24.0
DO (mg/L)	Initial	8.6	8.8	8.8	8.4	8.8	8.6
	Final	7.7	7.5	7.8	7.7	7.8	7.7
pH	Initial	7.0	7.4	7.4	7.1	7.5	7.2
	Final	7.8	7.4	7.1	7.3	7.6	7.2
Cond. (µmhos)	Initial	686	687	688	694	687	687

"–" = not measured

[3] % saturation (adjusted for actual temperature and barometric pressure)

[4] ≤100 bubbles/minute

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TOXICITY TEST REPORT

Fathead minnow
EPS 1/RM/22

Work Order : 234028
Sample Number : 51785

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo		
Location :	Waterloo ON	Sampled By :	LM/BL
Job Number :	L1965132	Date Collected :	2017-07-25
Substance :	L1965132-1 MS-08	Time Collected :	09:20
Sampling Method :	Not provided	Date Received :	2017-07-28
Temp. on arrival :	8.0°C	Time Received :	10:40
Sample Description :	Clear, colourless, odourless.	Date Tested :	2017-07-28

Test Method : Test of Larval Growth and Survival Using Fathead Minnows. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/22 , 2nd ed. (February 2011).

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth from Biomass)	>100%	-	-
LC50	>100%	-	-

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2017-07-24	Analyst(s) :	EZ, RD, JF, SEW, NK, MR, DK
Organism Batch :	Fm17-07	Test Duration :	7 days
IC25 Growth (from Biomass) :	1.05 g/L	LC50 :	1.18 g/L
95% Confidence Limits :	0.96 - 1.12 g/L	95% Confidence Limits :	1.10 - 1.26 g/L
Statistical Method :	Non-Linear Regression (CETIS)[a]	Statistical Method :	Probit (Stephan)[c]
Historical Mean IC25 :	0.98 g/L	Historical Mean LC50 :	1.16 g/L
Warning Limits (± 2SD) :	0.84 - 1.13 g/L	Warning Limits (± 2SD) :	1.03 - 1.31 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Test Organism :	*Pimephales promelas*	Test Type :	Static Renewal
Organism Batch :	Fm17-07	Control/Dilution Water :	Well water (no chemicals added)
Organism Age :	~07:00 - 21:15 h at start of test	Test Volume / Replicate :	300 mL
Source :	In-house culture	Test Vessel :	420 mL polystyrene beaker
Culture Mortality/Diseased :	0 % (previous 7 days)	Depth of Test Solution :	8 cm
pH Adjustment :	None	Organisms per Replicate :	10
Sample Filtration :	None	Number of Replicates :	3
Hardness Adjustment :	None	Daily Renewal Method :	80-85% syphoned and replaced
Test Aeration :	None	Test Method Deviation(s):	None

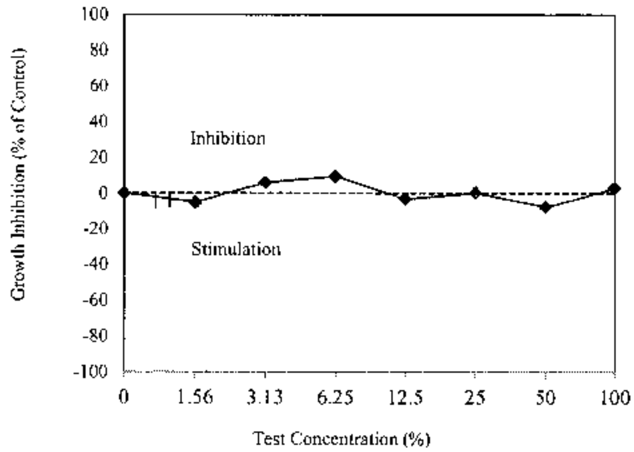
COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.
•No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.
•Inflated swim bladders were confirmed in all test organisms used in this test.

AQUATOX

Work Order : 234028
Sample Number : 51785

Fathead Minnow Growth Inhibition (based on Biomass)



REFERENCES

[a] CETIS™, © 2000-2013. V.1.8.7.17. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[b] Grubbs, F.E., 1969. Procedures for detecting outlying observations in samples. *Technometrics, 11*:1-21.

[c] Stephan, C. E. 1977. Methods for calculating an LC50. pp 65-84 in : P. L. Mayer and J. L. Hamelink (eds.), Aquatic Toxicology and Hazard Evaluation. Amer. Soc. Testing and Materials, Philadelphia PA. ASTM STP 634.

Date : 2017-08-30
yyyy-mm-dd

Approved By :
Project Manager

AQUATOX

TOXICITY TEST REPORT

Fathead minnow

EPS 1/RM/22

Work Order : 234028

Sample Number : 51785

CUMULATIVE DAILY CONTROL MORTALITY AND IMPAIRMENT (±SD)

Date :	2017-07-28	2017-07-29	2017-07-30	2017-07-31	2017-08-01	2017-08-02	2017-08-03	2017-08-04
	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)

FATHEAD MINNOW CUMULATIVE DAILY MORTALITY

Initiation Time : 14:15

Initiation Date : 2017-07-28

Completion Date : 2017-08-04

		Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Treatment Mean Mortality (± SD)
Date :		2017-07-28		2017-07-29		2017-07-30		2017-07-31		2017-08-01		2017-08-02		2017-08-03		2017-08-04		
Analyst(s):		XD		SEW		SEW		TL		MA		SEW		MA		JF(SV)		
Concentration (%)	Replicate	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	%
Control	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1*	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.56	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3.13	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.25	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12.5	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
25	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1*	0	
100	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Aberrant behaviour or swimming impairment : None

NOTES : *2017-08-04: One test organism was missing from each of replicates Control-A and 50%-C (JF). The missing test organisms were excluded from calculations and statistical analyses. Test endpoints were calculated from a total of 9 test organisms exposed in replicates Control-A and 50%-C (JL).

Data Reviewed By: JL

Date : 2017-08-24

Work Order : 234028
Sample Number : 51785

FATHEAD MINNOW DRY WEIGHT AND BIOMASS DATA

Concentration (%)	Replicate	Number of Larvae Exposed	Replicate Mean Dry Weight (mg)	Treatment Mean Biomass (mg)	Standard Deviation
	A	9*	1.001		
Control	B	10	0.997	1.015	0.027
	C	10	1.046		
	A	10	1.024		
1.56	B	10	1.071	1.066	0.039
	C	10	1.102		
	A	10	1.042		
3.13	B	10	0.845	0.954	0.100
	C	10	0.974		
	A	10	1.016		
6.25	B	10	0.913	0.919	0.094
	C	10	0.828		
	A	10	0.983		
12.5	B	10	1.055	1.047	0.060
	C	10	1.102		
	A	10	0.922		
25	B	10	0.974	1.013	0.115
	C	10	1.142		
	A	10	1.021		
50	B	10	1.122	1.092	0.062
	C	9*	1.134		
	A	10	0.903		
100	B	10	1.015	0.986	0.073
	C	10	1.039		

NOTES :

•No outlying data points were detected according to Grubbs Test [b].

• Control average dry weight per surviving organism = 1.015 mg

*Missing test organisms were excluded from calculations and statistical analyses; refer to 'NOTES' on page 3.

Data Reviewed By: IL

Date : 2014-08-24

Work Order : 234028
Sample Number: 51785

Fathead Minnow Water Chemistry Data

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	24.0	9.9	7.0	682	360

		Day 0 - 1 2017-07-28	Day 1 - 2 2017-07-29	Day 2 - 3 2017-07-30	Day 3 - 4 2017-07-31	Day 4 - 5 2017-08-01	Day 5 - 6 2017-08-02	Day 6 - 7 2017-08-03
Sub-sample Used		1	1	1	2	2	3	3
Temperature (°C)		24.0	24.0	24.0	24.0	24.0	24.0	24.0
Dissolved Oxygen (mg/L)		9.9	9.5	9.8	9.4	9.5	9.5	9.6
Dissolved Oxygen % Sat.[1]		119	114	117	113	115	116	115
pH		7.0	7.0	7.1	7.1	7.1	7.2	7.2
Pre-aeration Time (min)[2]		20	20	20	20	20	20	20
Analyst(s) :	Initial	NK	SEW	SEW	TL	JF(SF)	CZN	NL
	Final	JF(SF)	JF(SF)	TL	JF(SF)	SEW	NL	EZ(SF)
Control (0%)								
Temp.(°C)	Initial	24.0	24.0	24.0	24.0	24.0	24.0	24.0
	Final	25.0	25.0	24.0	24.0	24.0	24.0	25.0
DO % Sat.	Initial	100	100	100	100	100	100	100
DO (mg/L)	Initial	8.2	8.2	8.2	8.3	8.3	8.3	8.2
	Final	7.6	6.6	7.3	6.3	7.3	7.7	6.8
pH	Initial	8.3	8.3	8.4	8.2	8.3	8.3	8.3
	Final	8.2	8.0	8.0	7.7	7.9	7.9	7.9
Cond. (µmhos)	Initial	667	663	648	642	667	671	708
1.56 %								
Temp.(°C)	Initial	24.0	24.0	24.0	24.0	24.0	24.0	24.0
	Final	25.0	25.0	24.0	24.0	24.0	24.0	25.0
DO (mg/L)	Initial	8.3	8.3	8.2	8.2	8.7	8.0	8.0
	Final	7.6	6.7	7.4	6.4	7.3	7.6	6.9
pH	Initial	8.2	8.4	8.3	8.1	8.1	8.3	8.3
	Final	8.2	8.0	8.0	7.7	7.9	8.0	7.9
Cond. (µmhos)	Initial	669	670	653	677	674	673	722
25 %								
Temp.(°C)	Initial	24.0	24.0	24.0	24.0	24.0	24.0	24.0
	Final	25.0	25.0	24.0	24.0	24.0	24.0	25.0
DO (mg/L)	Initial	8.4	8.4	8.2	8.2	8.3	8.2	8.0
	Final	7.7	6.8	7.2	6.4	7.3	7.7	7.0
pH	Initial	8.2	8.3	8.3	8.2	8.2	8.2	8.2
	Final	8.1	7.8	7.8	7.6	7.9	7.9	7.8
Cond. (µmhos)	Initial	673	674	665	672	684	682	716
100 %								
Temp.(°C)	Initial	24.0	24.0	24.0	24.0	24.0	24.0	24.0
	Final	25.0	25.0	24.0	24.0	24.0	24.0	25.0
DO (mg/L)	Initial	8.6	8.8	8.8	8.4	8.8	8.6	8.2
	Final	7.8	7.0	7.4	6.3	7.6	7.7	7.2
pH	Initial	7.0	7.4	7.4	7.1	7.5	7.2	7.2
	Final	7.2	7.1	7.1	7.1	7.4	7.1	7.1
Cond. (µmhos)	Initial	686	687	688	694	687	687	692

"–" = not measured

[1] % saturation (adjusted for actual temperature and barometric pressure)

[2] ≤100 bubbles/minute

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Lemna minor
EPS 1/RM/37

Work Order : 234028
Sample Number : 51785

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Date Collected :	2017-07-25
Location :	Waterloo ON	Time Collected :	09:20
Substance :	L1965132-1 MS-08	Date Received :	2017-07-28
Job Number :	L1965132	Time Received :	10:40
Sampling Method :	Not provided	Temp. on arrival :	8.0°C
Sampled By :	LM/BL	Date Tested :	2017-07-28
Sample Description :	Clear, colourless, odourless.		

Test Method : Test for Measuring the Inhibition of Growth using the Freshwater Macrophyte, *Lemna minor*. Method Development and Application Section, Environmental Technology Centre, Environment Canada. Ottawa, Ontario. Report EPS 1/RM/37, 2nd ed. (January 2007).

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Weight)	56.2%	33.2-88.7	Nonlinear Regression (CETIS) a
IC25 (Frond Production)	22.8%	16.2-27.9	Nonlinear Regression (CETIS) a

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2017-08-09	Statistical Method :	Non-Linear Regression* (CETIS)[a]
Test Duration :	7 days	Historical Geometric Mean IC25 :	2.07 g/L
IC25 (Frond Production) :	2.53 g/L	Warning Limits (± 2SD) :	1.50 - 2.87 g/L
95% Confidence Limits :	2.25 - 2.80 g/L	Growth Medium :	Modified APHA
		Analyst(s) :	SEW, CZN

The reference toxicant test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Test Organism :	*Lemna minor* L., Strain 7730	Test Type :	Static (no sub-samples required)
Organism Batch :	Lm17-07	Control/Dilution Medium :	Modified APHA
Culture Origin :	UTCC 492	Medium Preparation Water :	Distilled Water
Test Organism Source :	Axenic in-house culture	Source of Water :	Morning Mist
Culture Medium :	Modified Hoaglands E+	Medium Preparation Chemicals :	Modified APHA stocks A, B, C (10 mL/L)
Age (on Test Day 0) :	10 days	Nutrient Spiking of Sample :	Modified APHA stocks A, B, C (10 mL/L)
Health Criteria (in APHA) :	21.3-fold frond increase in 7 days	Replicates per Concentration :	4
Organism Acclimation :	21:25 h in APHA medium	Test Volume per Replicate :	100 mL
Inoculum (Test Day 0) :	2 plants (3 fronds per plant)	Test Vessel :	250 mL glass Erlenmeyer flask
Sample Filtration :	1 µm (Whatman GF/C)	Depth of Test Solution :	4.0 cm
Sample Pre-aeration :	20 min. at ≤100 bubbles/min.	Photoperiod/Light Intensity :	Continuous, 4260 - 5580 lux
pH Adjustment :	None	Test Method Deviation(s) :	None
Hardness Adjustment :	None		

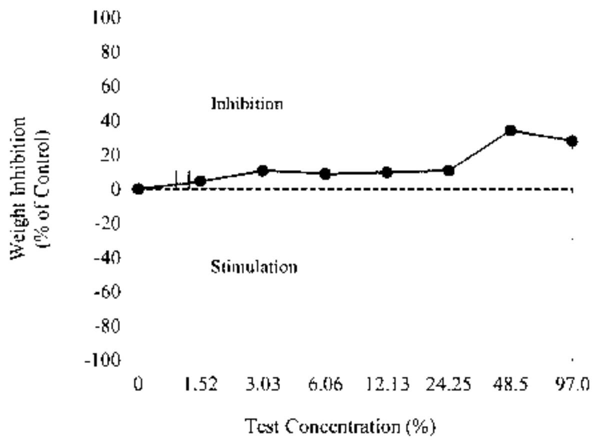
COMMENTS

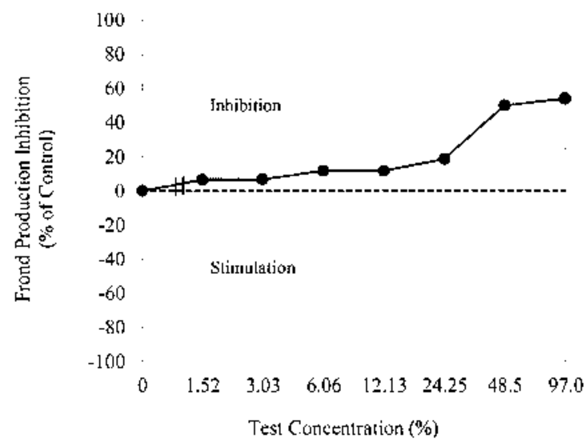
•All test validity criteria as specified in the test method cited above were satisfied.

*Poisson weighting (CETIS)[a] was applied.

Work Order : 234028
Sample Number : 51785

Lemna minor Growth Inhibition





TEST MONITORING

Initiation Date : 2017-07-28
Intitiation Time : 13:00
Initiated By : CG/CZN

Termination Date : 2017-08-04
Termination Time : 13:30
Terminated By : VC

Temperature Monitoring

Test Day	Date	Temperature (°C)
0 (unmodified sample)	2017-07-28	25.0
0	2017-07-28	24.0
1	2017-07-29	23.0
2	2017-07-30	23.0
3	2017-07-31	23.0
4	2017-08-01	23.0
5	2017-08-02	23.0
6	2017-08-03	23.0
7	2017-08-04	23.5

pH Monitoring

Concentration (%)	Day 0	Day 7
100 (unmodified sample)	6.7	–
Control	8.4	8.4
1.52	8.3	8.4
3.03	–	–
6.06	–	–
12.13	8.3	8.4
24.25	–	–
48.5	–	–
97.0	8.0	8.3

"–" = not required

REFERENCES

[a] CETIS™, © 2000-2013. V.1.8.7.17. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2017-08-30
yyyy-mm-dd

Approved By: [signature]
Project Manager

Lemna minor Frond Increase

Concentration (%)	Replicate	Frond Count Day 0*	Frond Count Day 7	Frond Increase	Mean Frond Increase	Standard Deviation	CV (%)	Frond/Root Appearance (Day 7)
	A	6	83	77				
Control	B	6	84	78	85.50	9.26	10.8	Fronds healthy, appearance normal in all replicates.
	C	6	100	94				
	D	6	99	93				
	A	6	89	83				
1.52	B	6	80	74	80.00	4.24	5.3	Fronds healthy, appearance normal in all replicates.
	C	6	89	83				
	D	6	86	80				
	A	6	85	79				
3.03	B	6	87	81	79.75	4.57	5.7	Fronds healthy, appearance normal in all replicates.
	C	6	80	74				
	D	6	91	85				
	A	6	81	75				
6.06	B	6	84	78	75.50	4.80	6.4	Fronds healthy, appearance normal in all replicates.
	C	6	86	80				
	D	6	75	69				
	A	6	77	71				
12.13	B	6	86	80	75.50	4.65	6.2	Fronds healthy, appearance normal in all replicates.
	C	6	85	79				
	D	6	78	72				
	A	6	84	78				
24.25	B	6	74	68	69.50	7.05	10.1	Fronds healthy, appearance normal in all replicates.
	C	6	77	71				
	D	6	67	61				
	A	6	60	54				
48.5	B	6	43	37	42.75	8.30	19.4	Fronds smaller, paler green in colour, roots shorter in all replicates.
	C	6	50	44				
	D	6	42	36				
	A	6	46	40				
97.0	B	6	37	31	39.25	6.55	16.7	Fronds smaller, paler green in colour, some fronds yellow in colour, roots shorter in all replicates.
	C	6	45	39				
	D	6	53	47				

NOTES: *No unusual appearance or treatment of culture prior to testing. Test inoculated with healthy plants.
•No stimulation of frond increase compared to the control was observed at any test level.
•A 15.3-fold increase in frond number was observed in the control over the testing period.
•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : JL
Date : 2017-08-24

Work Order : 234028
Sample Number : 51785

Lemna minor Frond Weight Data

Concentration (%)	Replicate	Dry Weight of Fronds (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation
	A	8.45		
Control	B	8.66	9.30	0.92
	C	10.43		
	D	9.68		
	A	8.76		
1.52	B	8.22	8.89	0.68
	C	9.83		
	D	8.74		
	A	8.07		
3.03	B	8.97	8.30	0.75
	C	7.35		
	D	8.82		
	A	8.19		
6.06	B	9.36	8.49	1.03
	C	9.23		
	D	7.16		
	A	8.03		
12.13	B	9.20	8.39	0.58
	C	8.40		
	D	7.92		
	A	8.34		
24.25	B	8.09	8.29	0.56
	C	9.03		
	D	7.70		
	A	6.88		
48.5	B	5.85	6.12	0.51
	C	5.98		
	D	5.79		
	A	6.76		
97.0	B	5.84	6.68	1.03
	C	6.01		
	D	8.11		

NOTES :

**Significant stimulation (No stimulation (compared to control) was observed at any concentration.) compared to control.

•No stimulation of weight compared to the control was observed at any test level.

•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : JL

Date : 2017-08-24

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Pseudokirchneriella subcapitata
EPS 1/RM/25

Work Order : 234028
Sample Number : 51785

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo		
Location :	Waterloo ON	Sampled By :	LM/BL
Job Number :	L1965132	Date Collected :	2017-07-25
Substance :	L1965132-1 MS-08	Time Collected :	09:20
Sampling Method :	Not provided	Date Received :	2017-07-28
Temp. on arrival :	8.0 °C	Time Received :	10:40
Sample Description :	Clear, colourless, odourless.	Date Tested :	2017-07-28

Test Method : Growth Inhibition Test Using a Freshwater Alga. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/25, 2nd ed. (March 2007).

72-h TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth)	>90.91%	-	-

The results reported relate only to the sample tested.

ZINC (AS ZINC SULPHATE) REFERENCE TOXICANT DATA

Date Tested :	2017-07-25	Statistical Method :	Nonlinear Regression (CETIS)[a]
Organism Batch :	Ps17-07	Historical Mean IC25 :	16.2 μg/L
Test Duration :	72 hours	Warning Limits (± 2SD) :	5.3 - 49.8 μg/L
IC25 Growth :	8.6 μg/L	Analyst(s) :	AS, SEW
95% Confidence Limits :	6.8 - 10.5 μg/L		

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST ORGANISM

Test Organism :	*Pseudokirchneriella subcapitata*	Source :	In-house culture
Culture Origin :	University of Waterloo, Waterloo ON	Cell Density at 0-h :	9591 cells/mL
Strain Number :	CPCC 37	Inoculum Prepared :	00:20 h prior to test initiation
Organism Batch :	Ps17-07	Age (at start of test) :	4 days (in exponential growth)

•Algal growth curve is determined at least twice per year as required by the test method cited above.
•No unusual appearance or treatment of culture prior to testing.

TEST CONDITIONS

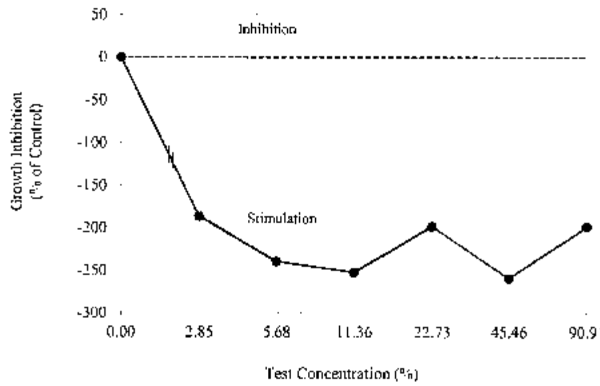
Test Type :	Static	Volume per Replicate :	220 μL
Test Duration :	72 hours	Control Replicates:	10
Mean Temperature (± SD):	24.4°C (± 0.3)	Test Replicates :	4
Sample Pre-aeration :	None	Concentrations Tested :	10 + Control
Sample Filtration :	0.45 μm preconditioned filter	Photoperiod :	Continuous light
Volume Filtered:	≥10 mL	Light Intensity :	3920-4250 lux
Control/Dilution Water :	Millipore Milli-Q (no chemicals added)	pH Adjustment :	None
Enrichment Medium :	Stock 2B: EDTA reduced to 25%	Hardness Adjustment :	None
Test Vessel :	U-shaped polystyrene microplate	Test Method Deviation(s) :	None

COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.

Work Order : 234028
Sample Number : 51785

Pseudokirchneriella subcapitata Growth Inhibition



CELL ENUMERATION AT 72-HOURS

Initiated By : SEW
Completion/Enumeration Date : 2017-07-31
Enumerated By : VC
Enumeration Method : Manual (haemocytometer)

Sample pH (at 0 hours) : 6.7
Control pH (at 0 hours) : 6.5
Control pH (at 72 hours) : 7.0
Control Cell Increase Factor : 28.2 times growth

Concentration (%)	Cell Concentration (x 10000 cells/mL) Replicate 1	2	3	4	7	8	9	10	Cell Yield (x 10000 cells/mL) Mean	Standard Deviation	CV (%)	Stimulation (% of control)**
Control	23.5	26.5	20.5	26.5	35.5	29.5	27.0	27.5	26.10	4.37	16.74	–
0.18	–	–	–	–	–	–	–	–	–	–	–	–
0.35	–	–	–	–	–	–	–	–	–	–	–	–
0.71	–	–	–	–	–	–	–	–	–	–	–	–
1.42	–	–	–	–	–	–	–	–	–	–	–	–
2.85	72.5	69.5	85.5	–	–	–	–	–	74.87	8.50	11.36	186.84
5.68	81.0	91.5	96.5	–	–	–	–	–	88.71	7.91	8.92	239.83
11.36	91.5	104.5	83.0	–	–	–	–	–	92.04	10.83	11.76	252.60
22.73	58.0	82.5	96.0	–	–	–	–	–	77.87	19.26	24.74	198.33
45.46	87.0	86.0	111.5	–	–	–	–	–	93.87	14.44	15.38	259.62
90.91	89.5	72.5	75.0	–	–	–	–	–	78.04	9.18	11.76	198.97

NOTES : **Statistically significant stimulation, according to ANOVA/Dunnett Multiple Comparison Test (CETIS)[a], (a=0.05).
•Control replicates 5 and 6 used for pH measurement.
•The Mann-Kendall test shows that there is no inhibitory gradient (α=0.05).
•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not enumerated/not required

Data Reviewed By : [signature]
Date : 2017-08-25

REFERENCES

[a] CETIS™, © 2000-2013. V.1.8.7.17. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2017-08-30
yyyy-mm-dd

Approved By : [signature]
Project Manager

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 234028

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 Fax: (519) 763-4419

P.O. Number:	4500017476
Field Sampler Name (print):	LM/BL
Signature:	
Affiliation:	ALS Env
Sample Storage (prior to shipping):	
Custody Relinquished by:	RH
Date/Time Shipped:	28-Jul-17

Client:	ALS Environmental Waterloo Q# 162705399-15
Phone:	519-886-6910
Fax:	519-886-9047
Contact:	Wayne Smith / Rick Hawthorne

L1965132-1

Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	Daphnia magna Single Concentration	Daphnia magna LC50	Fathead Minnow Survival & Growth	Ceriodaphnia dubia Survival & Reproduction	Lemna minor Growth	Pseudokirchneriella subcapitata Growth	Other (please specify below) RISS	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
25-Jul-17	0920	MS-08	51785	8.0	X	X	X		X	X	X	X	X			3

Client confirmed NO Trout/Daphnia on this sample
JW

For Lab Use Only

Received By:	CG/SV
Date:	2017-07-28
Time:	1040
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions:

~~Regular Biphasic Toxicity Tests~~

MMER Toxicity / RISS Reporting

X 2017-07-28 NO PAIL for RBT & DM RECEIVED CG/mk

JW

Standard COC rev 3 2016 09 01 TC

L1965132

WATERLOO

ALS Environmental

Subcontract Request Form

Subcontract To:

AQUATOX TESTING AND CONSULTING
11B NICHOLAS BEAVER ROAD
RR3
GUELPH,ON N1H 6H9

NOTES: Please reference on final report and invoice: PO# *L1965132*
ALS requires QC data to be provided with your final results.
Sublethal!

Please see enclosed 1 **sample(s) in** 0 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1965132-1 MS-08		7/ 25/ 2017	
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	8/14/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	8/8/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: Rick.Hawthorne@alsglobal.com

Shipped By: ____________ Date Shipped: ____________

Received By: ____________ Date Received: ____________

Verified By: ____________ Date Verified: ____________

Temperature: ____________

Sample Integrity Issues: ____________

Tuesday, August 15, 2017

Rick Hawthorne
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1708025
Project Name:
Project Number: L1965132

Dear Mr. Hawthorne:

One water sample was received from ALS Environmental, on 8/1/2017. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1708025

Radium-226:
The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1708025
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1965132
Client PO Number: L1965132

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1965132-1	1708025-1		WATER	25-Jul-17	

ALS Environmental

1708025

L1965132

WATERLOO

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

1 X 1L GEN CHEM

NOTES: Please reference on final report and invoice: PO# L1965132
ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 1 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
1 L1965132-1 MS-08		7/25/2017	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/17/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______ Date Shipped: ______

Received By: C Trimble Date Received: 8-1-17 0950

Verified By: ______ Date Verified: ______

Temperature: ______

Sample Integrity Issues: ______

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS- Waterloo Workorder No: 1708025

Project Manager: SS Initials: CDR Date: 8-1-17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are Custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5. Are the COC and bottle labels complete and legible?		YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		YES	NO
12. Are all samples within holding times for the requested analyses?		YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	N/A	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	NO
16. Were the samples shipped on ice?		YES	~~NO~~ 8-9-17 n
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	NO

Cooler #:	1							
Temperature (°C):	Amb							
No. of custody seals on cooler:	0							
DOT Survey/ Acceptance Information — External µR/hr reading:	10							
Background µR/hr reading:	10							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

The ice was all melted and room temp.

If applicable, was the client contacted? YES / NO / NA Contact: ____________ Date/Time: ________

Project Manager Signature / Date: [signature]

Form 201r24.xls (06/04/2012)

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

EXPRESS 12:00 **TDY** DHL

2017-07-31 MWI 3.22.00 / *00-1411*

From : ALS Environmental
Ed Hill
60 Northland Rd
Unit 1.
N2V 2B8 WATERLOO ON
Canada

1708025

Origin:
YHM

Contact: Ph : 1 9988869102355

To : **ALS Environmental Fort Collins**
Sample Login
225 Commerce Drive
80524 FORT COLLINS CO
United States Of America

Contact:
Ph : [illegible]431 11

0/8

0

US – DEN – DEN

C

Day	Time
	X12

Pce/Shpt Weight	Piece
19.80/19.8 lbs	1/1

Contents:Water Samples for testing

WAYBILL 43 2293 3263

(2L)US80524+50002001

1135

Client:	ALS Environmental	**Date:**	*15-Aug-17*
Project:	L1965132	**Work Order:**	1708025
Sample ID:	L1965132-1	**Lab ID:**	1708025-1
Legal Location:		**Matrix:**	WATER
Collection Date:	7/25/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**		Prep Date: **8/3/2017**		PrepBy: **HCJ**
Ra-226	0.0077 (+/- 0.0052)	LT	0.0067	BQ/l	NA	8/14/2017 14:14
Carr: BARIUM	*98*		*40-110*	*%REC*	DL = NA	8/14/2017 14:14

Client:	ALS Environmental	**Date:**	*15-Aug-17*
Project:	L1965132	**Work Order:**	1708025
Sample ID:	L1965132-1	**Lab ID:**	1708025-1
Legal Location:		**Matrix:**	WATER
Collection Date:	7/25/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS -- Fort Collins

Date: *8/15/2017 11:55*

Client: ALS Environmental
Work Order: 1708025
Project: L1965132

QC BATCH REPORT

Batch ID: **RE170803-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170803-1** Units: **BQ/l** Analysis Date: **8/14/2017 14:48**
Client ID: Run ID: **RE170803-1A** Prep Date: **8/3/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.79 (+/- 0.441)	0.00993	1.715		104	67-120					P,Y1
Carr: BARIUM	15700		15530		101	40-110					Y1

LCSD Sample ID: **RE170803-1** Units: **BQ/l** Analysis Date: **8/14/2017 14:48**
Client ID: Run ID: **RE170803-1A** Prep Date: **8/3/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.80 (+/- 0.445)	0.00438	1.715		105	67-120		1.79	0.03	2.1	P,Y1
Carr: BARIUM	15700		15530		101	40-110		15700			Y1

MB Sample ID: **RE170803-1** Units: **BQ/l** Analysis Date: **8/14/2017 14:48**
Client ID: Run ID: **RE170803-1A** Prep Date: **8/3/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0 (+/- 0.0033)	0.0064									U
Carr: BARIUM	15200		15530		98	40-110					

The following samples were analyzed in this batch: 1708025-1

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1965132-COFC

COC Number: 15 -

Report To — Contact and company name below will appear on the final report

Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	647-253-0596 EXT 6010
Company address below will appear on the final report	
Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: bimcore@alsglobal.com
Email 2: bimww@alsglobal.com
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@baffinland.com
Email 2: commercial@baffinland.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐
EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	23642 /Q42455
Job #:	MS-08
PO / AFE:	4500027854
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L1965132

ALS Contact:
Sampler: LM/BL

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	DIM-MMER-WT	Sublethal Toxcty (Fathead Minnow, Ceriodaphnia dubia, Pseudokirchneriella subcapitata, Lemna minor)	Number of Containers
	MS-08	25-Jul-17	9:20	Water	R	R	13

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO
Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C | FINAL COOLER TEMPERATURES °C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: C. Devereaux	Date: July 25, 2017	Time: 12:30	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION. WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

RW

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 03-AUG-17
Report Date: 21-AUG-17 14:03 (MT)
Version: FINAL REV. 5

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1969176
Project P.O. #: 4500027854
Job Reference: SNP MS WATER QUALITY
C of C Numbers:
Legal Site Desc:

Comments:

21-AUG-2017 MS-08

Rick Hawthorne

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1969176-15 MS-08							
Sampled By: SS on 01-AUG-17 @ 16:30							
Matrix: WATER							
Physical Tests							
Conductivity	1860		3.0	umhos/cm		03-AUG-17	R3790603
pH	5.25		0.10	pH units		03-AUG-17	R3790603
Total Suspended Solids	10.7		2.0	mg/L	08-AUG-17	09-AUG-17	R3793423
Total Dissolved Solids	1700	DLDS	20	mg/L		04-AUG-17	R3793381
Turbidity	20.1		0.10	NTU		03-AUG-17	R3790776
Cyanides							
Cyanide, Total	0.0056		0.0020	mg/L		03-AUG-17	R3791554
Total Metals							
Aluminum (Al)-Total	0.816	DLHC	0.050	mg/L	04-AUG-17	04-AUG-17	R3792013
Antimony (Sb)-Total	<0.0010	DLHC	0.0010	mg/L	04-AUG-17	04-AUG-17	R3792013
Arsenic (As)-Total	<0.0010	DLHC	0.0010	mg/L	04-AUG-17	04-AUG-17	R3792013
Barium (Ba)-Total	0.0201	DLHC	0.0020	mg/L	04-AUG-17	04-AUG-17	R3792013
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	04-AUG-17	04-AUG-17	R3792013
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	04-AUG-17	04-AUG-17	R3792013
Boron (B)-Total	<0.10	DLHC	0.10	mg/L	04-AUG-17	04-AUG-17	R3792013
Cadmium (Cd)-Total	0.00027	DLHC	0.00010	mg/L	04-AUG-17	04-AUG-17	R3792013
Calcium (Ca)-Total	53.6	DLHC	5.0	mg/L	04-AUG-17	04-AUG-17	R3792013
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	04-AUG-17	04-AUG-17	R3792013
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	04-AUG-17	04-AUG-17	R3792013
Cobalt (Co)-Total	0.186	DLHC	0.0010	mg/L	04-AUG-17	04-AUG-17	R3792013
Copper (Cu)-Total	0.029	DLHC	0.010	mg/L	04-AUG-17	04-AUG-17	R3792013
Iron (Fe)-Total	34.8	DLHC	0.50	mg/L	04-AUG-17	04-AUG-17	R3792013
Lead (Pb)-Total	0.00764	DLHC	0.00050	mg/L	04-AUG-17	04-AUG-17	R3792013
Lithium (Li)-Total	0.014	DLHC	0.010	mg/L	04-AUG-17	04-AUG-17	R3792013
Magnesium (Mg)-Total	227	DLHC	0.50	mg/L	04-AUG-17	04-AUG-17	R3792013
Manganese (Mn)-Total	9.60	DLHC	0.0050	mg/L	04-AUG-17	04-AUG-17	R3792013
Molybdenum (Mo)-Total	<0.00050	DLHC	0.00050	mg/L	04-AUG-17	04-AUG-17	R3792013
Nickel (Ni)-Total	0.215	DLHC	0.0050	mg/L	04-AUG-17	04-AUG-17	R3792013
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	04-AUG-17	04-AUG-17	R3792013
Potassium (K)-Total	2.31	DLHC	0.50	mg/L	04-AUG-17	04-AUG-17	R3792013
Rubidium (Rb)-Total	0.0045	DLHC	0.0020	mg/L	04-AUG-17	04-AUG-17	R3792013
Selenium (Se)-Total	0.00310	DLHC	0.00050	mg/L	04-AUG-17	04-AUG-17	R3792013
Silicon (Si)-Total	1.5	DLHC	1.0	mg/L	04-AUG-17	04-AUG-17	R3792013
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	04-AUG-17	04-AUG-17	R3792013
Sodium (Na)-Total	<5.0	DLHC	5.0	mg/L	04-AUG-17	04-AUG-17	R3792013
Strontium (Sr)-Total	0.038	DLHC	0.010	mg/L	04-AUG-17	04-AUG-17	R3792013
Sulfur (S)-Total	374	DLHC	5.0	mg/L	04-AUG-17	04-AUG-17	R3792013
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	04-AUG-17	04-AUG-17	R3792013
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	04-AUG-17	04-AUG-17	R3792013
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	04-AUG-17	04-AUG-17	R3792013
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	04-AUG-17	04-AUG-17	R3792013

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1969176-15 MS-08							
Sampled By: SS on 01-AUG-17 @ 16:30							
Matrix: WATER							
Total Metals							
Titanium (Ti)-Total	<0.007	DLUI	0.0070	mg/L	04-AUG-17	04-AUG-17	R3792013
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	04-AUG-17	04-AUG-17	R3792013
Uranium (U)-Total	0.00121	DLHC	0.00010	mg/L	04-AUG-17	04-AUG-17	R3792013
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	04-AUG-17	04-AUG-17	R3792013
Zinc (Zn)-Total	0.042	DLHC	0.030	mg/L	04-AUG-17	04-AUG-17	R3792013
Zirconium (Zr)-Total	<0.0030	DLHC	0.0030	mg/L	04-AUG-17	04-AUG-17	R3792013
Radiological Parameters							
Ra-226	0.015		0.0036	Bq/L	07-AUG-17	16-AUG-17	R3786631

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Total	MS-B	L1969176-15
Matrix Spike	Calcium (Ca)-Total	MS-B	L1969176-15
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1969176-15
Matrix Spike	Silicon (Si)-Total	MS-B	L1969176-15
Matrix Spike	Sodium (Na)-Total	MS-B	L1969176-15
Matrix Spike	Strontium (Sr)-Total	MS-B	L1969176-15
Matrix Spike	Sulfur (S)-Total	MS-B	L1969176-15
Matrix Spike	Uranium (U)-Total	MS-B	L1969176-15

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

C-DIS-ORG-WT	Water	Dissolved Organic Carbon	APHA 5310 B-INSTRUMENTAL

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

F1-F4-CALC-WT	Water	CCME Total Hydrocarbons	CCME CWS-PHC, Pub #1310, Dec 2001-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-WT	Water	F1 (O.Reg.153/04)	E3421/CCME (HS)

Fraction F1 is determined by analyzing by headspace-GC/FID.

F2-F4-WT	Water	F2-F4 (O.Reg.153/04)	MOE DECPH-E3421/CCME TIER 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, 2001.

Reference Information

HG-T-CVAA-WT | Water | Total Mercury in Water by CVAAS | EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT | Water | Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-WT | Water | Ammonia, Total as N | EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO3-IC-WT | Water | Nitrate in Water by IC | EPA 300.1 (mod)

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

OGG-TOT-WT | Water | Oil and Grease, Total | APHA 5520 B

The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease.

PH-WT | Water | pH | APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

PHENOLS-4AAP-WT | Water | Phenol (4AAP) | EPA 9066

An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.

RA226-MMER-FC | Water | Ra226 by Alpha Scint, MDC=0.01 Bq/L | EPA 903.1

SOLIDS-TDS-WT | Water | Total Dissolved Solids | APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5□C overnight and then 180–10□C for 1hr.

SOLIDS-TSS-WT | Water | Suspended solids | APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1□C for a minimum of four hours or until a constant weight is achieved.

TOC-WT | Water | Total Organic Carbon | APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

TURB-MET-WT | Water | Turbidity on preserved metals sample | APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

TURBIDITY-WT | Water | Turbidity | APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

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 weight of sample

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

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.

ALS Environmental

Quality Control Report

Workorder: L1969176 Report Date: 21-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-TOT-WT	**Water**							
Batch R3791554								
WG2584808-3 DUP		**L1968362-1**						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	03-AUG-17
WG2584808-7 DUP		**L1968362-2**						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	03-AUG-17
WG2584808-2 LCS								
Cyanide, Total			88.9		%		80-120	03-AUG-17
WG2584808-6 LCS								
Cyanide, Total			86.9		%		80-120	03-AUG-17
WG2584808-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	03-AUG-17
WG2584808-5 MB								
Cyanide, Total			<0.0020		mg/L		0.002	03-AUG-17
WG2584808-4 MS		**L1968362-1**						
Cyanide, Total			88.2		%		70-130	03-AUG-17
WG2584808-8 MS		**L1968362-2**						
Cyanide, Total			84.0		%		70-130	03-AUG-17
EC-WT	**Water**							
Batch R3790603								
WG2584432-12 DUP		**WG2584432-11**						
Conductivity		789	788		umhos/cm	0.1	10	03-AUG-17
WG2584432-16 DUP		**WG2584432-15**						
Conductivity		858	857		umhos/cm	0.1	10	03-AUG-17
WG2584432-10 LCS								
Conductivity			101.8		%		90-110	03-AUG-17
WG2584432-14 LCS								
Conductivity			102.0		%		90-110	03-AUG-17
WG2584432-13 MB								
Conductivity			<3.0		umhos/cm		3	03-AUG-17
WG2584432-9 MB								
Conductivity			<3.0		umhos/cm		3	03-AUG-17
MET-T-CCMS-WT	**Water**							
Batch R3792013								
WG2585303-4 DUP		**WG2585303-3**						
Aluminum (Al)-Total		0.0052	0.0057		mg/L	8.6	20	04-AUG-17
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-AUG-17
Arsenic (As)-Total		0.00013	0.00015		mg/L	9.4	20	04-AUG-17
Barium (Ba)-Total		0.0275	0.0274		mg/L	0.3	20	04-AUG-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3792013								
WG2585303-4 DUP		**WG2585303-3**						
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-AUG-17
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-AUG-17
Boron (B)-Total		0.021	0.020		mg/L	2.1	20	04-AUG-17
Cadmium (Cd)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	04-AUG-17
Calcium (Ca)-Total		41.4	40.3		mg/L	2.9	20	04-AUG-17
Chromium (Cr)-Total		0.00052	0.00054		mg/L	3.2	20	04-AUG-17
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	04-AUG-17
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-AUG-17
Copper (Cu)-Total		0.0019	0.0015	J	mg/L	0.0004	0.002	04-AUG-17
Iron (Fe)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	04-AUG-17
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-AUG-17
Lithium (Li)-Total		0.0067	0.0063		mg/L	7.1	20	04-AUG-17
Magnesium (Mg)-Total		29.4	29.3		mg/L	0.3	20	04-AUG-17
Manganese (Mn)-Total		0.00144	0.00142		mg/L	1.5	20	04-AUG-17
Molybdenum (Mo)-Total		0.000192	0.000181		mg/L	5.7	20	04-AUG-17
Nickel (Ni)-Total		0.00850	0.00781		mg/L	8.5	20	04-AUG-17
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	04-AUG-17
Potassium (K)-Total		1.39	1.37		mg/L	1.5	20	04-AUG-17
Rubidium (Rb)-Total		0.00397	0.00400		mg/L	0.7	20	04-AUG-17
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-AUG-17
Silicon (Si)-Total		3.81	3.78		mg/L	1.0	20	04-AUG-17
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-AUG-17
Sodium (Na)-Total		6.50	6.48		mg/L	0.2	20	04-AUG-17
Strontium (Sr)-Total		0.0246	0.0241		mg/L	2.2	20	04-AUG-17
Sulfur (S)-Total		4.12	4.12		mg/L	0.1	25	04-AUG-17
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	04-AUG-17
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	04-AUG-17
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	04-AUG-17
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-AUG-17
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	04-AUG-17
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-AUG-17
Uranium (U)-Total		0.000697	0.000706		mg/L	1.3	20	04-AUG-17
Vanadium (V)-Total		<0.00050	<0.00050		mg/L			04-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3792013								
WG2585303-4 DUP		**WG2585303-3**						
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	04-AUG-17
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	04-AUG-17
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	04-AUG-17
WG2585303-2 LCS								
Aluminum (Al)-Total			97.5		%		80-120	04-AUG-17
Antimony (Sb)-Total			100.4		%		80-120	04-AUG-17
Arsenic (As)-Total			97.2		%		80-120	04-AUG-17
Barium (Ba)-Total			95.8		%		80-120	04-AUG-17
Beryllium (Be)-Total			98.8		%		80-120	04-AUG-17
Bismuth (Bi)-Total			98.7		%		80-120	04-AUG-17
Boron (B)-Total			97.2		%		80-120	04-AUG-17
Cadmium (Cd)-Total			94.4		%		80-120	04-AUG-17
Calcium (Ca)-Total			96.5		%		80-120	04-AUG-17
Chromium (Cr)-Total			95.7		%		80-120	04-AUG-17
Cesium (Cs)-Total			100.5		%		80-120	04-AUG-17
Cobalt (Co)-Total			95.9		%		80-120	04-AUG-17
Copper (Cu)-Total			94.8		%		80-120	04-AUG-17
Iron (Fe)-Total			97.2		%		80-120	04-AUG-17
Lead (Pb)-Total			101.3		%		80-120	04-AUG-17
Lithium (Li)-Total			109.6		%		80-120	04-AUG-17
Magnesium (Mg)-Total			99.8		%		80-120	04-AUG-17
Manganese (Mn)-Total			95.6		%		80-120	04-AUG-17
Molybdenum (Mo)-Total			95.1		%		80-120	04-AUG-17
Nickel (Ni)-Total			95.3		%		80-120	04-AUG-17
Phosphorus (P)-Total			100.8		%		70-130	04-AUG-17
Potassium (K)-Total			94.8		%		80-120	04-AUG-17
Rubidium (Rb)-Total			97.6		%		80-120	04-AUG-17
Selenium (Se)-Total			97.8		%		80-120	04-AUG-17
Silicon (Si)-Total			116.4		%		60-140	04-AUG-17
Silver (Ag)-Total			100.3		%		80-120	04-AUG-17
Sodium (Na)-Total			101.6		%		80-120	04-AUG-17
Strontium (Sr)-Total			94.2		%		80-120	04-AUG-17
Sulfur (S)-Total			101.3		%		70-130	04-AUG-17
Thallium (Tl)-Total			98.8				80-120	

ALS Environmental

Quality Control Report

Workorder: L1969176 Report Date: 21-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3792013								
WG2585303-2 LCS								
Thallium (Tl)-Total			98.8		%		80-120	04-AUG-17
Tellurium (Te)-Total			99.1		%		80-120	04-AUG-17
Thorium (Th)-Total			99.9		%		70-130	04-AUG-17
Tin (Sn)-Total			94.9		%		80-120	04-AUG-17
Titanium (Ti)-Total			92.6		%		80-120	04-AUG-17
Tungsten (W)-Total			102.3		%		80-120	04-AUG-17
Uranium (U)-Total			103.0		%		80-120	04-AUG-17
Vanadium (V)-Total			99.2		%		80-120	04-AUG-17
Zinc (Zn)-Total			91.3		%		80-120	04-AUG-17
Zirconium (Zr)-Total			93.4		%		80-120	04-AUG-17
WG2585303-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	04-AUG-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	04-AUG-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	04-AUG-17
Barium (Ba)-Total			<0.00020		mg/L		0.0002	04-AUG-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	04-AUG-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	04-AUG-17
Boron (B)-Total			<0.010		mg/L		0.01	04-AUG-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	04-AUG-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	04-AUG-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	04-AUG-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	04-AUG-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	04-AUG-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	04-AUG-17
Iron (Fe)-Total			<0.050		mg/L		0.05	04-AUG-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	04-AUG-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	04-AUG-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	04-AUG-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	04-AUG-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	04-AUG-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	04-AUG-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	04-AUG-17
Potassium (K)-Total			<0.050		mg/L		0.05	04-AUG-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	04-AUG-17

Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3792013								
WG2585303-1 MB								
Selenium (Se)-Total			<0.000050		mg/L		0.00005	04-AUG-17
Silicon (Si)-Total			<0.10		mg/L		0.1	04-AUG-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	04-AUG-17
Sodium (Na)-Total			<0.50		mg/L		0.5	04-AUG-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	04-AUG-17
Sulfur (S)-Total			<0.50		mg/L		0.5	04-AUG-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	04-AUG-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	04-AUG-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	04-AUG-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	04-AUG-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	04-AUG-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	04-AUG-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	04-AUG-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	04-AUG-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	04-AUG-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	04-AUG-17
WG2585303-5 MS		**WG2585303-3**						
Aluminum (Al)-Total			99.4		%		70-130	04-AUG-17
Antimony (Sb)-Total			104.0		%		70-130	04-AUG-17
Arsenic (As)-Total			98.1		%		70-130	04-AUG-17
Barium (Ba)-Total			N/A	MS-B	%		-	04-AUG-17
Beryllium (Be)-Total			99.3		%		70-130	04-AUG-17
Bismuth (Bi)-Total			93.5		%		70-130	04-AUG-17
Boron (B)-Total			96.2		%		70-130	04-AUG-17
Cadmium (Cd)-Total			95.2		%		70-130	04-AUG-17
Calcium (Ca)-Total			N/A	MS-B	%		-	04-AUG-17
Chromium (Cr)-Total			98.3		%		70-130	04-AUG-17
Cesium (Cs)-Total			102.6		%		70-130	04-AUG-17
Cobalt (Co)-Total			95.9		%		70-130	04-AUG-17
Copper (Cu)-Total			89.1		%		70-130	04-AUG-17
Iron (Fe)-Total			93.7		%		70-130	04-AUG-17
Lead (Pb)-Total			96.6		%		70-130	04-AUG-17
Lithium (Li)-Total			96.9		%		70-130	04-AUG-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	04-AUG-17

Quality Control Report

Workorder: L1969176 Report Date: 21-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3792013								
WG2585303-5 MS		**WG2585303-3**						
Manganese (Mn)-Total			95.6		%		70-130	04-AUG-17
Molybdenum (Mo)-Total			96.0		%		70-130	04-AUG-17
Nickel (Ni)-Total			89.5		%		70-130	04-AUG-17
Phosphorus (P)-Total			98.7		%		70-130	04-AUG-17
Potassium (K)-Total			94.3		%		70-130	04-AUG-17
Rubidium (Rb)-Total			88.7		%		70-130	04-AUG-17
Selenium (Se)-Total			97.4		%		70-130	04-AUG-17
Silicon (Si)-Total			N/A	MS-B	%		-	04-AUG-17
Silver (Ag)-Total			99.5		%		70-130	04-AUG-17
Sodium (Na)-Total			N/A	MS-B	%		-	04-AUG-17
Strontium (Sr)-Total			N/A	MS-B	%		-	04-AUG-17
Sulfur (S)-Total			N/A	MS-B	%		-	04-AUG-17
Thallium (Tl)-Total			96.9		%		70-130	04-AUG-17
Tellurium (Te)-Total			103.9		%		70-130	04-AUG-17
Thorium (Th)-Total			98.1		%		70-130	04-AUG-17
Tin (Sn)-Total			96.1		%		70-130	04-AUG-17
Titanium (Ti)-Total			96.1		%		70-130	04-AUG-17
Tungsten (W)-Total			101.6		%		70-130	04-AUG-17
Uranium (U)-Total			N/A	MS-B	%		-	04-AUG-17
Vanadium (V)-Total			102.3		%		70-130	04-AUG-17
Zinc (Zn)-Total			94.0		%		70-130	04-AUG-17
Zirconium (Zr)-Total			93.0		%		70-130	04-AUG-17
PH-WT	**Water**							
Batch R3790603								
WG2584432-12 DUP		**WG2584432-11**						
pH		7.54	7.54	J	pH units	0.00	0.2	03-AUG-17
WG2584432-16 DUP		**WG2584432-15**						
pH		7.70	7.71	J	pH units	0.01	0.2	03-AUG-17
WG2584432-10 LCS								
pH			7.05		pH units		6.9-7.1	03-AUG-17
WG2584432-14 LCS								
pH			7.02		pH units		6.9-7.1	03-AUG-17
SOLIDS-TDS-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-WT	**Water**							
Batch R3793381								
WG2585378-3 DUP		**L1968302-1**						
Total Dissolved Solids		504	501		mg/L	0.5	20	04-AUG-17
WG2585378-2 LCS								
Total Dissolved Solids			94.6		%		85-115	04-AUG-17
WG2585378-1 MB								
Total Dissolved Solids			<10		mg/L		10	04-AUG-17
SOLIDS-TSS-WT	**Water**							
Batch R3793423								
WG2586736-3 DUP		**L1969173-2**						
Total Suspended Solids		374	370		mg/L	1.0	20	09-AUG-17
WG2586736-2 LCS								
Total Suspended Solids			100.4		%		85-115	09-AUG-17
WG2586736-1 MB								
Total Suspended Solids			<2.0		mg/L		2	09-AUG-17
TURBIDITY-WT	**Water**							
Batch R3790776								
WG2584843-3 DUP		**L1969176-14**						
Turbidity		16.9	16.6		NTU	1.8	15	03-AUG-17
WG2584843-2 LCS								
Turbidity			105.0		%		85-115	03-AUG-17
WG2584843-1 MB								
Turbidity			<0.10		NTU		0.1	03-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Wednesday, August 16, 2017

Rick Hawthorne
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1708101
Project Name:
Project Number: L1969176

Dear Mr. Hawthorne:

Two water samples were received from ALS Environmental, on 8/4/2017. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1708101

Radium-226:
The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1708101
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1969176
Client PO Number: L1969176

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1969176-14	1708101-1		WATER	01-Aug-17	
L1969176-15	1708101-2		WATER	01-Aug-17	

1708101

ALS Environmental

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# *L1969176*
ALS requires QC data to be provided with your final results.

Please see enclosed 2 **sample(s) in** 2 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
1 **L1969176-14 MS-06**		**8/1/2017**	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/28/2017	
2 **L1969176-15 MS-08**		**8/1/2017**	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	8/28/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910
Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______ Date Shipped: ______
Received By: C Trumble Date Received: 8-4-17 1140
Verified By: ______ Date Verified: ______
Temperature: ______
Sample Integrity Issues: ______

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS- Waterloo Workorder No: 1708101

Project Manager: ______ Initials: CDT Date: 8-4-17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are Custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5. Are the COC and bottle labels complete and legible?		YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		YES	NO
12. Are all samples within holding times for the requested analyses?		YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	N/A	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	NO
16. Were the samples shipped on ice?		YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	NO

Cooler #:	1							
Temperature (°C):	9.0							
No. of custody seals on cooler:	0							
DOT Survey/ Acceptance Information — External µR/hr reading:	10							
Background µR/hr reading:	10							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

The ice was melted.

If applicable, was the client contacted? YES / NO / NA Contact: ______ Date/Time: ______

Project Manager Signature / Date: Shilah Lumy

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

1708101

2017-08-03 WGI 8.23.00 / "99-1411"

IDY

DHL

From : ALS Environmental
Ed Hill
60 Northland Rd
Unit 1
N2V 2B8 WATERLOO ON
Canada

Origin:
YHM

10-0

Contact: Ph : 15198866910235

To: ALS Environmental Fort Collins
Sample Login
225 Commerce Drive
80524 FORT COLLINS CO
United States Of America

Contact:
Ph :18004431511

US – DEN – DEN

C

Time
X12

Pce/Shpt Weight
13.20/13.2 lbs

Piece
1/1

Contents:Water samples for testing

WAYBILL 66 8247 3554

(2L)US80524+50002001

Client:	ALS Environmental	**Date:**	*16-Aug-17*
Project:	L1969176	**Work Order:**	1708101
Sample ID:	L1969176-14	**Lab ID:**	1708101-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/1/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**		Prep Date: **8/7/2017**		PrepBy: **HCJ**
Ra-226	**0.011 (+/- 0.0056)**		**0.0045**	**BQ/l**	NA	8/16/2017 12:08
Carr: BARIUM	*98.2*		*40-110*	*%REC*	DL = NA	8/16/2017 12:08

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*16-Aug-17*
Project:	L1969176	**Work Order:**	1708101
Sample ID:	L1969176-15	**Lab ID:**	1708101-2
Legal Location:		**Matrix:**	WATER
Collection Date:	8/1/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **8/7/2017**	PrepBy: **HCJ**
Ra-226	**0.015 (+/- 0.0067)**		**0.0036**	**BQ/l**	NA	8/16/2017 12:08
Carr: BARIUM	*99.6*		*40-110*	*%REC*	DL = NA	8/16/2017 12:08

Client:	ALS Environmental	**Date:**	*16-Aug-17*
Project:	L1969176	**Work Order:**	1708101
Sample ID:	L1969176-15	**Lab ID:**	1708101-2
Legal Location:		**Matrix:**	WATER
Collection Date:	8/1/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Date: *8/16/2017 3:32:*

Client: ALS Environmental
Work Order: 1708101
Project: L1969176

QC BATCH REPORT

Batch ID: **RE170807-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170807-1** Units: **BQ/l** Analysis Date: **8/16/2017 12:42**
Client ID: Run ID: **RE170807-1B** Prep Date: **8/7/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.78 (+/- 0.440)	0.00884	1.715		104	67-120					P
Carr: BARIUM	16100		16150		99.5	40-110					

LCSD Sample ID: **RE170807-1** Units: **BQ/l** Analysis Date: **8/16/2017 12:42**
Client ID: Run ID: **RE170807-1B** Prep Date: **8/7/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.75 (+/- 0.433)	0.0104	1.715		102	67-120		1.78	0.04	2.1	P,M3
Carr: BARIUM	15200		16150		94	40-110		16100			

MB Sample ID: **RE170807-1** Units: **BQ/l** Analysis Date: **8/16/2017 12:42**
Client ID: Run ID: **RE170807-1B** Prep Date: **8/7/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.00094 (+/- 0.0033)	0.0062									U
Carr: BARIUM	15400		16150		95.5	40-110					

The following samples were analyzed in this batch: 1708101-1 1708101-2

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Daphnia magna

Work Order :	234061
Sample Number :	51841

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	SS
Location :	Waterloo ON	Time Collected :	16:30
Job Number :	L1969176	Date Collected :	2017-08-01
Substance :	L1969176-15 MS-08	Date Received :	2017-08-03
Sampling Method :	Grab	Date Tested :	2017-08-04
Sample Description :	Cloudy, yellow, mild odour	Temp. on arrival :	22.0° C

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna.* Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	100.0 %

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	Dm17-18		
Date Tested (yyyy/mm/dd) :	2017-08-01	Historical Mean LC50 :	5.8 g/L
LC50 (95% Confidence Limits) :	5.7 g/L (5.4 - 6.0)	Warning Limits (± 2SD) :	5.1 - 6.5 g/L
Statistical Method :	Spearman Kärber	Analyst(s) :	AW, CZN

Daphnia magna CULTURE HEALTH DATA

Time to First Brood :	7.6 days	Mean Young Per Brood :	32.9
Culture Mortality :	1.0% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Test Organisms / Replicate :	10
Test Aeration :	None	Total Organisms / Test Level :	30
Organism Batch :	Dm17-18	Organism Loading Rate :	15.0 mL/organism
		Test Method Deviation(s) :	None

Date: 2017-08-14
yyyy-mm-dd

Approved by: [signature]
Project Manager

Accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA)

AQUATOX

TOXICITY TEST REPORT
Daphnia magna

Work Order: 234061
Sample Number: 51841

	Hardness (mg/L as $CaCO_3$)	Hardness Adjustment	pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*	Total Pre-Aeration Time (h) @ 30 mL/min/L
Initial Water Chemistry:	>1000	None	5.5	8.7	1820	21.0	102	0:30

0 hours

Date & Time 2017-08-04 9:50
Technician: JF(AW)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*	Hardness
100A	0	0	5.5	8.5	1823	21.0	100	>1000
100B	0	0	5.5	8.5	1823	21.0	100	>1000
100C	0	0	5.5	8.5	1823	21.0	100	>1000
Control A	0	0	8.5	8.4	494	21.0	99	210
Control B	0	0	8.5	8.4	494	21.0	99	210
Control C	0	0	8.5	8.4	494	21.0	99	210

Notes:

24 hours

Date & Time 2017-08-05 9:50
Technician: SV

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	–	10	–	–	–	21.0
100B	–	10	–	–	–	21.0
100C	–	10	–	–	–	21.0
Control A	–	0	–	–	–	21.0
Control B	–	0	–	–	–	21.0
Control C	–	0	–	–	–	21.0

Notes:

48 hours

Date & Time 2017-08-06 9:50
Technician: SV

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	10	0	5.2	8.6	1816	20.5
100B	10	0	5.2	8.7	1839	20.5
100C	10	0	5.3	8.7	1861	20.5
Control A	0	0	8.5	8.8	511	20.5
Control B	0	0	8.5	8.8	504	20.5
Control C	0	0	8.5	8.8	503	20.5

Notes:

Control organisms showing stress: 0
Organism Batch : Dm17-18

Number immobile does not include number of mortalities.

– = not measured/not required
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: JL
Date: 2017-08-08

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 234061
Sample Number : 51841

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	SS
Location :	Waterloo ON	Time Collected :	16:30
Job Number :	L1969176	Date Collected :	2017-08-01
Substance :	L1969176-15 MS-08	Date Received :	2017-08-03
Sampling Method :	Grab	Date Tested :	2017-08-04
Sample Description :	Cloudy, yellow, mild odour	Temp. on arrival :	22.0°C

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	100.0 %

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T17-11		
Date Tested (yyyy-mm-dd) :	2017-08-02	Historical Mean LC50 :	3668 mg/L
LC50 (95% Confidence Limits) :	4070 mg/L (3591 - 4528)	Warning Limits (± 2SD) :	3109 - 4329 mg/L
Statistical Method :	Linear Regression (MLE)	Analyst(s) :	MA, FS, NL, DK

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.54 ± 0.27 g	Mean Fish Fork Length (± 2 SD) :	38.8 ± 5.1 mm
Range of Weights :	0.36 - 0.77 g	Range of Fork Lengths (mm) :	35 - 43 mm
Fish Loading Rate :	0.3 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	19
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2017-08-14
yyyy-mm-dd

Approved by: [signature]
Project Manager

Accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA)

AQUATOX

TOXICITY TEST REPORT
Rainbow Trout

Work Order: 234061
Sample Number: 51841

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	Initial Water Chemistry:	4.5	9.0	1783	14.5	–
	Chemistry after 30min air:	4.5	9.1	1777	14.5	96

0 hours

Date & Time: 2017-08-04 9:40
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	4.5	9.1	1777	14.5	96
Control	0	0	8.3	9.4	849	15.0	100

Notes:

24 hours

Date & Time: 2017-08-05 9:40
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	4.8	9.1	1770	14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time: 2017-08-06 9:40
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	–	–	–	–
Control	0	0	–	–	–	14.5

Notes:

72 hours

Date & Time: 2017-08-07 9:40
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	–	–	–	–
Control	0	0	–	–	–	14.5

Notes:

96 hours

Date & Time: 2017-08-08 9:40
Technician: FS

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	10	0	–	–	–	–
Control	0	0	8.3	9.3	801	15.0

Notes:

Control organisms showing stress: 0
Organism Batch : T17-11

"–" = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: I
Date: 2017-08-09

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 234061

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 Fax: (519) 763-4419

P.O. Number:	4500017476
Field Sampler Name (print):	GS
Signature:	
Affiliation:	ALS Env
Sample Storage (prior to shipping):	
Custody Relinquished by:	RH
Date/Time Shipped:	3 Aug 17

Client:	ALS Environmental Waterloo Q#162705399-15
Phone:	519-886-6910
Fax:	519-886-9047
Contact:	Wayne Smith /Rick Hawthorne

Sample Identification					Analyses Requested									Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name (L1969176-8, " -14, " -15)	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	Daphnia magna Single Concentration	Daphnia magna LC50	Fathead Minnow Survival & Growth	Ceriodaphnia dubia Survival & Reproduction	Lemna minor Growth	Pseudokirchneriella subcapitata Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2017-07-31	1515	~~[illegible]~~ MQ-C-B	51839	22.0	X		X							✓		Pail
2017-08-01	1945	MS-06	51840	↓	X		X							✓		↓
2017-08-01	1630	MS-08	51841	↓	X		X							✓		↓

For Lab Use Only	
Received By:	S
Date:	2017-08-03
Time:	15:30
Storage Location:	
Storage Temp.(°C)	

CN

Please list any special requests or instructions:
Regular Baffinland Toxicity Tests

Standard COC rev 3 2016 09 01 TC

L1969176

WATERLOO

ALS Environmental

Subcontract Request Form

Subcontract To:

AQUATOX TESTING AND CONSULTING
11B NICHOLAS BEAVER ROAD
RR3
GUELPH,ON N1H 6H9

NOTES: Please reference on final report and invoice: PO# *L1969176*
ALS requires QC data to be provided with your final results.

Please see enclosed 3 **sample(s) in** 0 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1969176-8 MQ-C-B		**7/31/2017**	
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	8/23/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	8/17/2017	
L1969176-14 MS-06		**8/1/2017**	
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	8/23/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	8/17/2017	
L1969176-15 MS-08		**8/1/2017**	
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	8/23/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	8/17/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910
Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______________ Date Shipped: ______________

Received By: ______________ Date Received: ______________

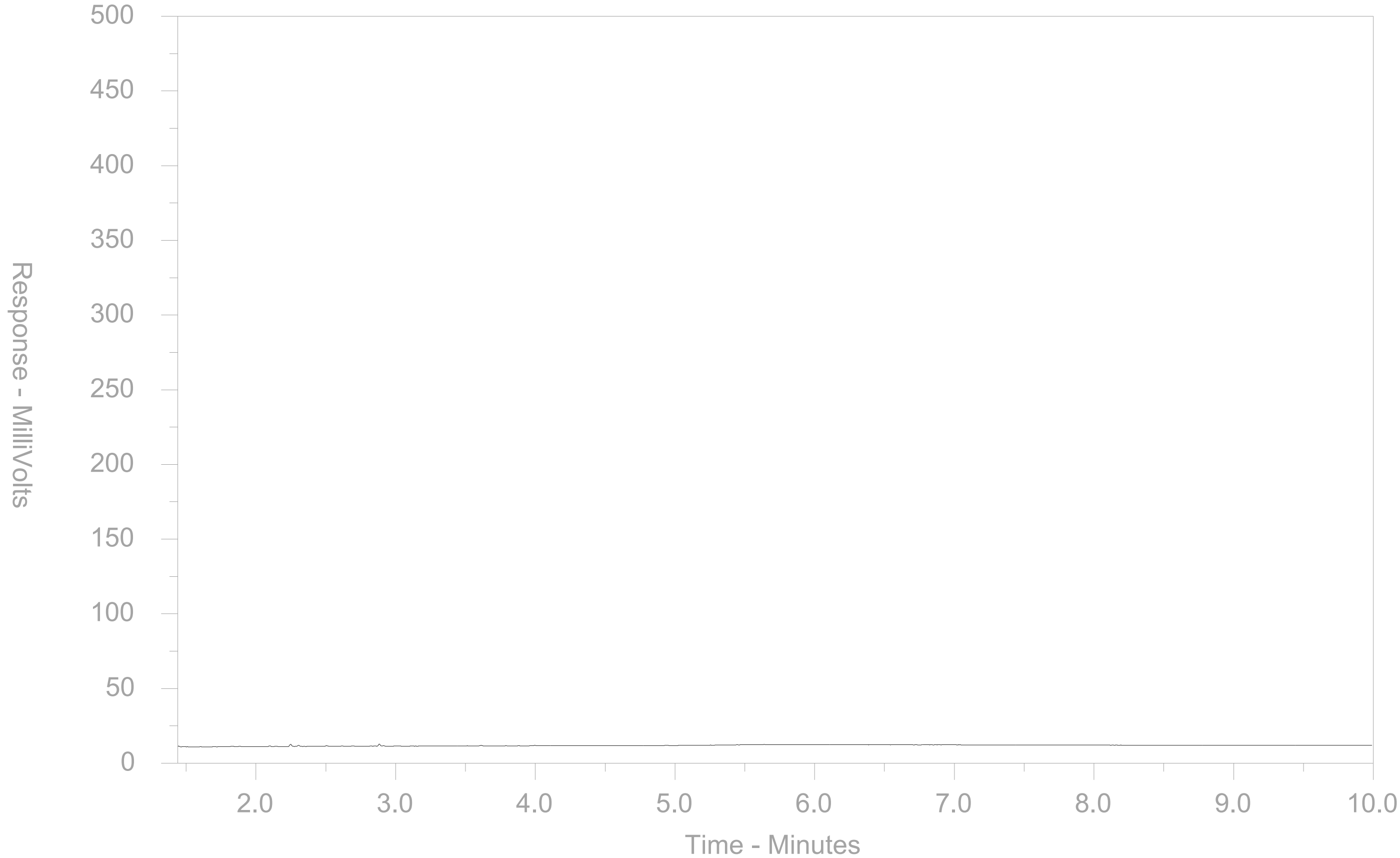
Verified By: ______________ Date Verified: ______________

Temperature: ______________

Sample Integrity Issues: ______________

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1969176-12
Client Sample ID: MS-MRY-13B



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

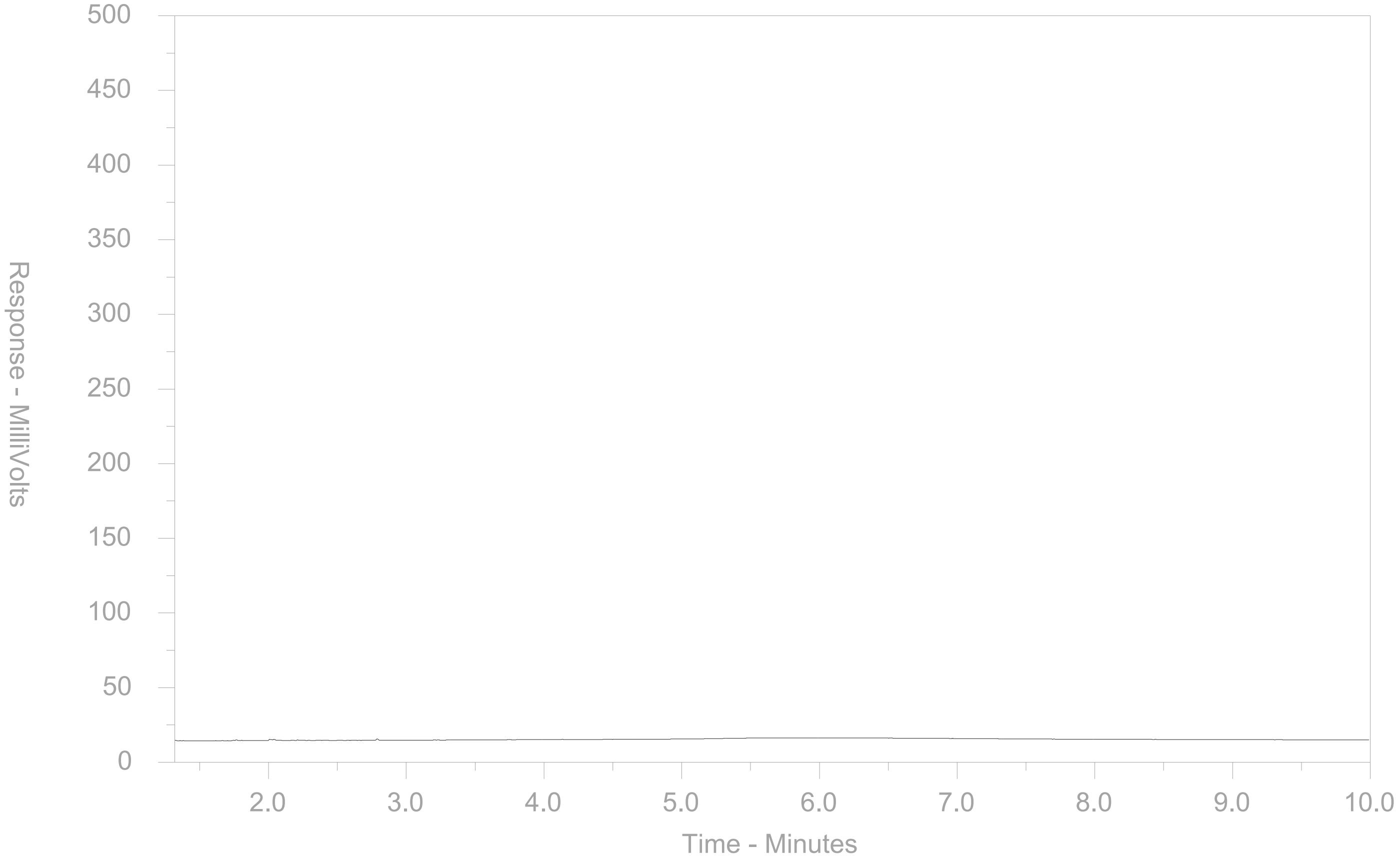
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1969176-13
Client Sample ID: MS-MRY-13A



←F2→	←F3→		←F4→
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 25-AUG-17
Report Date: 14-SEP-17 12:01 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1980963
Project P.O. #: 4500027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Rick Hawthorne
Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-1 MRTF-1 Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Physical Tests							
Conductivity	196		3.0	umhos/cm		26-AUG-17	R3812484
Hardness (as CaCO3)	96		10	mg/L		27-AUG-17	
pH	8.12		0.10	pH units		26-AUG-17	R3812483
Total Suspended Solids	<2.0		2.0	mg/L	26-AUG-17	27-AUG-17	R3812721
Total Dissolved Solids	106		13	mg/L		26-AUG-17	R3812645
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	97		10	mg/L		26-AUG-17	R3812543
Ammonia, Total (as N)	0.177		0.020	mg/L		26-AUG-17	R3812741
Chloride (Cl)	1.26		0.50	mg/L		26-AUG-17	R3812607
Fluoride (F)	<0.020		0.020	mg/L		26-AUG-17	R3812607
Nitrate (as N)	0.116		0.020	mg/L		26-AUG-17	R3812607
Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	26-AUG-17	27-AUG-17	R3812661
Phosphorus, Total	<0.0030		0.0030	mg/L	27-AUG-17	27-AUG-17	R3812722
Sulfate (SO4)	2.80		0.30	mg/L		26-AUG-17	R3812607
Cyanides							
Cyanide, Total	<0.20	DLM	0.20	mg/L		28-AUG-17	R3813435
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<1.0		1.0	mg/L		26-AUG-17	R3812641
Total Organic Carbon	<1.0		1.0	mg/L		27-AUG-17	R3812643
Inorganic Parameters							
Acidity (as CaCO3)	<2.0		2.0	mg/L		26-AUG-17	R3812508
Total Metals							
Aluminum (Al)-Total	0.0573		0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Antimony (Sb)-Total	0.00043		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Arsenic (As)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Barium (Ba)-Total	0.00760		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812689
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Boron (B)-Total	<0.010		0.010	mg/L	27-AUG-17	27-AUG-17	R3812689
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Calcium (Ca)-Total	20.7		0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Copper (Cu)-Total	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Iron (Fe)-Total	<0.050		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Lead (Pb)-Total	0.000051		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Lithium (Li)-Total	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Magnesium (Mg)-Total	11.5		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Manganese (Mn)-Total	0.00052		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Mercury (Hg)-Total	<0.000010		0.000010	mg/L		27-AUG-17	R3812736
Molybdenum (Mo)-Total	0.000186		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-1 MRTF-1 Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Total Metals							
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Phosphorus (P)-Total	<0.050		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Potassium (K)-Total	0.902		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Rubidium (Rb)-Total	0.00121		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812689
Selenium (Se)-Total	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Silicon (Si)-Total	0.88		0.10	mg/L	27-AUG-17	27-AUG-17	R3812689
Silver (Ag)-Total	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Sodium (Na)-Total	0.90		0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Strontium (Sr)-Total	0.0108		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Sulfur (S)-Total	1.39		0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812689
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Thorium (Th)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Tin (Sn)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Titanium (Ti)-Total	<0.00030		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812689
Tungsten (W)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Uranium (U)-Total	0.00251		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Vanadium (V)-Total	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Zinc (Zn)-Total	0.0038		0.0030	mg/L	27-AUG-17	27-AUG-17	R3812689
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812689
Dissolved Metals							
Dissolved Mercury Filtration Location	FIELD					27-AUG-17	R3812684
Dissolved Metals Filtration Location	FIELD					27-AUG-17	R3812617
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Barium (Ba)-Dissolved	0.00758		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Boron (B)-Dissolved	<0.010		0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Cadmium (Cd)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Calcium (Ca)-Dissolved	19.6		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Copper (Cu)-Dissolved	0.00047		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812687
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Magnesium (Mg)-Dissolved	11.6		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Manganese (Mn)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-1 MRTF-1 Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Dissolved Metals							
Mercury (Hg)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812737
Molybdenum (Mo)-Dissolved	0.000174		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Potassium (K)-Dissolved	0.815		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Rubidium (Rb)-Dissolved	0.00121		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812687
Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Silicon (Si)-Dissolved	0.829		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Sodium (Na)-Dissolved	0.89		0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Strontium (Sr)-Dissolved	0.0105		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Sulfur (S)-Dissolved	0.98		0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812687
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812687
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Uranium (U)-Dissolved	0.00230		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812687
Radiological Parameters							
Ra-226	<0.0085		0.0085	Bq/L	31-AUG-17	12-SEP-17	R3828449
L1980963-2 MS-08-US Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Physical Tests							
Conductivity	136		3.0	umhos/cm		26-AUG-17	R3812484
Hardness (as CaCO3)	61		10	mg/L		27-AUG-17	
pH	8.06		0.10	pH units		26-AUG-17	R3812483
Total Suspended Solids	<2.0		2.0	mg/L	26-AUG-17	27-AUG-17	R3812721
Total Dissolved Solids	76		13	mg/L		26-AUG-17	R3812645
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	58		10	mg/L		26-AUG-17	R3812543
Ammonia, Total (as N)	<0.020		0.020	mg/L		26-AUG-17	R3812741
Chloride (Cl)	3.86		0.50	mg/L		26-AUG-17	R3812607
Fluoride (F)	0.021		0.020	mg/L		26-AUG-17	R3812607
Nitrate (as N)	<0.020		0.020	mg/L		26-AUG-17	R3812607
Total Kjeldahl Nitrogen	<0.15		0.15	mg/L	26-AUG-17	27-AUG-17	R3812661
Phosphorus, Total	0.0046		0.0030	mg/L	27-AUG-17	27-AUG-17	R3812722
Sulfate (SO4)	2.44		0.30	mg/L		26-AUG-17	R3812607

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-2 MS-08-US Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Anions and Nutrients							
Cyanides							
Cyanide, Total	<0.20	DLM	0.20	mg/L		28-AUG-17	R3813435
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<1.0		1.0	mg/L		26-AUG-17	R3812641
Total Organic Carbon	1.4		1.0	mg/L		27-AUG-17	R3812643
Inorganic Parameters							
Acidity (as CaCO3)	<2.0		2.0	mg/L		26-AUG-17	R3812508
Total Metals							
Aluminum (Al)-Total	0.154		0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Arsenic (As)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Barium (Ba)-Total	0.00907		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812689
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Boron (B)-Total	<0.010		0.010	mg/L	27-AUG-17	27-AUG-17	R3812689
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Calcium (Ca)-Total	13.1		0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Cesium (Cs)-Total	0.000018		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Copper (Cu)-Total	0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Iron (Fe)-Total	0.114		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Lead (Pb)-Total	0.000103		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Lithium (Li)-Total	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Magnesium (Mg)-Total	6.90		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Manganese (Mn)-Total	0.00186		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Mercury (Hg)-Total	<0.000010		0.000010	mg/L		27-AUG-17	R3812736
Molybdenum (Mo)-Total	0.000310		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Phosphorus (P)-Total	<0.050		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Potassium (K)-Total	1.04		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Rubidium (Rb)-Total	0.00186		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812689
Selenium (Se)-Total	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Silicon (Si)-Total	0.99		0.10	mg/L	27-AUG-17	27-AUG-17	R3812689
Silver (Ag)-Total	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Sodium (Na)-Total	2.23		0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Strontium (Sr)-Total	0.0125		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Sulfur (S)-Total	1.14		0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812689
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Thorium (Th)-Total	0.00012		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Tin (Sn)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-2 MS-08-US Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Total Metals							
Titanium (Ti)-Total	0.00572		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812689
Tungsten (W)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Uranium (U)-Total	0.00231		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Vanadium (V)-Total	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	27-AUG-17	27-AUG-17	R3812689
Zirconium (Zr)-Total	0.00031		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812689
Dissolved Metals							
Dissolved Mercury Filtration Location	FIELD					27-AUG-17	R3812684
Dissolved Metals Filtration Location	FIELD					27-AUG-17	R3812617
Aluminum (Al)-Dissolved	0.0093		0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Barium (Ba)-Dissolved	0.00856		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Boron (B)-Dissolved	<0.010		0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Cadmium (Cd)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Calcium (Ca)-Dissolved	13.0		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Copper (Cu)-Dissolved	0.00102		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812687
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Magnesium (Mg)-Dissolved	7.02		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Manganese (Mn)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Mercury (Hg)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812737
Molybdenum (Mo)-Dissolved	0.000311		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Potassium (K)-Dissolved	0.994		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Rubidium (Rb)-Dissolved	0.00150		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812687
Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Silicon (Si)-Dissolved	0.689		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Sodium (Na)-Dissolved	2.14		0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Strontium (Sr)-Dissolved	0.0127		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Sulfur (S)-Dissolved	0.86		0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812687
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-2 MS-08-US Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Dissolved Metals							
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812687
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Uranium (U)-Dissolved	0.00233		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812687
Radiological Parameters							
Ra-226	<0.0080		0.0080	Bq/L	31-AUG-17	12-SEP-17	R3828449
L1980963-3 MS-08-DS Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Physical Tests							
Conductivity	141		3.0	umhos/cm		26-AUG-17	R3812484
Hardness (as CaCO3)	63		10	mg/L		27-AUG-17	
pH	8.04		0.10	pH units		26-AUG-17	R3812483
Total Suspended Solids	<2.0		2.0	mg/L	26-AUG-17	27-AUG-17	R3812721
Total Dissolved Solids	43		13	mg/L		26-AUG-17	R3812645
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	61		10	mg/L		26-AUG-17	R3812543
Ammonia, Total (as N)	<0.020		0.020	mg/L		26-AUG-17	R3812741
Chloride (Cl)	3.87		0.50	mg/L		26-AUG-17	R3812607
Fluoride (F)	<0.020		0.020	mg/L		26-AUG-17	R3812607
Nitrate (as N)	<0.020		0.020	mg/L		26-AUG-17	R3812607
Total Kjeldahl Nitrogen	0.15		0.15	mg/L	26-AUG-17	27-AUG-17	R3812661
Phosphorus, Total	0.0053		0.0030	mg/L	27-AUG-17	27-AUG-17	R3812722
Sulfate (SO4)	2.97		0.30	mg/L		26-AUG-17	R3812607
Cyanides							
Cyanide, Total	<0.20	DLM	0.20	mg/L		28-AUG-17	R3813435
Organic / Inorganic Carbon							
Dissolved Organic Carbon	<1.0		1.0	mg/L		26-AUG-17	R3812641
Total Organic Carbon	1.5		1.0	mg/L		27-AUG-17	R3812643
Inorganic Parameters							
Acidity (as CaCO3)	<2.0		2.0	mg/L		26-AUG-17	R3812508
Total Metals							
Aluminum (Al)-Total	0.150		0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Arsenic (As)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Barium (Ba)-Total	0.00949		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812689
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-3 MS-08-DS Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Total Metals							
Boron (B)-Total	<0.010		0.010	mg/L	27-AUG-17	27-AUG-17	R3812689
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Calcium (Ca)-Total	13.2		0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Cesium (Cs)-Total	0.000020		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Copper (Cu)-Total	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Iron (Fe)-Total	0.091		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Lead (Pb)-Total	0.000089		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Lithium (Li)-Total	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Magnesium (Mg)-Total	7.34		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Manganese (Mn)-Total	0.00105		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Mercury (Hg)-Total	<0.000010		0.000010	mg/L		27-AUG-17	R3812736
Molybdenum (Mo)-Total	0.000315		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Nickel (Ni)-Total	0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Phosphorus (P)-Total	<0.050		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Potassium (K)-Total	1.06		0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Rubidium (Rb)-Total	0.00192		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812689
Selenium (Se)-Total	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Silicon (Si)-Total	1.02		0.10	mg/L	27-AUG-17	27-AUG-17	R3812689
Silver (Ag)-Total	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812689
Sodium (Na)-Total	2.07		0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Strontium (Sr)-Total	0.0133		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Sulfur (S)-Total	1.16		0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812689
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Thorium (Th)-Total	0.00011		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Tin (Sn)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Titanium (Ti)-Total	0.00503		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812689
Tungsten (W)-Total	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Uranium (U)-Total	0.00237		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812689
Vanadium (V)-Total	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	27-AUG-17	27-AUG-17	R3812689
Zirconium (Zr)-Total	0.00031		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812689
Dissolved Metals							
Dissolved Mercury Filtration Location	FIELD					27-AUG-17	R3812684
Dissolved Metals Filtration Location	FIELD					27-AUG-17	R3812617
Aluminum (Al)-Dissolved	0.0085		0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Barium (Ba)-Dissolved	0.00873		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-3 MS-08-DS Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Dissolved Metals							
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Boron (B)-Dissolved	<0.010		0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Cadmium (Cd)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Calcium (Ca)-Dissolved	13.2		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Copper (Cu)-Dissolved	0.00078		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812687
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Magnesium (Mg)-Dissolved	7.34		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Manganese (Mn)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Mercury (Hg)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812737
Molybdenum (Mo)-Dissolved	0.000309		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Potassium (K)-Dissolved	1.03		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Rubidium (Rb)-Dissolved	0.00161		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812687
Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Silicon (Si)-Dissolved	0.705		0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	27-AUG-17	27-AUG-17	R3812687
Sodium (Na)-Dissolved	2.10		0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Strontium (Sr)-Dissolved	0.0123		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Sulfur (S)-Dissolved	0.98		0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	27-AUG-17	27-AUG-17	R3812687
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812687
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Uranium (U)-Dissolved	0.00226		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812687
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	27-AUG-17	27-AUG-17	R3812687
Radiological Parameters							
Ra-226	<0.0100	DLRC	0.010	Bq/L	31-AUG-17	12-SEP-17	R3828449
L1980963-4 MS-08-GEOTUBE Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Physical Tests							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-4 MS-08-GEOTUBE Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Physical Tests							
Conductivity	3250		3.0	umhos/cm		26-AUG-17	R3812484
Hardness (as CaCO3)	1960		10	mg/L		27-AUG-17	
pH	6.96		0.10	pH units		26-AUG-17	R3812483
Total Suspended Solids	39.8		2.0	mg/L	26-AUG-17	27-AUG-17	R3812721
Total Dissolved Solids	3110		20	mg/L		26-AUG-17	R3812645
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	83		10	mg/L		26-AUG-17	R3812543
Ammonia, Total (as N)	1.68	DLHC	0.20	mg/L		26-AUG-17	R3812741
Chloride (Cl)	9.1	DLDS	5.0	mg/L		26-AUG-17	R3812607
Fluoride (F)	<0.20	DLDS	0.20	mg/L		26-AUG-17	R3812607
Nitrate (as N)	7.99	DLDS	0.20	mg/L		26-AUG-17	R3812607
Total Kjeldahl Nitrogen	2.00		0.15	mg/L	26-AUG-17	27-AUG-17	R3812661
Phosphorus, Total	0.0159		0.0030	mg/L	27-AUG-17	27-AUG-17	R3812722
Sulfate (SO4)	2050	DLDS	3.0	mg/L		26-AUG-17	R3812607
Cyanides							
Cyanide, Total	<0.20	DLM	0.20	mg/L		28-AUG-17	R3813435
Organic / Inorganic Carbon							
Dissolved Organic Carbon	1.6		1.0	mg/L		26-AUG-17	R3812641
Total Organic Carbon	2.5		1.0	mg/L		27-AUG-17	R3812643
Inorganic Parameters							
Acidity (as CaCO3)	15.0		2.0	mg/L		26-AUG-17	R3812508
Total Metals							
Aluminum (Al)-Total	0.340	DLHC	0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Antimony (Sb)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Arsenic (As)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Barium (Ba)-Total	0.0318	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812689
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Boron (B)-Total	<0.10	DLHC	0.10	mg/L	27-AUG-17	27-AUG-17	R3812689
Cadmium (Cd)-Total	0.00035	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Calcium (Ca)-Total	88.9	DLHC	5.0	mg/L	27-AUG-17	27-AUG-17	R3812689
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Cobalt (Co)-Total	0.277	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Copper (Cu)-Total	<0.010	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812689
Iron (Fe)-Total	6.41	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Lead (Pb)-Total	0.00065	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Lithium (Li)-Total	0.023	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812689
Magnesium (Mg)-Total	421	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Manganese (Mn)-Total	18.0	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Mercury (Hg)-Total	<0.000010		0.000010	mg/L		27-AUG-17	R3812736
Molybdenum (Mo)-Total	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-4 MS-08-GEOTUBE Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Total Metals							
Nickel (Ni)-Total	0.305	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Potassium (K)-Total	3.58	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Rubidium (Rb)-Total	0.0073	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812689
Selenium (Se)-Total	0.00475	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Silicon (Si)-Total	1.6	DLHC	1.0	mg/L	27-AUG-17	27-AUG-17	R3812689
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Sodium (Na)-Total	94.2	DLHC	5.0	mg/L	27-AUG-17	27-AUG-17	R3812689
Strontium (Sr)-Total	0.061	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812689
Sulfur (S)-Total	745	DLHC	5.0	mg/L	27-AUG-17	27-AUG-17	R3812689
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812689
Thallium (Tl)-Total	0.00010	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Titanium (Ti)-Total	<0.030	DLUI	0.030	mg/L	27-AUG-17	27-AUG-17	R3812689
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Uranium (U)-Total	0.00011	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	27-AUG-17	27-AUG-17	R3812689
Zirconium (Zr)-Total	<0.0030	DLHC	0.0030	mg/L	27-AUG-17	27-AUG-17	R3812689
Dissolved Metals							
Dissolved Mercury Filtration Location	FIELD					27-AUG-17	R3812684
Dissolved Metals Filtration Location	FIELD					27-AUG-17	R3812617
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Antimony (Sb)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Arsenic (As)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Barium (Ba)-Dissolved	0.0293	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Boron (B)-Dissolved	<0.10	DLHC	0.10	mg/L	27-AUG-17	27-AUG-17	R3812687
Cadmium (Cd)-Dissolved	0.00030	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Calcium (Ca)-Dissolved	90.8	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687
Cobalt (Co)-Dissolved	0.264	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Copper (Cu)-Dissolved	<0.0020	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812687
Iron (Fe)-Dissolved	2.41	DLHC	0.10	mg/L	27-AUG-17	27-AUG-17	R3812687
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Lithium (Li)-Dissolved	0.026	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Magnesium (Mg)-Dissolved	420	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Manganese (Mn)-Dissolved	17.5	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980963-4 MS-08-GEOTUBE Sampled By: LM/MK/CD on 24-AUG-17 @ 18:25 Matrix: WATER							
Dissolved Metals							
Mercury (Hg)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812737
Molybdenum (Mo)-Dissolved	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Nickel (Ni)-Dissolved	0.291	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Potassium (K)-Dissolved	3.39	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Rubidium (Rb)-Dissolved	0.0060	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812687
Selenium (Se)-Dissolved	0.00509	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Silicon (Si)-Dissolved	0.98	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Sodium (Na)-Dissolved	93.0	DLHC	5.0	mg/L	27-AUG-17	27-AUG-17	R3812687
Strontium (Sr)-Dissolved	0.062	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Sulfur (S)-Dissolved	721	DLHC	5.0	mg/L	27-AUG-17	27-AUG-17	R3812687
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812687
Thallium (Tl)-Dissolved	0.00011	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	27-AUG-17	27-AUG-17	R3812687
Tungsten (W)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Uranium (U)-Dissolved	<0.00010	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687
Zinc (Zn)-Dissolved	0.013	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Zirconium (Zr)-Dissolved	<0.0030	DLHC	0.0030	mg/L	27-AUG-17	27-AUG-17	R3812687
Radiological Parameters							
Ra-226	0.041		0.0077	Bq/L	31-AUG-17	12-SEP-17	R3828449

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Boron (B)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Cobalt (Co)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Rubidium (Rb)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Boron (B)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Cobalt (Co)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Iron (Fe)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Lithium (Li)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Nickel (Ni)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Potassium (K)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Rubidium (Rb)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Silicon (Si)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Sulfur (S)-Total	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Ammonia, Total (as N)	MS-B	L1980963-1, -2, -3, -4
Matrix Spike	Sulfate (SO4)	MS-B	L1980963-1, -2, -3, -4

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLRC	Detection Limit Raised for RadioChemistry test due to sample matrix (e.g. high TDS) or instrument detector conditions.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-WT	Water	Acidity (as CaCO3)	APHA 2310 B - Potentiometric Titration
ALK-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-WT	Water	Dissolved Organic Carbon	APHA 5310 B-INSTRUMENTAL

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

Reference Information

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-TOT-WT | Water | Cyanide, Total | ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

EC-WT | Water | Conductivity | APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

F-IC-N-WT | 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-WT | Water | Hardness | APHA 2340 B

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-WT | Water | Dissolved Mercury in Water by CVAAS | 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-T-CVAA-WT | Water | Total Mercury in Water by CVAAS | EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-D-CCMS-WT | 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-T-CCMS-WT | Water | Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-WT | Water | Ammonia, Total as N | EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO3-IC-WT | Water | Nitrate in Water by IC | EPA 300.1 (mod)

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

P-T-COL-WT | Water | Total P in Water by Colour | APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PH-WT | Water | pH | APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

RA226-MMER-FC | Water | Ra226 by Alpha Scint, MDC=0.01 Bq/L | EPA 903.1

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

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

SOLIDS-TDS-WT | Water | Total Dissolved Solids | APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5□C overnight and then 180–10□C for 1hr.

Reference Information

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1□C for a minimum of four hours or until a constant weight is achieved.

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
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 weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
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.

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-WT	**Water**							
Batch R3812508								
WG2602106-3 DUP		**L1977867-1**						
Acidity (as CaCO3)		<2.0	<2.0	RPD-NA	mg/L	N/A	25	26-AUG-17
WG2602106-2 LCS								
Acidity (as CaCO3)			100.0		%		70-130	26-AUG-17
WG2602106-1 MB								
Acidity (as CaCO3)			<2.0		mg/L		2	26-AUG-17
ALK-WT	**Water**							
Batch R3812543								
WG2602199-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			102.3		%		80-120	26-AUG-17
WG2602199-4 DUP		**L1980957-1**						
Alkalinity, Total (as CaCO3)		82	82		mg/L	0.6	20	26-AUG-17
WG2602199-2 LCS								
Alkalinity, Total (as CaCO3)			101.5		%		85-115	26-AUG-17
WG2602199-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	26-AUG-17
C-DIS-ORG-WT	**Water**							
Batch R3812641								
WG2602306-3 DUP		**L1980957-1**						
Dissolved Organic Carbon		1.4	1.4		mg/L	1.5	20	26-AUG-17
WG2602306-2 LCS								
Dissolved Organic Carbon			99.1		%		80-120	26-AUG-17
WG2602306-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	26-AUG-17
WG2602306-4 MS		**L1980957-1**						
Dissolved Organic Carbon			100.9		%		70-130	26-AUG-17
CL-IC-N-WT	**Water**							
Batch R3812607								
WG2601380-4 DUP		**WG2601380-3**						
Chloride (Cl)		60.0	58.2		mg/L	3.2	20	26-AUG-17
WG2601380-2 LCS								
Chloride (Cl)			100.9		%		90-110	26-AUG-17
WG2601380-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	26-AUG-17
WG2601380-5 MS		**WG2601380-3**						
Chloride (Cl)			91.9		%		75-125	26-AUG-17
CN-TOT-WT	**Water**							

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-TOT-WT	**Water**							
Batch R3813435								
WG2602301-3 DUP		**L1980957-1**						
Cyanide, Total		<0.20	<0.0020	RPD-NA	mg/L	N/A	20	28-AUG-17
WG2602301-2 LCS								
Cyanide, Total			89.6		%		80-120	28-AUG-17
WG2602301-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	28-AUG-17
WG2602301-4 MS		**L1980957-1**						
Cyanide, Total			76.7		%		70-130	28-AUG-17
EC-WT	**Water**							
Batch R3812484								
WG2602164-2 DUP		**L1980957-1**						
Conductivity		3330	3270		umhos/cm	1.8	10	26-AUG-17
WG2602164-1 LCS								
Conductivity			98.4		%		90-110	26-AUG-17
WG2602164-3 MB								
Conductivity			<3.0		umhos/cm		3	26-AUG-17
F-IC-N-WT	**Water**							
Batch R3812607								
WG2601380-4 DUP		**WG2601380-3**						
Fluoride (F)		0.332	0.330		mg/L	0.7	20	26-AUG-17
WG2601380-2 LCS								
Fluoride (F)			99.8		%		90-110	26-AUG-17
WG2601380-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	26-AUG-17
WG2601380-5 MS		**WG2601380-3**						
Fluoride (F)			94.8		%		75-125	26-AUG-17
HG-D-CVAA-WT	**Water**							
Batch R3812737								
WG2602383-3 DUP		**L1980957-1**						
Mercury (Hg)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-AUG-17
WG2602383-2 LCS								
Mercury (Hg)-Dissolved			96.3		%		80-120	27-AUG-17
WG2602383-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	27-AUG-17
WG2602383-4 MS		**L1980959-1**						
Mercury (Hg)-Dissolved			85.4		%		70-130	27-AUG-17
HG-T-CVAA-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine’s Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R3812736								
WG2602382-3 DUP		**L1980957-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-AUG-17
WG2602382-2 LCS								
Mercury (Hg)-Total			96.0		%		80-120	27-AUG-17
WG2602382-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	27-AUG-17
WG2602382-4 MS		**L1980959-1**						
Mercury (Hg)-Total			88.8		%		70-130	27-AUG-17
MET-D-CCMS-WT	**Water**							
Batch R3812687								
WG2602281-4 DUP		**WG2602281-3**						
Aluminum (Al)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-AUG-17
Antimony (Sb)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Arsenic (As)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Barium (Ba)-Dissolved		0.0264	0.0254		mg/L	3.8	20	27-AUG-17
Beryllium (Be)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Bismuth (Bi)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Boron (B)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-AUG-17
Cadmium (Cd)-Dissolved		0.00032	0.00032		mg/L	1.6	20	27-AUG-17
Calcium (Ca)-Dissolved		89.9	85.0		mg/L	5.6	20	27-AUG-17
Cesium (Cs)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-AUG-17
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-AUG-17
Cobalt (Co)-Dissolved		0.270	0.275		mg/L	1.7	20	27-AUG-17
Copper (Cu)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	27-AUG-17
Iron (Fe)-Dissolved		2.79	2.76		mg/L	1.1	20	27-AUG-17
Lead (Pb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Lithium (Li)-Dissolved		0.025	0.024		mg/L	2.8	20	27-AUG-17
Magnesium (Mg)-Dissolved		429	439		mg/L	2.4	20	27-AUG-17
Manganese (Mn)-Dissolved		17.9	18.0		mg/L	0.9	20	27-AUG-17
Molybdenum (Mo)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Nickel (Ni)-Dissolved		0.301	0.307		mg/L	1.7	20	27-AUG-17
Phosphorus (P)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	27-AUG-17
Potassium (K)-Dissolved		3.47	3.43		mg/L	1.1	20	27-AUG-17
Rubidium (Rb)-Dissolved		0.0064	0.0066		mg/L	3.2	20	27-AUG-17
Selenium (Se)-Dissolved		0.00475	0.00472		mg/L	0.6	20	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3812687								
WG2602281-4 DUP		**WG2602281-3**						
Silicon (Si)-Dissolved		1.01	0.93		mg/L	8.1	20	27-AUG-17
Silver (Ag)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Sodium (Na)-Dissolved		95.3	97.4		mg/L	2.2	20	27-AUG-17
Strontium (Sr)-Dissolved		0.061	0.061		mg/L	0.8	20	27-AUG-17
Sulfur (S)-Dissolved		729	719		mg/L	1.4	20	27-AUG-17
Tellurium (Te)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	27-AUG-17
Thallium (Tl)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-AUG-17
Thorium (Th)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Tin (Sn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Titanium (Ti)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-AUG-17
Tungsten (W)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Uranium (U)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-AUG-17
Vanadium (V)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-AUG-17
Zinc (Zn)-Dissolved		0.016	0.015		mg/L	3.7	20	27-AUG-17
Zirconium (Zr)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-AUG-17
WG2602281-2 LCS								
Aluminum (Al)-Dissolved			102.0		%		80-120	27-AUG-17
Antimony (Sb)-Dissolved			94.9		%		80-120	27-AUG-17
Arsenic (As)-Dissolved			99.4		%		80-120	27-AUG-17
Barium (Ba)-Dissolved			104.3		%		80-120	27-AUG-17
Beryllium (Be)-Dissolved			97.6		%		80-120	27-AUG-17
Bismuth (Bi)-Dissolved			97.8		%		80-120	27-AUG-17
Boron (B)-Dissolved			97.3		%		80-120	27-AUG-17
Cadmium (Cd)-Dissolved			105.2		%		80-120	27-AUG-17
Calcium (Ca)-Dissolved			101.9		%		80-120	27-AUG-17
Cesium (Cs)-Dissolved			99.4		%		80-120	27-AUG-17
Chromium (Cr)-Dissolved			99.5		%		80-120	27-AUG-17
Cobalt (Co)-Dissolved			95.9		%		80-120	27-AUG-17
Copper (Cu)-Dissolved			96.7		%		80-120	27-AUG-17
Iron (Fe)-Dissolved			95.5		%		80-120	27-AUG-17
Lead (Pb)-Dissolved			100.1		%		80-120	27-AUG-17
Lithium (Li)-Dissolved			104.9		%		80-120	27-AUG-17
Magnesium (Mg)-Dissolved			98.0		%		80-120	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3812687								
WG2602281-2 LCS								
Manganese (Mn)-Dissolved			98.5		%		80-120	27-AUG-17
Molybdenum (Mo)-Dissolved			101.1		%		80-120	27-AUG-17
Nickel (Ni)-Dissolved			99.3		%		80-120	27-AUG-17
Phosphorus (P)-Dissolved			105.3		%		80-120	27-AUG-17
Potassium (K)-Dissolved			102.7		%		80-120	27-AUG-17
Rubidium (Rb)-Dissolved			99.7		%		80-120	27-AUG-17
Selenium (Se)-Dissolved			96.4		%		80-120	27-AUG-17
Silicon (Si)-Dissolved			113.2		%		60-140	27-AUG-17
Silver (Ag)-Dissolved			99.98		%		80-120	27-AUG-17
Sodium (Na)-Dissolved			96.3		%		80-120	27-AUG-17
Strontium (Sr)-Dissolved			103.2		%		80-120	27-AUG-17
Sulfur (S)-Dissolved			92.7		%		80-120	27-AUG-17
Tellurium (Te)-Dissolved			96.3		%		80-120	27-AUG-17
Thallium (Tl)-Dissolved			98.1		%		80-120	27-AUG-17
Thorium (Th)-Dissolved			97.1		%		80-120	27-AUG-17
Tin (Sn)-Dissolved			96.4		%		80-120	27-AUG-17
Titanium (Ti)-Dissolved			96.6		%		80-120	27-AUG-17
Tungsten (W)-Dissolved			102.2		%		80-120	27-AUG-17
Uranium (U)-Dissolved			100.8		%		80-120	27-AUG-17
Vanadium (V)-Dissolved			99.9		%		80-120	27-AUG-17
Zinc (Zn)-Dissolved			94.0		%		80-120	27-AUG-17
Zirconium (Zr)-Dissolved			101.1		%		80-120	27-AUG-17
WG2602281-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	27-AUG-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-AUG-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-AUG-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	27-AUG-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-AUG-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	27-AUG-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	27-AUG-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3812687								
WG2602281-1 MB								
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-AUG-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-AUG-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-AUG-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-AUG-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	27-AUG-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	27-AUG-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-AUG-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-AUG-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	27-AUG-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-AUG-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	27-AUG-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-AUG-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-AUG-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	27-AUG-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	27-AUG-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	27-AUG-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	27-AUG-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	27-AUG-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-AUG-17
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-AUG-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-AUG-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-AUG-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-AUG-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	27-AUG-17
WG2602281-5 MS		**WG2602281-3**						
Aluminum (Al)-Dissolved			90.1		%		70-130	27-AUG-17
Antimony (Sb)-Dissolved			91.0		%		70-130	27-AUG-17
Arsenic (As)-Dissolved			95.4		%		70-130	27-AUG-17
Barium (Ba)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Beryllium (Be)-Dissolved			89.3		%		70-130	27-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3812687								
WG2602281-5 MS		**WG2602281-3**						
Bismuth (Bi)-Dissolved			92.5		%		70-130	27-AUG-17
Boron (B)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Cadmium (Cd)-Dissolved			87.1		%		70-130	27-AUG-17
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Cesium (Cs)-Dissolved			93.0		%		70-130	27-AUG-17
Chromium (Cr)-Dissolved			95.3		%		70-130	27-AUG-17
Cobalt (Co)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Copper (Cu)-Dissolved			79.3		%		70-130	27-AUG-17
Iron (Fe)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Lead (Pb)-Dissolved			92.1		%		70-130	27-AUG-17
Lithium (Li)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Molybdenum (Mo)-Dissolved			94.5		%		70-130	27-AUG-17
Nickel (Ni)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Phosphorus (P)-Dissolved			102.9		%		70-130	27-AUG-17
Potassium (K)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Rubidium (Rb)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Selenium (Se)-Dissolved			88.0		%		70-130	27-AUG-17
Silicon (Si)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Silver (Ag)-Dissolved			94.9		%		70-130	27-AUG-17
Sodium (Na)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Sulfur (S)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Tellurium (Te)-Dissolved			91.5		%		70-130	27-AUG-17
Thallium (Tl)-Dissolved			91.6		%		70-130	27-AUG-17
Thorium (Th)-Dissolved			92.1		%		70-130	27-AUG-17
Tin (Sn)-Dissolved			92.8		%		70-130	27-AUG-17
Titanium (Ti)-Dissolved			95.2		%		70-130	27-AUG-17
Tungsten (W)-Dissolved			94.1		%		70-130	27-AUG-17
Uranium (U)-Dissolved			83.0		%		70-130	27-AUG-17
Vanadium (V)-Dissolved			97.1		%		70-130	27-AUG-17
Zirconium (Zr)-Dissolved			94.5		%		70-130	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3812689								
WG2602273-4 DUP		**WG2602273-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-AUG-17
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Barium (Ba)-Total		0.0271	0.0269		mg/L	0.5	20	27-AUG-17
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Boron (B)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-AUG-17
Cadmium (Cd)-Total		0.00038	0.00034		mg/L	12	20	27-AUG-17
Calcium (Ca)-Total		88.6	91.7		mg/L	3.5	20	27-AUG-17
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-AUG-17
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-AUG-17
Cobalt (Co)-Total		0.283	0.279		mg/L	1.2	20	27-AUG-17
Copper (Cu)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-AUG-17
Iron (Fe)-Total		7.10	6.79		mg/L	4.5	20	27-AUG-17
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Lithium (Li)-Total		0.024	0.026		mg/L	8.5	20	27-AUG-17
Magnesium (Mg)-Total		423	426		mg/L	0.8	20	27-AUG-17
Manganese (Mn)-Total		18.1	18.0		mg/L	0.3	20	27-AUG-17
Molybdenum (Mo)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Nickel (Ni)-Total		0.317	0.314		mg/L	1.2	20	27-AUG-17
Phosphorus (P)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	27-AUG-17
Potassium (K)-Total		3.45	3.47		mg/L	0.5	20	27-AUG-17
Rubidium (Rb)-Total		0.0061	0.0059		mg/L	4.7	20	27-AUG-17
Selenium (Se)-Total		0.00474	0.00470		mg/L	1.0	20	27-AUG-17
Silicon (Si)-Total		1.1	1.1		mg/L	1.9	20	27-AUG-17
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Sodium (Na)-Total		95.1	96.7		mg/L	1.7	20	27-AUG-17
Strontium (Sr)-Total		0.060	0.063		mg/L	3.9	20	27-AUG-17
Sulfur (S)-Total		762	725		mg/L	5.0	25	27-AUG-17
Thallium (Tl)-Total		0.00011	0.00011		mg/L	2.0	20	27-AUG-17
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	27-AUG-17
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	27-AUG-17
Tin (Sn)-Total		<0.0010	<0.0010		mg/L			27-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3812689								
WG2602273-4 DUP		**WG2602273-3**						
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-AUG-17
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-AUG-17
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-AUG-17
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	27-AUG-17
Zirconium (Zr)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-AUG-17
WG2602273-2 LCS								
Aluminum (Al)-Total			93.1		%		80-120	27-AUG-17
Antimony (Sb)-Total			94.3		%		80-120	27-AUG-17
Arsenic (As)-Total			87.7		%		80-120	27-AUG-17
Barium (Ba)-Total			93.9		%		80-120	27-AUG-17
Beryllium (Be)-Total			95.4		%		80-120	27-AUG-17
Bismuth (Bi)-Total			93.2		%		80-120	27-AUG-17
Boron (B)-Total			94.5		%		80-120	27-AUG-17
Cadmium (Cd)-Total			92.4		%		80-120	27-AUG-17
Calcium (Ca)-Total			98.3		%		80-120	27-AUG-17
Chromium (Cr)-Total			90.9		%		80-120	27-AUG-17
Cesium (Cs)-Total			97.1		%		80-120	27-AUG-17
Cobalt (Co)-Total			87.5		%		80-120	27-AUG-17
Copper (Cu)-Total			88.4		%		80-120	27-AUG-17
Iron (Fe)-Total			90.6		%		80-120	27-AUG-17
Lead (Pb)-Total			96.3		%		80-120	27-AUG-17
Lithium (Li)-Total			106.1		%		80-120	27-AUG-17
Magnesium (Mg)-Total			92.5		%		80-120	27-AUG-17
Manganese (Mn)-Total			92.1		%		80-120	27-AUG-17
Molybdenum (Mo)-Total			96.2		%		80-120	27-AUG-17
Nickel (Ni)-Total			89.5		%		80-120	27-AUG-17
Phosphorus (P)-Total			86.2		%		70-130	27-AUG-17
Potassium (K)-Total			96.4		%		80-120	27-AUG-17
Rubidium (Rb)-Total			92.1		%		80-120	27-AUG-17
Selenium (Se)-Total			88.5		%		80-120	27-AUG-17
Silicon (Si)-Total			102.0		%		60-140	27-AUG-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3812689								
WG2602273-2 LCS								
Silver (Ag)-Total			99.2		%		80-120	27-AUG-17
Sodium (Na)-Total			89.5		%		80-120	27-AUG-17
Strontium (Sr)-Total			101.7		%		80-120	27-AUG-17
Sulfur (S)-Total			95.2		%		70-130	27-AUG-17
Thallium (Tl)-Total			94.4		%		80-120	27-AUG-17
Tellurium (Te)-Total			90.5		%		80-120	27-AUG-17
Thorium (Th)-Total			92.2		%		70-130	27-AUG-17
Tin (Sn)-Total			93.5		%		80-120	27-AUG-17
Titanium (Ti)-Total			89.2		%		80-120	27-AUG-17
Tungsten (W)-Total			97.9		%		80-120	27-AUG-17
Uranium (U)-Total			95.6		%		80-120	27-AUG-17
Vanadium (V)-Total			91.8		%		80-120	27-AUG-17
Zinc (Zn)-Total			84.2		%		80-120	27-AUG-17
Zirconium (Zr)-Total			96.7		%		80-120	27-AUG-17
WG2602273-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	27-AUG-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Barium (Ba)-Total			<0.00020		mg/L		0.0002	27-AUG-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	27-AUG-17
Boron (B)-Total			<0.010		mg/L		0.01	27-AUG-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	27-AUG-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	27-AUG-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	27-AUG-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	27-AUG-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	27-AUG-17
Iron (Fe)-Total			<0.050		mg/L		0.05	27-AUG-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	27-AUG-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	27-AUG-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	27-AUG-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	27-AUG-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3812689								
WG2602273-1 MB								
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	27-AUG-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	27-AUG-17
Potassium (K)-Total			<0.050		mg/L		0.05	27-AUG-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	27-AUG-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	27-AUG-17
Silicon (Si)-Total			<0.10		mg/L		0.1	27-AUG-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	27-AUG-17
Sodium (Na)-Total			<0.50		mg/L		0.5	27-AUG-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	27-AUG-17
Sulfur (S)-Total			<0.50		mg/L		0.5	27-AUG-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	27-AUG-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	27-AUG-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	27-AUG-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	27-AUG-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	27-AUG-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	27-AUG-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	27-AUG-17
WG2602273-5 MS		**WG2602273-3**						
Aluminum (Al)-Total			101.5		%		70-130	27-AUG-17
Antimony (Sb)-Total			99.8		%		70-130	27-AUG-17
Arsenic (As)-Total			100.6		%		70-130	27-AUG-17
Barium (Ba)-Total			N/A	MS-B	%		-	27-AUG-17
Beryllium (Be)-Total			96.5		%		70-130	27-AUG-17
Bismuth (Bi)-Total			101.5		%		70-130	27-AUG-17
Boron (B)-Total			N/A	MS-B	%		-	27-AUG-17
Cadmium (Cd)-Total			101.4		%		70-130	27-AUG-17
Calcium (Ca)-Total			N/A	MS-B	%		-	27-AUG-17
Chromium (Cr)-Total			104.3		%		70-130	27-AUG-17
Cesium (Cs)-Total			102.3		%		70-130	27-AUG-17
Cobalt (Co)-Total			N/A	MS-B	%		-	27-AUG-17
Copper (Cu)-Total			101.2		%		70-130	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3812689								
WG2602273-5 MS		**WG2602273-3**						
Iron (Fe)-Total			N/A	MS-B	%		-	27-AUG-17
Lead (Pb)-Total			102.5		%		70-130	27-AUG-17
Lithium (Li)-Total			N/A	MS-B	%		-	27-AUG-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	27-AUG-17
Manganese (Mn)-Total			N/A	MS-B	%		-	27-AUG-17
Molybdenum (Mo)-Total			101.9		%		70-130	27-AUG-17
Nickel (Ni)-Total			N/A	MS-B	%		-	27-AUG-17
Phosphorus (P)-Total			90.5		%		70-130	27-AUG-17
Potassium (K)-Total			N/A	MS-B	%		-	27-AUG-17
Rubidium (Rb)-Total			N/A	MS-B	%		-	27-AUG-17
Selenium (Se)-Total			103.2		%		70-130	27-AUG-17
Silicon (Si)-Total			N/A	MS-B	%		-	27-AUG-17
Silver (Ag)-Total			102.1		%		70-130	27-AUG-17
Sodium (Na)-Total			N/A	MS-B	%		-	27-AUG-17
Strontium (Sr)-Total			N/A	MS-B	%		-	27-AUG-17
Sulfur (S)-Total			N/A	MS-B	%		-	27-AUG-17
Thallium (Tl)-Total			98.8		%		70-130	27-AUG-17
Tellurium (Te)-Total			110.7		%		70-130	27-AUG-17
Thorium (Th)-Total			98.3		%		70-130	27-AUG-17
Tin (Sn)-Total			101.1		%		70-130	27-AUG-17
Titanium (Ti)-Total			103.0		%		70-130	27-AUG-17
Tungsten (W)-Total			105.9		%		70-130	27-AUG-17
Uranium (U)-Total			103.4		%		70-130	27-AUG-17
Vanadium (V)-Total			106.8		%		70-130	27-AUG-17
Zinc (Zn)-Total			100.6		%		70-130	27-AUG-17
Zirconium (Zr)-Total			100.7		%		70-130	27-AUG-17
NH3-WT	**Water**							
Batch R3812741								
WG2602090-3 DUP		**L1980957-1**						
Ammonia, Total (as N)		1.67	1.67		mg/L	0.2	20	26-AUG-17
WG2602090-2 LCS								
Ammonia, Total (as N)			101.5		%		85-115	26-AUG-17
WG2602090-1 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	26-AUG-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-WT	**Water**							
Batch R3812741								
WG2602090-4 MS		**L1980957-1**						
Ammonia, Total (as N)			N/A	MS-B	%		-	26-AUG-17
NO3-IC-WT	**Water**							
Batch R3812607								
WG2601380-4 DUP		**WG2601380-3**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	26-AUG-17
WG2601380-2 LCS								
Nitrate (as N)			99.0		%		70-130	26-AUG-17
WG2601380-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	26-AUG-17
WG2601380-5 MS		**WG2601380-3**						
Nitrate (as N)			91.7		%		70-130	26-AUG-17
P-T-COL-WT	**Water**							
Batch R3812722								
WG2602402-3 DUP		**L1980963-3**						
Phosphorus, Total		0.0053	0.0038	J	mg/L	0.0015	0.006	27-AUG-17
WG2602402-2 LCS								
Phosphorus, Total			100.9		%		80-120	27-AUG-17
WG2602402-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	27-AUG-17
WG2602402-4 MS		**L1980963-3**						
Phosphorus, Total			88.8		%		70-130	27-AUG-17
PH-WT	**Water**							
Batch R3812483								
WG2602163-2 DUP		**L1980957-1**						
pH		6.99	7.04	J	pH units	0.05	0.2	26-AUG-17
WG2602163-1 LCS								
pH			6.98		pH units		6.9-7.1	26-AUG-17
SO4-IC-N-WT	**Water**							
Batch R3812607								
WG2601380-4 DUP		**WG2601380-3**						
Sulfate (SO4)		795	761		mg/L	4.4	20	26-AUG-17
WG2601380-2 LCS								
Sulfate (SO4)			101.3		%		90-110	26-AUG-17
WG2601380-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	26-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT	**Water**							
Batch R3812607								
WG2601380-5 MS		**WG2601380-3**						
Sulfate (SO4)			N/A	MS-B	%		-	26-AUG-17
SOLIDS-TDS-WT	**Water**							
Batch R3812645								
WG2602099-3 DUP		**L1980957-1**						
Total Dissolved Solids		3140	3100		mg/L	1.4	20	26-AUG-17
WG2602099-2 LCS								
Total Dissolved Solids			100.0		%		85-115	26-AUG-17
WG2602099-1 MB								
Total Dissolved Solids			<10		mg/L		10	26-AUG-17
SOLIDS-TSS-WT	**Water**							
Batch R3812721								
WG2602098-3 DUP		**L1980957-1**						
Total Suspended Solids		13.3	13.6		mg/L	2.2	20	27-AUG-17
WG2602098-2 LCS								
Total Suspended Solids			98.9		%		85-115	27-AUG-17
WG2602098-1 MB								
Total Suspended Solids			<2.0		mg/L		2	27-AUG-17
TKN-WT	**Water**							
Batch R3812661								
WG2602337-3 DUP		**L1980957-1**						
Total Kjeldahl Nitrogen		2.08	2.07		mg/L	0.3	20	27-AUG-17
WG2602337-2 LCS								
Total Kjeldahl Nitrogen			100.5		%		75-125	27-AUG-17
WG2602337-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	27-AUG-17
WG2602337-4 MS		**L1980957-1**						
Total Kjeldahl Nitrogen			93.5		%		70-130	27-AUG-17
TOC-WT	**Water**							
Batch R3812643								
WG2602307-3 DUP		**L1980957-1**						
Total Organic Carbon		1.5	1.7		mg/L	9.6	20	27-AUG-17
WG2602307-2 LCS								
Total Organic Carbon			99.6		%		80-120	27-AUG-17
WG2602307-1 MB								
Total Organic Carbon			<1.0		mg/L		1	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TOC-WT	**Water**							
Batch R3812643								
WG2602307-4 MS		**L1980957-1**						
Total Organic Carbon			102.8		%		70-130	27-AUG-17

Quality Control Report

Workorder: L1980963 Report Date: 14-SEP-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Wednesday, September 13, 2017

Rick Hawthorne
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1708618
Project Name:
Project Number: L1980963

Dear Mr. Hawthorne:

Four water samples were received from ALS Environmental, on 8/30/2017. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1708618

Radium-226:
The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1708618
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1980963
Client PO Number: L1980963

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1980963-1	1708618-1		WATER	24-Aug-17	
L1980963-2	1708618-2		WATER	24-Aug-17	
L1980963-3	1708618-3		WATER	24-Aug-17	
L1980963-4	1708618-4		WATER	24-Aug-17	

ALS Environmental

L1980963

1708618 WATERLOO

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# *L1980963*
ALS requires QC data to be provided with your final results.

Please see enclosed 4 **sample(s) in** 4 **Container(s)**

SAMPLE NUMBER / ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
1 **L1980963-1 MRTF-1**	8/ 24/ 2017	E2
Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/13/2017	
2 **L1980963-2 MS-08-US**	8/ 24/ 2017	E2
Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/13/2017	
3 **L1980963-3 MS-08-DS**	8/ 24/ 2017	E2
Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/13/2017	
4 **L1980963-4 MS-08-GEOTUBE**	8/ 24/ 2017	E2
Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/13/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910
Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______ Date Shipped: ______
Received By: [signature] Date Received: 8/30/17 930
Verified By: ______ Date Verified: ______
Temperature: ______

Sample Integrity Issues: ______

Saturday, August 26, 2017 11:59 AM

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS Canada Workorder No: 1708618

Project Manager: SS Initials: JE Date: 8/30/17

			YES	NO
1.	Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2.	Are custody seals on shipping containers intact?	NONE	YES	NO
3.	Are Custody seals on sample containers intact?	NONE	YES	NO
4.	Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5.	Are the COC and bottle labels complete and legible?		YES	NO
6.	Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7.	Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8.	Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO
9.	Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10.	Is there sufficient sample for the requested analyses?		YES	NO
11.	Were all samples placed in the proper containers for the requested analyses?		YES	NO
12.	Are all samples within holding times for the requested analyses?		YES	NO
13.	Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ___ < green pea ___ > green pea	N/A	YES	NO
15.	Do any water samples contain sediment? Amount Amount of sediment: ___ dusting ___ moderate ___ heavy	N/A	YES	NO
16.	Were the samples shipped on ice?		YES	NO
17.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	NO

Cooler #:	~~Amb~~ 1
Temperature (°C):	Amb
No. of custody seals on cooler:	0
External μR/hr reading:	9
Background μR/hr reading:	11

DOT Survey/ Acceptance Information

Were external μR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

All ice melted

If applicable, was the client contacted? YES / NO / NA Contact: ______ Date/Time: ______

Project Manager Signature / Date: ______

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

ORIGIN ID:YKFA (519) 886-6910
EDWARD HILL
ALS ENVIRONMENTAL
60 NORTHLAND RD

WATERLOO, ON N2V2B8
CANADA CA

SHIP DATE: 28AUG17
ACTWGT: 15.00 KG
CAD: 110459604/INET3920
DIMS: 38x30x36 CM

BILL SENDER

TO SAMPLE LOGIN
ALS ENVIRONMENTAL FORT COLLINS
225 COMMERCE DRIVE

FORT COLLINS CO 80524 (US)
(800) 443-1511 REF:
INV:
PO: DEPT:

a-D

FedEx
Express
E

J172017082902uv

10:30A
INTL PRIORITY

TRK# 0430 7701 2703 2099

XH FTCA

80524
CO-US DEN

549J1/FF19/104C

Client:	ALS Environmental	**Date:**	*13-Sep-17*
Project:	L1980963	**Work Order:**	1708618
Sample ID:	L1980963-1	**Lab ID:**	1708618-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/24/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **8/31/2017**	PrepBy: **HCJ**
Ra-226	0.0039 (+/- 0.0053)	U	0.0085	BQ/l	NA	9/12/2017 11:38
Carr: BARIUM	*93.3*		*40-110*	*%REC*	DL = NA	9/12/2017 11:38

Client:	ALS Environmental	**Date:**	*13-Sep-17*
Project:	L1980963	**Work Order:**	1708618
Sample ID:	L1980963-2	**Lab ID:**	1708618-2
Legal Location:		**Matrix:**	WATER
Collection Date:	8/24/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**		Prep Date: **8/31/2017**		PrepBy: **HCJ**
Ra-226	0.0069 (+/- 0.0057)	U	0.008	BQ/l	NA	9/12/2017 11:38
Carr: BARIUM	*95.7*		*40-110*	*%REC*	DL = NA	9/12/2017 11:38

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*13-Sep-17*
Project:	L1980963	**Work Order:**	1708618
Sample ID:	L1980963-3	**Lab ID:**	1708618-3
Legal Location:		**Matrix:**	WATER
Collection Date:	8/24/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **8/31/2017**	PrepBy: **HCJ**
Ra-226	0.0082 (+/- 0.0071)	U,M	0.01	BQ/l	NA	9/12/2017 11:38
Carr: BARIUM	*92.2*		*40-110*	*%REC*	DL = NA	9/12/2017 11:38

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*13-Sep-17*
Project:	L1980963	**Work Order:**	1708618
Sample ID:	L1980963-4	**Lab ID:**	1708618-4
Legal Location:		**Matrix:**	WATER
Collection Date:	8/24/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **8/31/2017**	PrepBy: **HCJ**
Ra-226	**0.041 (+/- 0.014)**		**0.0077**	**BQ/l**	NA	9/12/2017 11:38
Carr: BARIUM	*98.6*		*40-110*	*%REC*	DL = NA	9/12/2017 11:38

Client:	ALS Environmental	**Date:**	*13-Sep-17*
Project:	L1980963	**Work Order:**	1708618
Sample ID:	L1980963-4	**Lab ID:**	1708618-4
Legal Location:		**Matrix:**	WATER
Collection Date:	8/24/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Date: *9/13/2017 9:09:*

Client: ALS Environmental
Work Order: 1708618
Project: L1980963

QC BATCH REPORT

Batch ID: **RE170831-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170831-1** Units: **BQ/l** Analysis Date: **9/12/2017 12:10**
Client ID: Run ID: **RE170831-1A** Prep Date: **8/31/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.80 (+/- 0.446)	0.00802	1.715		105	67-120					P
Carr: BARIUM	15300		16180		94.4	40-110					

LCSD Sample ID: **RE170831-1** Units: **BQ/l** Analysis Date: **9/12/2017 12:10**
Client ID: Run ID: **RE170831-1A** Prep Date: **8/31/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.67 (+/- 0.412)	0.0104	1.715		97.2	67-120		1.8	0.2	2.1	P,M3
Carr: BARIUM	15700		16190		96.7	40-110		15300			

MB Sample ID: **RE170831-1** Units: **BQ/l** Analysis Date: **9/12/2017 12:10**
Client ID: Run ID: **RE170831-1A** Prep Date: **8/31/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.00055 (+/- 0.0045)	0.0087									U
Carr: BARIUM	14900		16190		92.1	40-110					

The following samples were analyzed in this batch:

1708618-1	1708618-2	1708618-3
1708618-4		

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Daphnia magna

Work Order : 234212
Sample Number : 52039

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	LM/MK/CD
Location :	Waterloo ON	Time Collected :	18:25
Job Number :	L1980963	Date Collected :	2017-08-24
Substance :	L1980963-1 MRTF-1	Date Received :	2017-08-25
Sampling Method :	Grab	Date Tested :	2017-08-25
Sample Description :	Clear, colourless, odourless.	Temp. on arrival :	15.0° C

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	Dm17-19		
Date Tested (yyyy/mm/dd) :	2017-08-15	Historical Mean LC50 :	5.8 g/L
LC50 (95% Confidence Limits) :	6.0 g/L (5.7 - 6.3)	Warning Limits (± 2SD) :	5.1 - 6.5 g/L
Statistical Method :	Spearman-Kärber	Analyst(s) :	SV, MA

Daphnia magna CULTURE HEALTH DATA

Time to First Brood :	7.4 days	Mean Young Per Brood :	28.4
Culture Mortality :	1.5% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Test Organisms / Replicate :	10
Test Aeration :	None	Total Organisms / Test Level :	30
Organism Batch :	Dm17-19	Organism Loading Rate :	15.0 mL/organism
		Test Method Deviation(s) :	None

Date: 2017-08-30
yyyy-mm-dd

Approved by:
Project Manager

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

Work Order: 234212
Sample Number: 52039

	Hardness (mg/L as $CaCO_3$)	Hardness Adjustment	pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*	Total Pre-Aeration Time (h) @ 30 mL/min/L
Initial Water Chemistry:	200	None	8.4	10.1	195	20.0	114	0:30

0 hours

Date & Time 2017-08-25 14:05
Technician: AW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*	Hardness
100A	0	0	8.3	9.1	192	20.0	103	200
100B	0	0	8.3	9.1	192	20.0	103	200
100C	0	0	8.3	9.1	192	20.0	103	200
Control A	0	0	8.4	8.7	555	20.0	100	210
Control B	0	0	8.4	8.7	555	20.0	100	210
Control C	0	0	8.4	8.7	555	20.0	100	210

Notes:

24 hours

Date & Time 2017-08-26 14:05
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	–	0	–	–	–	20.5
100B	–	0	–	–	–	20.5
100C	–	0	–	–	–	20.5
Control A	–	0	–	–	–	20.5
Control B	–	0	–	–	–	20.5
Control C	–	0	–	–	–	20.5

Notes:

48 hours

Date & Time 2017-08-27 14:05
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	0	0	8.5	8.7	200	20.5
100B	0	0	8.5	8.7	199	20.5
100C	0	0	8.5	8.6	204	20.5
Control A	0	0	8.5	8.7	564	20.5
Control B	0	0	8.5	8.7	563	20.5
Control C	0	0	8.5	8.5	569	20.5

Notes:

Control organisms showing stress: 0
Organism Batch : Dm17-19

Number immobile does not include number of mortalities.

– = not measured/not required

* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: DK
Date: 2017-08-28

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 234212
Sample Number : 52039

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	LM/MK/CD
Location :	Waterloo ON	Time Collected :	18:25
Job Number :	L1980963	Date Collected :	2017-08-24
Substance :	L1980963-1 MRTF-1	Date Received :	2017-08-25
Sampling Method :	Grab	Date Tested :	2017-08-25
Sample Description :	Clear, colourless, odourless.	Temp. on arrival :	15.0°C

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T17-13		
Date Tested (yyyy-mm-dd) :	2017-08-18	Historical Mean LC50 :	3709 mg/L
LC50 (95% Confidence Limits) :	3762 mg/L (3474 - 4074)	Warning Limits (± 2SD) :	3119 - 4411 mg/L
Statistical Method :	Spearman-Kärber	Analyst(s) :	NL, FS, EZ

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0.5 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.44 ± 0.22 g	Mean Fish Fork Length (± 2 SD) :	36.5 ± 5.2 mm
Range of Weights :	0.33 - 0.63 g	Range of Fork Lengths (mm) :	34 - 42 mm
Fish Loading Rate :	0.3 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	17
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2017-08-30
yyyy-mm-dd

Approved by:
Project Manager

Work Order: 234212
Sample Number: 52039

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
2:00	Initial Water Chemistry:	8.1	10.2	190	15.0	-
	Chemistry after 30min air:	8.2	10.0	191	15.0	103

0 hours

Date & Time 2017-08-25 15:15
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	8.1	9.9	191	14.5	102
Control	0	0	8.3	9.4	809	15.0	98

Notes:

24 hours

Date & Time 2017-08-26 15:15
Technician: TL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time 2017-08-27 15:15
Technician: TL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.5
Control	0	0		–	–	14.5

Notes:

72 hours

Date & Time 2017-08-28 15:15
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0		–	–	14.5
Control	0	0		–	–	14.5

Notes:

96 hours

Date & Time 2017-08-29 15:15
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	8.0	9.3	199	14.5
Control	0	0	8.3	9.2	798	14.5

Notes:

Control organisms showing stress: 0
Organism Batch : T17-13

"- " = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2017-08-30

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
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TOXICITY TEST REPORT

Daphnia magna

Work Order :	234212
Sample Number :	52040

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	LM/MK/CD
Location :	Waterloo ON	Time Collected :	19:10
Job Number :	L1980963	Date Collected :	2017-08-24
Substance :	L1980963-3 MS-08-DS	Date Received :	2017-08-25
Sampling Method :	Grab	Date Tested :	2017-08-25
Sample Description :	Clear, colourless, odourless.	Temp. on arrival :	15.0° C

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	Dm17-19		
Date Tested (yyyy/mm/dd) :	2017-08-15	Historical Mean LC50 :	5.8 g/L
LC50 (95% Confidence Limits) :	6.0 g/L (5.7 - 6.3)	Warning Limits (± 2SD) :	5.1 - 6.5 g/L
Statistical Method :	Spearman-Kärber	Analyst(s) :	SV, MA

Daphnia magna CULTURE HEALTH DATA

Time to First Brood :	7.4 days	Mean Young Per Brood :	28.4
Culture Mortality :	1.5% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Test Organisms / Replicate :	10
Test Aeration :	None	Total Organisms / Test Level :	30
Organism Batch :	Dm17-19	Organism Loading Rate :	15.0 mL/organism
		Test Method Deviation(s) :	None

Date: 2017-08-30
yyyy-mm-dd

Approved by:
Project Manager

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

Work Order: 234212
Sample Number: 52040

	Hardness (mg/L as $CaCO_3$)	Hardness Adjustment	pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*	Total Pre-Aeration Time (h) @ 30 mL/min/L
Initial Water Chemistry:	90	None	8.2	10.1	140	20.0	114	0:30

0 hours

Date & Time 2017-08-25 14:15
Technician: AW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*	Hardness
100A	0	0	8.2	9.5	136	20.0	107	90
100B	0	0	8.2	9.5	136	20.0	107	90
100C	0	0	8.2	9.5	136	20.0	107	90
Control A	0	0	8.4	8.7	555	20.0	100	210
Control B	0	0	8.4	8.7	555	20.0	100	210
Control C	0	0	8.4	8.7	555	20.0	100	210

Notes:

24 hours

Date & Time 2017-08-26 14:15
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	–	0	–	–	–	20.5
100B	–	0	–	–	–	20.5
100C	–	0	–	–	–	20.5
Control A	–	0	–	–	–	20.5
Control B	–	0	–	–	–	20.5
Control C	–	0	–	–	–	20.5

Notes:

48 hours

Date & Time 2017-08-27 14:15
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	0	0	8.3	8.7	148	20.5
100B	0	0	8.3	8.7	156	20.5
100C	0	0	8.4	8.6	165	20.5
Control A	0	0	8.5	8.6	563	20.5
Control B	0	0	8.5	8.6	563	20.5
Control C	0	0	8.5	8.6	568	20.5

Notes:

Control organisms showing stress: 0
Organism Batch : Dm17-19

Number immobile does not include number of mortalities.

– = not measured/not required

* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: DK
Date: 2017-08-28

AquaTox Testing & Consulting Inc.
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Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 234212
Sample Number : 52040

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	LM/MK/CD
Location :	Waterloo ON	Time Collected :	19:10
Job Number :	L1980963	Date Collected :	2017-08-24
Substance :	L1980963-3 MS-08-DS	Date Received :	2017-08-25
Sampling Method :	Grab	Date Tested :	2017-08-25
Sample Description :	Clear, colourless, odourless.	Temp. on arrival :	15.0°C

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T17-13		
Date Tested (yyyy-mm-dd) :	2017-08-18	Historical Mean LC50 :	3709 mg/L
LC50 (95% Confidence Limits) :	3762 mg/L (3474 - 4074)	Warning Limits (± 2SD) :	3119 - 4411 mg/L
Statistical Method :	Spearman-Kärber	Analyst(s) :	NL, FS, EZ

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0.5 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.46 ± 0.23 g	Mean Fish Fork Length (± 2 SD) :	37.1 ± 5.8 mm
Range of Weights :	0.35 - 0.73 g	Range of Fork Lengths (mm) :	34 - 44 mm
Fish Loading Rate :	0.2 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	20
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2017-08-30
yyyy-mm-dd

Approved by: [signature]
Project Manager

AQUATOX

TOXICITY TEST REPORT
Rainbow Trout

Work Order: 234212
Sample Number: 52040

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (μmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
2:00	**Initial Water Chemistry:**	8.0	10.4	135	15.0	
	Chemistry after 30min air:	8.1	10.2	135	15.0	104

0 hours

Date & Time 2017-08-25 15:20
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	8.0	9.9	135	15.0	102
Control	0	0	8.3	9.4	809	15.0	98

Notes:

24 hours

Date & Time 2017-08-26 15:20
Technician: TL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–			14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time 2017-08-27 15:20
Technician: TL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.5
Control	0	0		–	–	14.5

Notes:

72 hours

Date & Time 2017-08-28 15:20
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.5
Control	0	0		–	–	14.5

Notes:

96 hours

Date & Time 2017-08-29 15:20
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	7.8	9.5	141	14.5
Control	0	0	8.3	9.5	802	14.5

Notes:

Control organisms showing stress: 0
Organism Batch : T17-13

"–" = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2017-08-30

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Daphnia magna

Work Order : 234212
Sample Number : 52041

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	LM/MK/CD
Location :	Waterloo ON	Time Collected :	18:00
Job Number :	L1980963	Date Collected :	2017-08-24
Substance :	L1980963-4 MS-08-Geotube	Date Received :	2017-08-25
Sampling Method :	Grab	Date Tested :	2017-08-25
Sample Description :	Cloudy, pale orange, mild odour.	Temp. on arrival :	15.0° C

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	6.7 %

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	Dm17-19		
Date Tested (yyyy/mm/dd) :	2017-08-15	Historical Mean LC50 :	5.8 g/L
LC50 (95% Confidence Limits) :	6.0 g/L (5.7 - 6.3)	Warning Limits (± 2SD) :	5.1 - 6.5 g/L
Statistical Method :	Spearman-Kärber	Analyst(s) :	SV, MA

Daphnia magna CULTURE HEALTH DATA

Time to First Brood :	7.4 days	Mean Young Per Brood :	28.4
Culture Mortality :	1.5% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Test Organisms / Replicate :	10
Test Aeration :	None	Total Organisms / Test Level :	30
Organism Batch :	Dm17-19	Organism Loading Rate :	15.0 mL/organism
		Test Method Deviation(s) :	None

Date: 2017-08-30
yyyy-mm-dd

Approved by:
Project Manager

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

Work Order: 234212
Sample Number: 52041

	Hardness (mg/L as $CaCO_3$)	Hardness Adjustment	pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*	Total Pre-Aeration Time (h) @ 30 mL/min/L
Initial Water Chemistry:	110	None	7.2	9.1	3160	20.0	105	0:30

0 hours

Date & Time 2017-08-25 14:30
Technician: AW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*	Hardness
100A	0	0	7.4	8.8	3160	20.0	101	110
100B	0	0	7.4	8.8	3160	20.0	101	110
100C	0	0	7.4	8.8	3160	20.0	101	110
Control A	0	0	8.4	8.7	555	20.0	100	210
Control B	0	0	8.4	8.7	555	20.0	100	210
Control C	0	0	8.4	8.7	555	20.0	100	210

Notes:

24 hours

Date & Time 2017-08-26 14:30
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	–	0	–	–	–	20.5
100B	–	0	–	–	–	20.5
100C	–	0	–	–	–	20.5
Control A	–	0	–	–	–	20.5
Control B	–	0	–	–	–	20.5
Control C	–	0	–	–	–	20.5

Notes:

48 hours

Date & Time 2017-08-27 14:30
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	2	0	8.1	8.5	3180	20.5
100B	0	0	8.1	8.6	3170	20.5
100C	0	0	8.1	8.6	3160	20.5
Control A	0	0	8.5	8.6	585	20.5
Control B	0	0	8.5	8.6	581	20.5
Control C	0	0	8.5	8.7	582	20.5

Notes: Dead test organisms in the 100% concentration are covered in solids (JL).

Control organisms showing stress: 0
Organism Batch : Dm17-19

Number immobile does not include number of mortalities.

– = not measured/not required

* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: DK
Date: 2017-08-28

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 234212
Sample Number : 52041

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	LM/MK/CD
Location :	Waterloo ON	Time Collected :	18:00
Job Number :	L1980963	Date Collected :	2017-08-24
Substance :	L1980963-4 MS-08-Geotube	Date Received :	2017-08-25
Sampling Method :	Grab	Date Tested :	2017-08-25
Sample Description :	Cloudy, pale orange, mild odour.	Temp. on arrival :	15.0°C

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T17-13		
Date Tested (yyyy-mm-dd) :	2017-08-18	Historical Mean LC50 :	3709 mg/L
LC50 (95% Confidence Limits) :	3762 mg/L (3474 - 4074)	Warning Limits (± 2SD) :	3119 - 4411 mg/L
Statistical Method :	Spearman-Kärber	Analyst(s) :	NL, FS, EZ

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0.5 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.44 ± 0.14 g	Mean Fish Fork Length (± 2 SD) :	38.0 ± 4.2 mm
Range of Weights :	0.31 - 0.54 g	Range of Fork Lengths (mm) :	34 - 40 mm
Fish Loading Rate :	0.2 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	18
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2017-08-30
yyyy-mm-dd

Approved by: [signature]
Project Manager

Work Order: 234212
Sample Number: 52041

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	Initial Water Chemistry:	6.8	9.3	3209	14.0	–
	Chemistry after 30min air:	7.0	9.5	3201	14.5	98

0 hours

Date & Time 2017-08-25 13:50
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	7.0	9.5	3201	14.5	98
Control	0	0	8.3	9.4	809	15.0	98

Notes:

24 hours

Date & Time 2017-08-26 13:50
Technician: TL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–		14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time 2017-08-27 13:50
Technician: TL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.5
Control	0	0	–		–	14.5

Notes:

72 hours

Date & Time 2017-08-28 13:50
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	·	–	–	14.5
Control	0	0	–		–	14.5

Notes:

96 hours

Date & Time 2017-08-29 13:50
Technician: EZ (NL)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	7.7	9.0	3201	15.0
Control	0	0	8.3	9.4	805	15.0

Notes:

Control organisms showing stress: 0
Organism Batch : T17-13

" " = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2017-08-30

/

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 234212

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 Fax: (519) 763-4419

P.O. Number:	4500017476
Field Sampler Name (print):	LM/MK/CD
Signature:	
Affiliation:	ALS ENV
Sample Storage (prior to shipping):	
Custody Relinquished by:	RH /CD
Date/Time Shipped:	25 Aug 17

Client:	ALS Environmental Waterloo Q# 162705399-15
Phone:	519-886-6910
Fax:	519-886-9047
Contact:	Wayne Smith / Rick Hawthorne

Sample Identification					Analyses Requested										Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name L1980963-1 " -3 " -4	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2017-08-24	1825	MRTF-1	52039	15.0	X		X									Pail
"	1910	MS-08-DS	52040	15.0	X		X									"
"	1800	MS-08-Geotube	52041	15.0	X		X									"
														→ "GRAB" as per label		
																RD

For Lab Use Only

Received By:	TL/RD
Date:	2017-08-25
Time:	12:15
Storage Location:	
Storage Temp.(°C)	

CD

Please list any special requests or instructions:

~~Regular~~ Baffinland Toxicity Tests
Rush Acute Tox for RBT, Daphnia w/ weekend updates

ALS Environmental

L1980963

WATERLOO

Subcontract Request Form

Subcontract To:

AQUATOX TESTING AND CONSULTING
11B NICHOLAS BEAVER ROAD
RR3
GUELPH,ON N1H 6H9

NOTES:	Please reference on final report and invoice: PO# *L1980963* ALS requires QC data to be provided with your final results.

Please see enclosed 3 **sample(s) in** 0 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1980963-1 MRTF-1		**8/ 24/ 2017**	**E**
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	8/31/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	8/31/2017	
L1980963-3 MS-08-DS		**8/ 24/ 2017**	**E**
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	8/31/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	8/31/2017	
L1980963-4 MS-08-GEOTUBE		**8/ 24/ 2017**	**E**
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	8/31/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	8/31/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______________________ Date Shipped: ______________________

Received By: ______________________ Date Received: ______________________

Verified By: ______________________ Date Verified: ______________________

Temperature: ______________________

Sample Integrity Issues: ______________________

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1980963-COFC

COC Number: 15 -

Report To — Contact and company name below will appear on the final report

Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	647-253-0596 EXT 6010

Company address below will appear on the final report

Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3

Invoice To

Same as Report To	☑ YES ☐ NO
Copy of Invoice with Report	☐ YES ☑ NO
Company:	
Contact:	

Project Information

ALS Account # / Quote #:	23642 /Q42455
Job #:	MS-08
PO / AFE:	4500027854
LSD:	
ALS Lab Work Order # (lab use only)	L1980963 AH

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	bimcore@alsglobal.com
Email 2	bimww@alsglobal.com
Email 3	

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	ap@baffinland.com
Email 2	commercial@baffinland.com

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler: LM/MK/CD

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4]	☐	1 Business day [E1]	☐
3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☑
2 day [P2]	☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	BIM-MMER-WT	Group 3	Number of Containers
1	MRTF-1	24-Aug-17	16:25	Water	E0	E0	10
2	MS-08-US	24-Aug-17	18:50	Water	E0		9
3	MS-08-DS	24-Aug-17	19:10	Water	E0	E0	10
4	MS-08-GEOTUBE	24-Aug-17	18:00	Water	E0	E0	10

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C | FINAL COOLER TEMPERATURES °C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ben Widdowson	Date: 17 08 25	Time: 6:11	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 25-AUG-17
Report Date: 21-SEP-17 14:07 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1980957
Project P.O. #: 4500027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980957-1 MS-08 Sampled By: SS/DS on 24-AUG-17 @ 16:45 Matrix: WATER							
Physical Tests							
Conductivity	3330		3.0	umhos/cm		26-AUG-17	R3812484
Hardness (as CaCO3)	1990		10	mg/L		27-AUG-17	
pH	6.99		0.10	pH units		26-AUG-17	R3812483
Total Suspended Solids	13.3		2.0	mg/L	26-AUG-17	27-AUG-17	R3812721
Total Dissolved Solids	3140		20	mg/L		26-AUG-17	R3812645
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	82		10	mg/L		26-AUG-17	R3812543
Ammonia, Total (as N)	1.67	DLHC	0.20	mg/L		26-AUG-17	R3812741
Chloride (Cl)	9.1	DLDS	5.0	mg/L		26-AUG-17	R3812607
Fluoride (F)	<0.20	DLDS	0.20	mg/L		26-AUG-17	R3812607
Nitrate (as N)	7.98	DLDS	0.20	mg/L		26-AUG-17	R3812607
Total Kjeldahl Nitrogen	2.08		0.15	mg/L	26-AUG-17	27-AUG-17	R3812661
Phosphorus, Total	<0.0030		0.0030	mg/L	27-AUG-17	27-AUG-17	R3812722
Sulfate (SO4)	2040	DLDS	3.0	mg/L		26-AUG-17	R3812607
Cyanides							
Cyanide, Total	<0.20	DLM	0.20	mg/L		28-AUG-17	R3813435
Organic / Inorganic Carbon							
Dissolved Organic Carbon	1.4		1.0	mg/L		26-AUG-17	R3812641
Total Organic Carbon	1.5		1.0	mg/L		27-AUG-17	R3812643
Inorganic Parameters							
Acidity (as CaCO3)	14.0		2.0	mg/L		26-AUG-17	R3812508
Total Metals							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	27-AUG-17	27-AUG-17	R3812689
Antimony (Sb)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Arsenic (As)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Barium (Ba)-Total	0.0271	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812689
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Boron (B)-Total	<0.10	DLHC	0.10	mg/L	27-AUG-17	27-AUG-17	R3812689
Cadmium (Cd)-Total	0.00038	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Calcium (Ca)-Total	88.6	DLHC	5.0	mg/L	27-AUG-17	27-AUG-17	R3812689
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Cobalt (Co)-Total	0.283	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Copper (Cu)-Total	<0.010	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812689
Iron (Fe)-Total	7.10	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Lithium (Li)-Total	0.024	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812689
Magnesium (Mg)-Total	423	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Manganese (Mn)-Total	18.1	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Mercury (Hg)-Total	<0.000010		0.000010	mg/L		27-AUG-17	R3812736
Molybdenum (Mo)-Total	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980957-1 MS-08 Sampled By: SS/DS on 24-AUG-17 @ 16:45 Matrix: WATER							
Total Metals							
Nickel (Ni)-Total	0.317	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Potassium (K)-Total	3.45	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812689
Rubidium (Rb)-Total	0.0061	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812689
Selenium (Se)-Total	0.00474	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Silicon (Si)-Total	1.1	DLHC	1.0	mg/L	27-AUG-17	27-AUG-17	R3812689
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812689
Sodium (Na)-Total	95.1	DLHC	5.0	mg/L	27-AUG-17	27-AUG-17	R3812689
Strontium (Sr)-Total	0.060	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812689
Sulfur (S)-Total	762	DLHC	5.0	mg/L	27-AUG-17	27-AUG-17	R3812689
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812689
Thallium (Tl)-Total	0.00011	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	27-AUG-17	27-AUG-17	R3812689
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812689
Uranium (U)-Total	<0.00010	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812689
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812689
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	27-AUG-17	27-AUG-17	R3812689
Zirconium (Zr)-Total	<0.0030	DLHC	0.0030	mg/L	27-AUG-17	27-AUG-17	R3812689
Dissolved Metals							
Dissolved Mercury Filtration Location	FIELD					27-AUG-17	R3812684
Dissolved Metals Filtration Location	FIELD					27-AUG-17	R3812617
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	27-AUG-17	27-AUG-17	R3812687
Antimony (Sb)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Arsenic (As)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Barium (Ba)-Dissolved	0.0264	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Boron (B)-Dissolved	<0.10	DLHC	0.10	mg/L	27-AUG-17	27-AUG-17	R3812687
Cadmium (Cd)-Dissolved	0.00032	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Calcium (Ca)-Dissolved	89.9	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687
Cobalt (Co)-Dissolved	0.270	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Copper (Cu)-Dissolved	<0.0020	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812687
Iron (Fe)-Dissolved	2.79	DLHC	0.10	mg/L	27-AUG-17	27-AUG-17	R3812687
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Lithium (Li)-Dissolved	0.025	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Magnesium (Mg)-Dissolved	429	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Manganese (Mn)-Dissolved	17.9	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1980957-1 MS-08							
Sampled By: SS/DS on 24-AUG-17 @ 16:45							
Matrix: WATER							
Dissolved Metals							
Mercury (Hg)-Dissolved	<0.000010		0.000010	mg/L	27-AUG-17	27-AUG-17	R3812737
Molybdenum (Mo)-Dissolved	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Nickel (Ni)-Dissolved	0.301	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Potassium (K)-Dissolved	3.47	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Rubidium (Rb)-Dissolved	0.0064	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812687
Selenium (Se)-Dissolved	0.00475	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Silicon (Si)-Dissolved	1.01	DLHC	0.50	mg/L	27-AUG-17	27-AUG-17	R3812687
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	27-AUG-17	27-AUG-17	R3812687
Sodium (Na)-Dissolved	95.3	DLHC	5.0	mg/L	27-AUG-17	27-AUG-17	R3812687
Strontium (Sr)-Dissolved	0.061	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Sulfur (S)-Dissolved	729	DLHC	5.0	mg/L	27-AUG-17	27-AUG-17	R3812687
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	27-AUG-17	27-AUG-17	R3812687
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	27-AUG-17	27-AUG-17	R3812687
Tungsten (W)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-AUG-17	27-AUG-17	R3812687
Uranium (U)-Dissolved	<0.00010	DLHC	0.00010	mg/L	27-AUG-17	27-AUG-17	R3812687
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	27-AUG-17	27-AUG-17	R3812687
Zinc (Zn)-Dissolved	0.016	DLHC	0.010	mg/L	27-AUG-17	27-AUG-17	R3812687
Zirconium (Zr)-Dissolved	<0.0030	DLHC	0.0030	mg/L	27-AUG-17	27-AUG-17	R3812687
Radiological Parameters							
Ra-226	0.030		0.0083	Bq/L	31-AUG-17	12-SEP-17	R3828449

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1980957-1
Matrix Spike	Boron (B)-Dissolved	MS-B	L1980957-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1980957-1
Matrix Spike	Cobalt (Co)-Dissolved	MS-B	L1980957-1
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1980957-1
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L1980957-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1980957-1
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1980957-1
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L1980957-1
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1980957-1
Matrix Spike	Rubidium (Rb)-Dissolved	MS-B	L1980957-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1980957-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1980957-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1980957-1
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1980957-1
Matrix Spike	Barium (Ba)-Total	MS-B	L1980957-1
Matrix Spike	Boron (B)-Total	MS-B	L1980957-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L1980957-1
Matrix Spike	Cobalt (Co)-Total	MS-B	L1980957-1
Matrix Spike	Iron (Fe)-Total	MS-B	L1980957-1
Matrix Spike	Lithium (Li)-Total	MS-B	L1980957-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1980957-1
Matrix Spike	Manganese (Mn)-Total	MS-B	L1980957-1
Matrix Spike	Nickel (Ni)-Total	MS-B	L1980957-1
Matrix Spike	Potassium (K)-Total	MS-B	L1980957-1
Matrix Spike	Rubidium (Rb)-Total	MS-B	L1980957-1
Matrix Spike	Silicon (Si)-Total	MS-B	L1980957-1
Matrix Spike	Sodium (Na)-Total	MS-B	L1980957-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L1980957-1
Matrix Spike	Sulfur (S)-Total	MS-B	L1980957-1
Matrix Spike	Ammonia, Total (as N)	MS-B	L1980957-1
Matrix Spike	Sulfate (SO4)	MS-B	L1980957-1

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-WT	Water	Acidity (as CaCO3)	APHA 2310 B - Potentiometric Titration
ALK-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

C-DIS-ORG-WT	Water	Dissolved Organic Carbon	APHA 5310 B-INSTRUMENTAL

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

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

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

Reference Information

CN-TOT-WT Water — Cyanide, Total — ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

EC-WT Water — Conductivity — APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

F-IC-N-WT 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-WT Water — Hardness — APHA 2340 B

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-WT Water — Dissolved Mercury in Water by CVAAS — 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-T-CVAA-WT Water — Total Mercury in Water by CVAAS — EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-D-CCMS-WT 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-T-CCMS-WT Water — Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-WT Water — Ammonia, Total as N — EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO3-IC-WT Water — Nitrate in Water by IC — EPA 300.1 (mod)

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

P-T-COL-WT Water — Total P in Water by Colour — APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PH-WT Water — pH — APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

RA226-MMER-FC Water — Ra226 by Alpha Scint, MDC=0.01 Bq/L — EPA 903.1

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

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

SOLIDS-TDS-WT Water — Total Dissolved Solids — APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5□C overnight and then 180–10□C for 1hr.

SOLIDS-TSS-WT Water — Suspended solids — APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1□C for a minimum of four hours or until a constant weight is achieved.

Reference Information

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
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 weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
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.

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-WT	**Water**							
Batch R3812508								
WG2602106-3 DUP		**L1977867-1**						
Acidity (as CaCO3)		<2.0	<2.0	RPD-NA	mg/L	N/A	25	26-AUG-17
WG2602106-2 LCS								
Acidity (as CaCO3)			100.0		%		70-130	26-AUG-17
WG2602106-1 MB								
Acidity (as CaCO3)			<2.0		mg/L		2	26-AUG-17
ALK-WT	**Water**							
Batch R3812543								
WG2602199-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			102.3		%		80-120	26-AUG-17
WG2602199-4 DUP		**L1980957-1**						
Alkalinity, Total (as CaCO3)		82	82		mg/L	0.6	20	26-AUG-17
WG2602199-2 LCS								
Alkalinity, Total (as CaCO3)			101.5		%		85-115	26-AUG-17
WG2602199-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	26-AUG-17
C-DIS-ORG-WT	**Water**							
Batch R3812641								
WG2602306-3 DUP		**L1980957-1**						
Dissolved Organic Carbon		1.4	1.4		mg/L	1.5	20	26-AUG-17
WG2602306-2 LCS								
Dissolved Organic Carbon			99.1		%		80-120	26-AUG-17
WG2602306-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	26-AUG-17
WG2602306-4 MS		**L1980957-1**						
Dissolved Organic Carbon			100.9		%		70-130	26-AUG-17
CL-IC-N-WT	**Water**							
Batch R3812607								
WG2601380-4 DUP		**WG2601380-3**						
Chloride (Cl)		60.0	58.2		mg/L	3.2	20	26-AUG-17
WG2601380-2 LCS								
Chloride (Cl)			100.9		%		90-110	26-AUG-17
WG2601380-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	26-AUG-17
WG2601380-5 MS		**WG2601380-3**						
Chloride (Cl)			91.9		%		75-125	26-AUG-17
CN-TOT-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-TOT-WT	**Water**							
Batch R3813435								
WG2602301-3 DUP		**L1980957-1**						
Cyanide, Total		<0.20	<0.0020	RPD-NA	mg/L	N/A	20	28-AUG-17
WG2602301-2 LCS								
Cyanide, Total			89.6		%		80-120	28-AUG-17
WG2602301-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	28-AUG-17
WG2602301-4 MS		**L1980957-1**						
Cyanide, Total			76.7		%		70-130	28-AUG-17
EC-WT	**Water**							
Batch R3812484								
WG2602164-2 DUP		**L1980957-1**						
Conductivity		3330	3270		umhos/cm	1.8	10	26-AUG-17
WG2602164-1 LCS								
Conductivity			98.4		%		90-110	26-AUG-17
WG2602164-3 MB								
Conductivity			<3.0		umhos/cm		3	26-AUG-17
F-IC-N-WT	**Water**							
Batch R3812607								
WG2601380-4 DUP		**WG2601380-3**						
Fluoride (F)		0.332	0.330		mg/L	0.7	20	26-AUG-17
WG2601380-2 LCS								
Fluoride (F)			99.8		%		90-110	26-AUG-17
WG2601380-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	26-AUG-17
WG2601380-5 MS		**WG2601380-3**						
Fluoride (F)			94.8		%		75-125	26-AUG-17
HG-D-CVAA-WT	**Water**							
Batch R3812737								
WG2602383-3 DUP		**L1980957-1**						
Mercury (Hg)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-AUG-17
WG2602383-2 LCS								
Mercury (Hg)-Dissolved			96.3		%		80-120	27-AUG-17
WG2602383-1 MB								
Mercury (Hg)-Dissolved			<0.000010		mg/L		0.00001	27-AUG-17
WG2602383-4 MS		**L1980959-1**						
Mercury (Hg)-Dissolved			85.4		%		70-130	27-AUG-17
HG-T-CVAA-WT	**Water**							

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R3812736								
WG2602382-3 DUP		**L1980957-1**						
Mercury (Hg)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-AUG-17
WG2602382-2 LCS								
Mercury (Hg)-Total			96.0		%		80-120	27-AUG-17
WG2602382-1 MB								
Mercury (Hg)-Total			<0.000010		mg/L		0.00001	27-AUG-17
WG2602382-4 MS		**L1980959-1**						
Mercury (Hg)-Total			88.8		%		70-130	27-AUG-17
MET-D-CCMS-WT	**Water**							
Batch R3812687								
WG2602281-4 DUP		**WG2602281-3**						
Aluminum (Al)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-AUG-17
Antimony (Sb)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Arsenic (As)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Barium (Ba)-Dissolved		0.0264	0.0254		mg/L	3.8	20	27-AUG-17
Beryllium (Be)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Bismuth (Bi)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Boron (B)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-AUG-17
Cadmium (Cd)-Dissolved		0.00032	0.00032		mg/L	1.6	20	27-AUG-17
Calcium (Ca)-Dissolved		89.9	85.0		mg/L	5.6	20	27-AUG-17
Cesium (Cs)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-AUG-17
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-AUG-17
Cobalt (Co)-Dissolved		0.270	0.275		mg/L	1.7	20	27-AUG-17
Copper (Cu)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	27-AUG-17
Iron (Fe)-Dissolved		2.79	2.76		mg/L	1.1	20	27-AUG-17
Lead (Pb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Lithium (Li)-Dissolved		0.025	0.024		mg/L	2.8	20	27-AUG-17
Magnesium (Mg)-Dissolved		429	439		mg/L	2.4	20	27-AUG-17
Manganese (Mn)-Dissolved		17.9	18.0		mg/L	0.9	20	27-AUG-17
Molybdenum (Mo)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Nickel (Ni)-Dissolved		0.301	0.307		mg/L	1.7	20	27-AUG-17
Phosphorus (P)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	27-AUG-17
Potassium (K)-Dissolved		3.47	3.43		mg/L	1.1	20	27-AUG-17
Rubidium (Rb)-Dissolved		0.0064	0.0066		mg/L	3.2	20	27-AUG-17
Selenium (Se)-Dissolved		0.00475	0.00472		mg/L	0.6	20	27-AUG-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3812687								
WG2602281-4 DUP		**WG2602281-3**						
Silicon (Si)-Dissolved		1.01	0.93		mg/L	8.1	20	27-AUG-17
Silver (Ag)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Sodium (Na)-Dissolved		95.3	97.4		mg/L	2.2	20	27-AUG-17
Strontium (Sr)-Dissolved		0.061	0.061		mg/L	0.8	20	27-AUG-17
Sulfur (S)-Dissolved		729	719		mg/L	1.4	20	27-AUG-17
Tellurium (Te)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	27-AUG-17
Thallium (Tl)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-AUG-17
Thorium (Th)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Tin (Sn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Titanium (Ti)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-AUG-17
Tungsten (W)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Uranium (U)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-AUG-17
Vanadium (V)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-AUG-17
Zinc (Zn)-Dissolved		0.016	0.015		mg/L	3.7	20	27-AUG-17
Zirconium (Zr)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-AUG-17
WG2602281-2 LCS								
Aluminum (Al)-Dissolved			102.0		%		80-120	27-AUG-17
Antimony (Sb)-Dissolved			94.9		%		80-120	27-AUG-17
Arsenic (As)-Dissolved			99.4		%		80-120	27-AUG-17
Barium (Ba)-Dissolved			104.3		%		80-120	27-AUG-17
Beryllium (Be)-Dissolved			97.6		%		80-120	27-AUG-17
Bismuth (Bi)-Dissolved			97.8		%		80-120	27-AUG-17
Boron (B)-Dissolved			97.3		%		80-120	27-AUG-17
Cadmium (Cd)-Dissolved			105.2		%		80-120	27-AUG-17
Calcium (Ca)-Dissolved			101.9		%		80-120	27-AUG-17
Cesium (Cs)-Dissolved			99.4		%		80-120	27-AUG-17
Chromium (Cr)-Dissolved			99.5		%		80-120	27-AUG-17
Cobalt (Co)-Dissolved			95.9		%		80-120	27-AUG-17
Copper (Cu)-Dissolved			96.7		%		80-120	27-AUG-17
Iron (Fe)-Dissolved			95.5		%		80-120	27-AUG-17
Lead (Pb)-Dissolved			100.1		%		80-120	27-AUG-17
Lithium (Li)-Dissolved			104.9		%		80-120	27-AUG-17
Magnesium (Mg)-Dissolved			98.0		%		80-120	27-AUG-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3812687								
WG2602281-2 LCS								
Manganese (Mn)-Dissolved			98.5		%		80-120	27-AUG-17
Molybdenum (Mo)-Dissolved			101.1		%		80-120	27-AUG-17
Nickel (Ni)-Dissolved			99.3		%		80-120	27-AUG-17
Phosphorus (P)-Dissolved			105.3		%		80-120	27-AUG-17
Potassium (K)-Dissolved			102.7		%		80-120	27-AUG-17
Rubidium (Rb)-Dissolved			99.7		%		80-120	27-AUG-17
Selenium (Se)-Dissolved			96.4		%		80-120	27-AUG-17
Silicon (Si)-Dissolved			113.2		%		60-140	27-AUG-17
Silver (Ag)-Dissolved			99.98		%		80-120	27-AUG-17
Sodium (Na)-Dissolved			96.3		%		80-120	27-AUG-17
Strontium (Sr)-Dissolved			103.2		%		80-120	27-AUG-17
Sulfur (S)-Dissolved			92.7		%		80-120	27-AUG-17
Tellurium (Te)-Dissolved			96.3		%		80-120	27-AUG-17
Thallium (Tl)-Dissolved			98.1		%		80-120	27-AUG-17
Thorium (Th)-Dissolved			97.1		%		80-120	27-AUG-17
Tin (Sn)-Dissolved			96.4		%		80-120	27-AUG-17
Titanium (Ti)-Dissolved			96.6		%		80-120	27-AUG-17
Tungsten (W)-Dissolved			102.2		%		80-120	27-AUG-17
Uranium (U)-Dissolved			100.8		%		80-120	27-AUG-17
Vanadium (V)-Dissolved			99.9		%		80-120	27-AUG-17
Zinc (Zn)-Dissolved			94.0		%		80-120	27-AUG-17
Zirconium (Zr)-Dissolved			101.1		%		80-120	27-AUG-17
WG2602281-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	27-AUG-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-AUG-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-AUG-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	27-AUG-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-AUG-17
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	27-AUG-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3812687								
WG2602281-1 MB								
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-AUG-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-AUG-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-AUG-17
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-AUG-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	27-AUG-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	27-AUG-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-AUG-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-AUG-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	27-AUG-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-AUG-17
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	27-AUG-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-AUG-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-AUG-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	27-AUG-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	27-AUG-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	27-AUG-17
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	27-AUG-17
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	27-AUG-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-AUG-17
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-AUG-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	27-AUG-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-AUG-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-AUG-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-AUG-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	27-AUG-17
WG2602281-5 MS		**WG2602281-3**						
Aluminum (Al)-Dissolved			90.1		%		70-130	27-AUG-17
Antimony (Sb)-Dissolved			91.0		%		70-130	27-AUG-17
Arsenic (As)-Dissolved			95.4		%		70-130	27-AUG-17
Barium (Ba)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Beryllium (Be)-Dissolved			89.3		%		70-130	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3812687								
WG2602281-5 MS		**WG2602281-3**						
Bismuth (Bi)-Dissolved			92.5		%		70-130	27-AUG-17
Boron (B)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Cadmium (Cd)-Dissolved			87.1		%		70-130	27-AUG-17
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Cesium (Cs)-Dissolved			93.0		%		70-130	27-AUG-17
Chromium (Cr)-Dissolved			95.3		%		70-130	27-AUG-17
Cobalt (Co)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Copper (Cu)-Dissolved			79.3		%		70-130	27-AUG-17
Iron (Fe)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Lead (Pb)-Dissolved			92.1		%		70-130	27-AUG-17
Lithium (Li)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Molybdenum (Mo)-Dissolved			94.5		%		70-130	27-AUG-17
Nickel (Ni)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Phosphorus (P)-Dissolved			102.9		%		70-130	27-AUG-17
Potassium (K)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Rubidium (Rb)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Selenium (Se)-Dissolved			88.0		%		70-130	27-AUG-17
Silicon (Si)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Silver (Ag)-Dissolved			94.9		%		70-130	27-AUG-17
Sodium (Na)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Sulfur (S)-Dissolved			N/A	MS-B	%		-	27-AUG-17
Tellurium (Te)-Dissolved			91.5		%		70-130	27-AUG-17
Thallium (Tl)-Dissolved			91.6		%		70-130	27-AUG-17
Thorium (Th)-Dissolved			92.1		%		70-130	27-AUG-17
Tin (Sn)-Dissolved			92.8		%		70-130	27-AUG-17
Titanium (Ti)-Dissolved			95.2		%		70-130	27-AUG-17
Tungsten (W)-Dissolved			94.1		%		70-130	27-AUG-17
Uranium (U)-Dissolved			83.0		%		70-130	27-AUG-17
Vanadium (V)-Dissolved			97.1		%		70-130	27-AUG-17
Zirconium (Zr)-Dissolved			94.5		%		70-130	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3812689								
WG2602273-4 DUP		**WG2602273-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-AUG-17
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Barium (Ba)-Total		0.0271	0.0269		mg/L	0.5	20	27-AUG-17
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Boron (B)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-AUG-17
Cadmium (Cd)-Total		0.00038	0.00034		mg/L	12	20	27-AUG-17
Calcium (Ca)-Total		88.6	91.7		mg/L	3.5	20	27-AUG-17
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-AUG-17
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-AUG-17
Cobalt (Co)-Total		0.283	0.279		mg/L	1.2	20	27-AUG-17
Copper (Cu)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-AUG-17
Iron (Fe)-Total		7.10	6.79		mg/L	4.5	20	27-AUG-17
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Lithium (Li)-Total		0.024	0.026		mg/L	8.5	20	27-AUG-17
Magnesium (Mg)-Total		423	426		mg/L	0.8	20	27-AUG-17
Manganese (Mn)-Total		18.1	18.0		mg/L	0.3	20	27-AUG-17
Molybdenum (Mo)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Nickel (Ni)-Total		0.317	0.314		mg/L	1.2	20	27-AUG-17
Phosphorus (P)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	27-AUG-17
Potassium (K)-Total		3.45	3.47		mg/L	0.5	20	27-AUG-17
Rubidium (Rb)-Total		0.0061	0.0059		mg/L	4.7	20	27-AUG-17
Selenium (Se)-Total		0.00474	0.00470		mg/L	1.0	20	27-AUG-17
Silicon (Si)-Total		1.1	1.1		mg/L	1.9	20	27-AUG-17
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-AUG-17
Sodium (Na)-Total		95.1	96.7		mg/L	1.7	20	27-AUG-17
Strontium (Sr)-Total		0.060	0.063		mg/L	3.9	20	27-AUG-17
Sulfur (S)-Total		762	725		mg/L	5.0	25	27-AUG-17
Thallium (Tl)-Total		0.00011	0.00011		mg/L	2.0	20	27-AUG-17
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	27-AUG-17
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	27-AUG-17
Tin (Sn)-Total		<0.0010	<0.0010		mg/L			27-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3812689								
WG2602273-4 DUP		**WG2602273-3**						
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-AUG-17
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-AUG-17
Uranium (U)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-AUG-17
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-AUG-17
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	27-AUG-17
Zirconium (Zr)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-AUG-17
WG2602273-2 LCS								
Aluminum (Al)-Total			93.1		%		80-120	27-AUG-17
Antimony (Sb)-Total			94.3		%		80-120	27-AUG-17
Arsenic (As)-Total			87.7		%		80-120	27-AUG-17
Barium (Ba)-Total			93.9		%		80-120	27-AUG-17
Beryllium (Be)-Total			95.4		%		80-120	27-AUG-17
Bismuth (Bi)-Total			93.2		%		80-120	27-AUG-17
Boron (B)-Total			94.5		%		80-120	27-AUG-17
Cadmium (Cd)-Total			92.4		%		80-120	27-AUG-17
Calcium (Ca)-Total			98.3		%		80-120	27-AUG-17
Chromium (Cr)-Total			90.9		%		80-120	27-AUG-17
Cesium (Cs)-Total			97.1		%		80-120	27-AUG-17
Cobalt (Co)-Total			87.5		%		80-120	27-AUG-17
Copper (Cu)-Total			88.4		%		80-120	27-AUG-17
Iron (Fe)-Total			90.6		%		80-120	27-AUG-17
Lead (Pb)-Total			96.3		%		80-120	27-AUG-17
Lithium (Li)-Total			106.1		%		80-120	27-AUG-17
Magnesium (Mg)-Total			92.5		%		80-120	27-AUG-17
Manganese (Mn)-Total			92.1		%		80-120	27-AUG-17
Molybdenum (Mo)-Total			96.2		%		80-120	27-AUG-17
Nickel (Ni)-Total			89.5		%		80-120	27-AUG-17
Phosphorus (P)-Total			86.2		%		70-130	27-AUG-17
Potassium (K)-Total			96.4		%		80-120	27-AUG-17
Rubidium (Rb)-Total			92.1		%		80-120	27-AUG-17
Selenium (Se)-Total			88.5		%		80-120	27-AUG-17
Silicon (Si)-Total			102.0		%		60-140	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3812689								
WG2602273-2 LCS								
Silver (Ag)-Total			99.2		%		80-120	27-AUG-17
Sodium (Na)-Total			89.5		%		80-120	27-AUG-17
Strontium (Sr)-Total			101.7		%		80-120	27-AUG-17
Sulfur (S)-Total			95.2		%		70-130	27-AUG-17
Thallium (Tl)-Total			94.4		%		80-120	27-AUG-17
Tellurium (Te)-Total			90.5		%		80-120	27-AUG-17
Thorium (Th)-Total			92.2		%		70-130	27-AUG-17
Tin (Sn)-Total			93.5		%		80-120	27-AUG-17
Titanium (Ti)-Total			89.2		%		80-120	27-AUG-17
Tungsten (W)-Total			97.9		%		80-120	27-AUG-17
Uranium (U)-Total			95.6		%		80-120	27-AUG-17
Vanadium (V)-Total			91.8		%		80-120	27-AUG-17
Zinc (Zn)-Total			84.2		%		80-120	27-AUG-17
Zirconium (Zr)-Total			96.7		%		80-120	27-AUG-17
WG2602273-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	27-AUG-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Barium (Ba)-Total			<0.00020		mg/L		0.0002	27-AUG-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	27-AUG-17
Boron (B)-Total			<0.010		mg/L		0.01	27-AUG-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	27-AUG-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	27-AUG-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	27-AUG-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	27-AUG-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	27-AUG-17
Iron (Fe)-Total			<0.050		mg/L		0.05	27-AUG-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	27-AUG-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	27-AUG-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	27-AUG-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	27-AUG-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	27-AUG-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3812689								
WG2602273-1 MB								
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	27-AUG-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	27-AUG-17
Potassium (K)-Total			<0.050		mg/L		0.05	27-AUG-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	27-AUG-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	27-AUG-17
Silicon (Si)-Total			<0.10		mg/L		0.1	27-AUG-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	27-AUG-17
Sodium (Na)-Total			<0.50		mg/L		0.5	27-AUG-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	27-AUG-17
Sulfur (S)-Total			<0.50		mg/L		0.5	27-AUG-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	27-AUG-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	27-AUG-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	27-AUG-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	27-AUG-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	27-AUG-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	27-AUG-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	27-AUG-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	27-AUG-17
WG2602273-5 MS		**WG2602273-3**						
Aluminum (Al)-Total			101.5		%		70-130	27-AUG-17
Antimony (Sb)-Total			99.8		%		70-130	27-AUG-17
Arsenic (As)-Total			100.6		%		70-130	27-AUG-17
Barium (Ba)-Total			N/A	MS-B	%		-	27-AUG-17
Beryllium (Be)-Total			96.5		%		70-130	27-AUG-17
Bismuth (Bi)-Total			101.5		%		70-130	27-AUG-17
Boron (B)-Total			N/A	MS-B	%		-	27-AUG-17
Cadmium (Cd)-Total			101.4		%		70-130	27-AUG-17
Calcium (Ca)-Total			N/A	MS-B	%		-	27-AUG-17
Chromium (Cr)-Total			104.3		%		70-130	27-AUG-17
Cesium (Cs)-Total			102.3		%		70-130	27-AUG-17
Cobalt (Co)-Total			N/A	MS-B	%		-	27-AUG-17
Copper (Cu)-Total			101.2		%		70-130	27-AUG-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3812689								
WG2602273-5 MS		**WG2602273-3**						
Iron (Fe)-Total			N/A	MS-B	%		-	27-AUG-17
Lead (Pb)-Total			102.5		%		70-130	27-AUG-17
Lithium (Li)-Total			N/A	MS-B	%		-	27-AUG-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	27-AUG-17
Manganese (Mn)-Total			N/A	MS-B	%		-	27-AUG-17
Molybdenum (Mo)-Total			101.9		%		70-130	27-AUG-17
Nickel (Ni)-Total			N/A	MS-B	%		-	27-AUG-17
Phosphorus (P)-Total			90.5		%		70-130	27-AUG-17
Potassium (K)-Total			N/A	MS-B	%		-	27-AUG-17
Rubidium (Rb)-Total			N/A	MS-B	%		-	27-AUG-17
Selenium (Se)-Total			103.2		%		70-130	27-AUG-17
Silicon (Si)-Total			N/A	MS-B	%		-	27-AUG-17
Silver (Ag)-Total			102.1		%		70-130	27-AUG-17
Sodium (Na)-Total			N/A	MS-B	%		-	27-AUG-17
Strontium (Sr)-Total			N/A	MS-B	%		-	27-AUG-17
Sulfur (S)-Total			N/A	MS-B	%		-	27-AUG-17
Thallium (Tl)-Total			98.8		%		70-130	27-AUG-17
Tellurium (Te)-Total			110.7		%		70-130	27-AUG-17
Thorium (Th)-Total			98.3		%		70-130	27-AUG-17
Tin (Sn)-Total			101.1		%		70-130	27-AUG-17
Titanium (Ti)-Total			103.0		%		70-130	27-AUG-17
Tungsten (W)-Total			105.9		%		70-130	27-AUG-17
Uranium (U)-Total			103.4		%		70-130	27-AUG-17
Vanadium (V)-Total			106.8		%		70-130	27-AUG-17
Zinc (Zn)-Total			100.6		%		70-130	27-AUG-17
Zirconium (Zr)-Total			100.7		%		70-130	27-AUG-17
NH3-WT	**Water**							
Batch R3812741								
WG2602090-3 DUP		**L1980957-1**						
Ammonia, Total (as N)		1.67	1.67		mg/L	0.2	20	26-AUG-17
WG2602090-2 LCS								
Ammonia, Total (as N)			101.5		%		85-115	26-AUG-17
WG2602090-1 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	26-AUG-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-WT	**Water**							
Batch R3812741								
WG2602090-4 MS		**L1980957-1**						
Ammonia, Total (as N)			N/A	MS-B	%		-	26-AUG-17
NO3-IC-WT	**Water**							
Batch R3812607								
WG2601380-4 DUP		**WG2601380-3**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	26-AUG-17
WG2601380-2 LCS								
Nitrate (as N)			99.0		%		70-130	26-AUG-17
WG2601380-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	26-AUG-17
WG2601380-5 MS		**WG2601380-3**						
Nitrate (as N)			91.7		%		70-130	26-AUG-17
P-T-COL-WT	**Water**							
Batch R3812722								
WG2602402-3 DUP		**L1980963-3**						
Phosphorus, Total		0.0053	0.0038	J	mg/L	0.0015	0.006	27-AUG-17
WG2602402-2 LCS								
Phosphorus, Total			100.9		%		80-120	27-AUG-17
WG2602402-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	27-AUG-17
WG2602402-4 MS		**L1980963-3**						
Phosphorus, Total			88.8		%		70-130	27-AUG-17
PH-WT	**Water**							
Batch R3812483								
WG2602163-2 DUP		**L1980957-1**						
pH		6.99	7.04	J	pH units	0.05	0.2	26-AUG-17
WG2602163-1 LCS								
pH			6.98		pH units		6.9-7.1	26-AUG-17
SO4-IC-N-WT	**Water**							
Batch R3812607								
WG2601380-4 DUP		**WG2601380-3**						
Sulfate (SO4)		795	761		mg/L	4.4	20	26-AUG-17
WG2601380-2 LCS								
Sulfate (SO4)			101.3		%		90-110	26-AUG-17
WG2601380-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	26-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT	**Water**							
Batch R3812607								
WG2601380-5 MS		**WG2601380-3**						
Sulfate (SO4)			N/A	MS-B	%		-	26-AUG-17
SOLIDS-TDS-WT	**Water**							
Batch R3812645								
WG2602099-3 DUP		**L1980957-1**						
Total Dissolved Solids		3140	3100		mg/L	1.4	20	26-AUG-17
WG2602099-2 LCS								
Total Dissolved Solids			100.0		%		85-115	26-AUG-17
WG2602099-1 MB								
Total Dissolved Solids			<10		mg/L		10	26-AUG-17
SOLIDS-TSS-WT	**Water**							
Batch R3812721								
WG2602098-3 DUP		**L1980957-1**						
Total Suspended Solids		13.3	13.6		mg/L	2.2	20	27-AUG-17
WG2602098-2 LCS								
Total Suspended Solids			98.9		%		85-115	27-AUG-17
WG2602098-1 MB								
Total Suspended Solids			<2.0		mg/L		2	27-AUG-17
TKN-WT	**Water**							
Batch R3812661								
WG2602337-3 DUP		**L1980957-1**						
Total Kjeldahl Nitrogen		2.08	2.07		mg/L	0.3	20	27-AUG-17
WG2602337-2 LCS								
Total Kjeldahl Nitrogen			100.5		%		75-125	27-AUG-17
WG2602337-1 MB								
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	27-AUG-17
WG2602337-4 MS		**L1980957-1**						
Total Kjeldahl Nitrogen			93.5		%		70-130	27-AUG-17
TOC-WT	**Water**							
Batch R3812643								
WG2602307-3 DUP		**L1980957-1**						
Total Organic Carbon		1.5	1.7		mg/L	9.6	20	27-AUG-17
WG2602307-2 LCS								
Total Organic Carbon			99.6		%		80-120	27-AUG-17
WG2602307-1 MB								
Total Organic Carbon			<1.0		mg/L		1	27-AUG-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TOC-WT	**Water**							
Batch R3812643								
WG2602307-4 MS		**L1980957-1**						
Total Organic Carbon			102.8		%		70-130	27-AUG-17

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Daphnia magna

Work Order :	234211
Sample Number :	52038

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	SS/DS
Location :	Waterloo ON	Time Collected :	16:45
Job Number :	L1980957	Date Collected :	2017-08-24
Substance :	L1980957-1 MS-08	Date Received :	2017-08-25
Sampling Method :	Grab	Date Tested :	2017-08-25
Sample Description :	Cloudy, pale orange, mild odour.	Temp. on arrival :	15.0° C

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	6.7 %

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	Dm17-19		
Date Tested (yyyy/mm/dd) :	2017-08-15	Historical Mean LC50 :	5.8 g/L
LC50 (95% Confidence Limits) :	6.0 g/L (5.7 - 6.3)	Warning Limits (± 2SD) :	5.1 - 6.5 g/L
Statistical Method :	Spearman-Kärber	Analyst(s) :	SV, MA

Daphnia magna CULTURE HEALTH DATA

Time to First Brood :	7.4 days	Mean Young Per Brood :	28.4
Culture Mortality :	1.5% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Test Organisms / Replicate :	10
Test Aeration :	None	Total Organisms / Test Level :	30
Organism Batch :	Dm17-19	Organism Loading Rate :	15.0 mL/organism
		Test Method Deviation(s) :	None

Date: 2017-08-30
yyyy-mm-dd

Approved by: [signature]
Project Manager

AQUATOX

TOXICITY TEST REPORT
Daphnia magna

Work Order: 234211
Sample Number: 52038

	Hardness (mg/L as $CaCO_3$)	Hardness Adjustment	pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*	Total Pre-Aeration Time (h) @ 30 mL/min/L
Initial Water Chemistry:	60	None	7.3	8.7	3180	20.0	100	0:00

0 hours

Date & Time 2017-08-25 13:30
Technician: AW

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*	Hardness
100A	0	0	7.3	8.7	3180	20.0	100	60
100B	0	0	7.3	8.7	3180	20.0	100	60
100C	0	0	7.3	8.7	3180	20.0	100	60
Control A	0	0	8.4	8.7	555	20.0	100	210
Control B	0	0	8.4	8.7	555	20.0	100	210
Control C	0	0	8.4	8.7	555	20.0	100	210

Notes:

24 hours

Date & Time 2017-08-26 13:30
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	–	0	–	–	–	20.5
100B	–	0	–	–	–	20.5
100C	–	0	–	–	–	20.5
Control A	–	0	–	–	–	20.5
Control B	–	0	–	–	–	20.5
Control C	–	0	–	–	–	20.5

Notes:

48 hours

Date & Time 2017-08-27 13:30
Technician: JL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	0	0	8.0	8.5	3160	20.5
100B	0	0	8.0	8.6	3160	20.5
100C	2	0	8.1	8.6	3170	20.5
Control A	0	0	8.5	8.6	582	20.5
Control B	0	0	8.5	8.6	583	20.5
Control C	0	0	8.5	8.7	584	20.5

Notes:

Control organisms showing stress: 0
Organism Batch : Dm17-19

Number immobile does not include number of mortalities.

– = not measured/not required

* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: DK
Date: 2017-08-28

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order :	234211
Sample Number :	52038

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	SS/DS
Location :	Waterloo ON	Time Collected :	16:45
Job Number :	L1980957	Date Collected :	2017-08-24
Substance :	L1980957-1 MS-08	Date Received :	2017-08-25
Sampling Method :	Grab	Date Tested :	2017-08-25
Sample Description :	Cloudy, pale orange, mild odour.	Temp. on arrival :	15.0°C

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T17-13		
Date Tested (yyyy-mm-dd) :	2017-08-18	Historical Mean LC50 :	3709 mg/L
LC50 (95% Confidence Limits) :	3762 mg/L (3474 - 4074)	Warning Limits (± 2SD) :	3119 - 4411 mg/L
Statistical Method :	Spearman-Kärber	Analyst(s) :	NL, FS, EZ

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0.5 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.46 ± 0.21 g	Mean Fish Fork Length (± 2 SD) :	38.6 ± 4.4 mm
Range of Weights :	0.37 - 0.72 g	Range of Fork Lengths (mm) :	36 - 44 mm
Fish Loading Rate :	0.2 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	19
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2017-08-30
yyyy-mm-dd

Approved by: [signature]
Project Manager

Work Order: 234211
Sample Number: 52038

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	Initial Water Chemistry:	6.8	9.2	3210	15.0	
	Chemistry after 30min air:	7.0	9.3	3207	15.0	98

0 hours

Date & Time 2017-08-25 13:45
Technician: NL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	7.0	9.3	3207	15.0	98
Control	0	0	8.3	9.4	809	15.0	98

Notes:

24 hours

Date & Time 2017-08-26 13:45
Technician: TL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.0
Control	0	0	–	–	–	14.0

Notes:

48 hours

Date & Time 2017-08-27 13:45
Technician: TL

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.5
Control	0	0	–	–	–	14.5

Notes:

72 hours

Date & Time 2017-08-28 13:45
Technician: EZ (NL)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	–	–	–	14.5
Control	0	0			–	14.5

Notes:

96 hours

Date & Time 2017-08-29 13:45
Technician: EZ (NL)

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	0	0	7.7	9.2	3212	15.0
Control	0	0	8.3	9.3	812	15.0

Notes:

Control organisms showing stress: 0
Organism Batch : T17-13

"–" = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: EJS
Date: 2017-08-30

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 234211

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	4500017476
Field Sampler Name (print):	SS/DS
Signature:	
Affiliation:	ALS ENV
Sample Storage (prior to shipping):	
Custody Relinquished by:	RH/CD
Date/Time Shipped:	25 Aug 17

Client:	ALS Environmental Waterloo Q# 162705399-15
Phone:	519-886-6910
Fax:	519-886-9047
Contact:	Wayne Smith / Rick Hawthorne

L1980957-1

Sample Identification					Analyses Requested									Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	Other (please specify below) RISS	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2017-08-24	1645	MS-08	52038	15.0	X		X		X	X	X	X	X			1 Pail, 3 bladders
																"GRAB" as per label
		Bladder temp = 15.0°C														
		Pail temp = 15.0°C														
		TC														Plus 1x2L jar
																R

For Lab Use Only	
Received By:	TC/RP
Date:	2017-08-25
Time:	12:15
Storage Location:	
Storage Temp.(°C)	

CN

Please list any special requests or instructions:
~~Regular~~ BioFinland Toxicity Tests
Rush RBT/Daphnia Tox w/weekend updates
Plus MMER Toxicity for Sublethal RISS Reporting

L1980957

WATERLOO

ALS Environmental

Subcontract Request Form

Subcontract To:

AQUATOX TESTING AND CONSULTING
11B NICHOLAS BEAVER ROAD
RR3
GUELPH,ON N1H 6H9

NOTES:	Please reference on final report and invoice: PO# L1980957 ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 0 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1980957-1 MS-08		8/ 24/ 2017	E2
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	8/31/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	8/31/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______________ Date Shipped: ______________

Received By: ______________ Date Received: ______________

Verified By: ______________ Date Verified: ______________

Temperature: ______________

Sample Integrity Issues: ______________

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Ceriodaphnia dubia
EPS 1/RM/21

Work Order :	234211
Sample Number :	52038

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo		
Location :	Waterloo ON	Sampled By :	SS/DS
Job Number :	L1980957	Date Collected :	2017-08-24
Substance :	L1980957-1 MS-08	Time Collected :	16:45
Sampling Method :	Grab	Date Received :	2017-08-25
Temp. on arrival :	15.0°C	Time Received :	12:15
Sample Description :	Cloudy, pale orange, mild odour.	Date Tested :	2017-08-25

Test Method : Test of Reproduction and Survival using the Cladoceran *Ceriodaphnia dubia*. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/21, 2nd ed. (February 2007).

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
LC50	19.9%	9-100	Non Linear Interpolation (Stephan) c
IC25 (Reproduction)	6.46%	3.39-10.0	Nonlinear Regression (CETIS) a

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2017-09-07		
Test Duration :	6 days	Analyst(s) :	NL, SV
IC25 Reproduction :	1.30 g/L	LC50 :	1.99 g/L
95% Confidence Limits :	1.20 - 1.42 g/L	95% Confidence Limits :	1.72 - 2.31 g/L
Statistical Method :	Linear Interpolation (CETIS)[a]	Statistical Method :	Spearman-Kärber (CETIS)[a]
Historical Mean IC25 :	1.35 g/L	Historical Mean LC50 :	2.24 g/L
Warning Limits (± 2SD) :	1.04 - 1.76 g/L	Warning Limits (± 2SD) :	1.91 - 2.61 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Sample Filtration :	None	Test Volume per Replicate :	15 mL
Test Aeration :	None	Test Vessel :	19 mL polystyrene vial
pH Adjustment :	None	Depth of Test Solution :	4.8 cm
Hardness Adjustment :	None	Organisms per Replicate :	1
Daily Renewal Method :	Transferred to fresh solutions	Number of Replicates :	10
Control/Dilution Water :	Well water (no chemicals added)	Test Method Deviation(s) :	None

COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.

Work Order : 234211
Sample Number : 52038

TEST ORGANISMS

Test Organism : *Ceriodaphnia dubia*
Organism Batch : Cd17-08
Organism Origin : Single in-house mass culture
Test Organism Origin : Individual in-house cultures

Range of Age (at start of test) : 09:20 h - 21:20 h
Mean Brood Organism Mortality : 3.3%
Ephippia in Culture : No

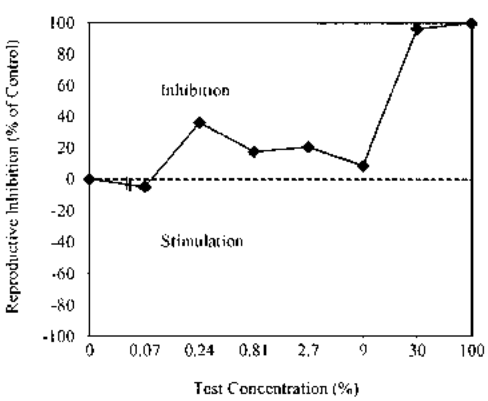
Brood Organism Neonate Production

Replicate :	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Mean**
Total (third or subsequent brood):	15	11	10	12	13	14	11	13	11	14	12.4
Total (first three broods):	22	21	18	18	20	18	19	17	18	19	19.0

No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.

TEST DATA

***Ceriodaphnia dubia* Reproductive Inhibition**



Cumulative Daily Test Organism Mortality (%)

		Test Concentration (%)							
Date	**Test Day**	Control	0.07	0.24	0.81	2.7	9	30	100
2017-08-26	1	0	0	0	0	0	0	0	0
2017-08-27	2	0	0	0	0	0	0	0	0
2017-08-28	3	0	0	0	0	0	0	0	10
2017-08-29	4	0	0	0	10	0	0	20	100
2017-08-30	5	10	0	0	10	0	10	70	100
2017-08-31	6	10	0	0	10	0	10	70	100
Total Mortality (%)		10	0	0	10	0	10	70	100

REFERENCES

[a] CETIS™, © 2000-2013. V.1.8.7.17. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[c] Stephan, C. E. 1977. Methods for calculating an LC50. pp 65-84 in : P. L. Mayer and J. L. Hamelink (eds.), Aquatic Toxicology and Hazard Evaluation. Amer. Soc. Testing and Materials, Philadelphia PA. ASTM STP 634.

Date : 2017-09-21
yyyy-mm-dd

Approved By :
Project Manager

Work Order : 234211
Sample Number : 52038

Ceriodaphnia dubia Survival and Reproduction

Test Initiation Date : 2017-08-25
Initiation Time : 15:20
Test Completion Date : 2017-08-31

Concentration (%) Control	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)	Analyst(s)
2017-08-26	1	0	0	0	0	0	0	0	0	0	0	0	CN
2017-08-27	2	0	0	0	0	0	0	0	0	0	0	0	CN
2017-08-28	3	0	0	0	0	4	3	4	0	0	5	1.6	NL
2017-08-29	4	5	6	4	7	0	6	0	6	2	0	3.6	MA
2017-08-30	5	8	7	9	12	4 x	0	5	10	7	11	7.3	VC
2017-08-31	6	11	13	12	13	0	10	5	15	11	9	9.9	NL
Total		**24**	**26**	**25**	**32**	**8**	**19**	**14**	**31**	**20**	**25**	**22.4 (±7.4)**	

Concentration (%) 2.7	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-08-26	1	0	0	0	0	0	0	0	0	0	0	0
2017-08-27	2	0	0	0	0	0	0	0	0	0	0	0
2017-08-28	3	0	0	0	0	0	3	0	0	0	0	0.3
2017-08-29	4	2	5	6	4	3	5	0	5	4	3	3.7
2017-08-30	5	3	9	10	6	5	6	7	10	8	9	7.3
2017-08-31	6	0	9	12	8	9	–	8	12	7	0	6.5
Total		**5**	**23**	**28**	**18**	**17**	**14**	**15**	**27**	**19**	**12**	**17.8 (±7.0)**

Concentration (%) 0.07	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-08-26	1	0	0	0	0	0	0	0	0	0	0	0
2017-08-27	2	0	0	0	0	0	0	0	0	0	0	0
2017-08-28	3	0	0	0	0	4	4	6	0	0	0	1.4
2017-08-29	4	6	1	6	6	0	0	0	2	4	6	3.1
2017-08-30	5	5	10	9	11	0	7	8	12	7	12	8.1
2017-08-31	6	12	13	13	14	7	10	8	13	7	12	10.9
Total		**23**	**24**	**28**	**31**	**11**	**21**	**22**	**27**	**18**	**30**	**23.5 (±6.0)**

Concentration (%) 9	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-08-26	1	0	0	0	0	0	0	0	0	0	0	0
2017-08-27	2	0	0	0	0	0	0	0	0	0	0	0
2017-08-28	3	0	0	0	0	4	4	0	0	0	0	0.8
2017-08-29	4	6	6	4	6	0	0	3	6	6	3	4.0
2017-08-30	5	9 x	10	10	11	7	6	9	11	9	10	9.2
2017-08-31	6	0	6	13	11	8	8	2	7	10	0	6.5
Total		**15**	**22**	**27**	**28**	**19**	**18**	**14**	**24**	**25**	**13**	**20.5 (±5.5)**

Concentration (%) 0.24	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-08-26	1	0	0	0	0	0	0	0	0	0	0	0
2017-08-27	2	0	0	0	0	0	0	0	0	0	0	0
2017-08-28	3	0	0	0	0	0	0	0	0	1	0	0.1
2017-08-29	4	5	3	4	4	5	2	2	2	5	5	3.7
2017-08-30	5	5	5	5	9	2	0	2	8	12	9	5.7
2017-08-31	6	5	9	4	11	3	4	1	0	11	0	4.8
Total		**15**	**17**	**13**	**24**	**10**	**6**	**5**	**10**	**29**	**14**	**14.3 (±7.5)**

Concentration (%) 30	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-08-26	1	0	0	0	0	0	0	0	0	0	0	0
2017-08-27	2	0	0	0	0	0	0	0	0	0	0	0
2017-08-28	3	0	0	0	0	0	4	2	0	0	0	0.6
2017-08-29	4	0 x	0	0	0	0 x	0	0	1	0	0	0.1
2017-08-30	5	0	0 x	0	0 x	0	1 x	0 x	0 x	0	0	0.1
2017-08-31	6	0	0	0	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**5**	**2**	**1**	**0**	**0**	**0.8 (±1.6)**

Concentration (%) 0.81	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-08-26	1	0	0	0	0	0	0	0	0	0	0	0
2017-08-27	2	0	0	0	0	0	0	0	0	0	0	0
2017-08-28	3	0	0	0	0	5	4	2	0	0	0	1.1
2017-08-29	4	3	7	2	2	0	0	1 x	6	6	6	3.3
2017-08-30	5	7	9	8	8	1	8	0	9	10	12	7.2
2017-08-31	6	10	10	6	7	7	8	0	13	8	0	6.9
Total		**20**	**26**	**16**	**17**	**13**	**20**	**3**	**28**	**24**	**18**	**18.5 (±7.2)**

Concentration (%) 100	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2017-08-26	1	0	0	0	0	0	0	0	0	0	0	0
2017-08-27	2	0	0	0	0	0	0	0	0	0	0	0
2017-08-28	3	0 x	0	0	0	0	0	0	0	0	0	0
2017-08-29	4	0	0 x	0 x	0 x	0 x	0 x	0 x	0 x	0 x	0 x	0
2017-08-30	5	0	0	0	0	0	0	0	0	0	0	0
2017-08-31	6	0	0	0	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0 (±0.0)**

NOTES : •All young produced by a test organism during its fourth and subsequent broods were discarded and not included in the above counts. The presence of two or more neonates in any test chamber, during any given day of the test, constitutes a brood.
•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"x"= test organism mortality
"*"= accidental test organism mortality
"–"=4th brood (see 'NOTES')

Data Reviewed By : SF
Date : 2017-09-20

Work Order : 234211
Sample Number: 52038

Ceriodaphnia dubia **Water Chemistry Data**

Initial Chemistry:	**Temp. (°C)**	**DO (mg/L)**	**pH**	**Conductivity (µmhos/cm)**	**Hardness (mg/L as $CaCO_3$)**
	24.0	8.8	6.9	3140	60

Date :		**Day 0 - 1 2017-08-25**	**Day 1 - 2 2017-08-26**	**Day 2 - 3 2017-08-27**	**Day 3 - 4 2017-08-28**	**Day 4 - 5 2017-08-29**	**Day 5 - 6 2017-08-30**
Sub-sample Used		1	1	1	2	2	3
Temperature (°C)		24.0	24.0	24.0	24.0	24.0	24.0
Dissolved Oxygen (mg/L)		8.8	9.5	9.9	9.4	9.5	9.6
Dissolved Oxygen % Sat.[3]		105	111	115	114	114	117
pH		6.9	7.0	7.0	7.0	7.0	7.0
Pre-aeration Time (min)[4]		20	20	20	20	20	20
Analyst(s)	Initial	EZ(RD)	SEW	SEW	XD	EZ(RD)	EZ(RD)
	Final	SEW	SEW	XD	EZ(RD)	EZ(RD)	EZ(RD)
Control (0%)							
Temp. (°C)	Initial	24.0	24.0	24.0	25.0	24.0	24.0
	Final	24.0	24.0	24.0	24.0	24.0	24.0
DO % Sat.[3]	Initial	96	100	98	99	99	100
DO (mg/L)	Initial	8.1	8.3	8.2	8.1	8.1	8.3
	Final	7.8	7.7	7.6	7.0	7.6	7.8
pH	Initial	8.3	8.3	8.3	8.3	8.2	8.3
	Final	8.0	8.1	8.1	8.0	8.1	8.1
Cond. (µmhos/cm)	Initial	678	675	673	679	683	680
0.07 %							
Temp. (°C)	Initial	24.0	24.0	24.0	25.0	24.0	24.0
	Final	24.0	24.0	24.0	24.0	24.0	24.0
DO (mg/L)	Initial	8.0	8.2	8.3	8.3	8.2	8.3
	Final	7.7	7.6	7.6	7.6	7.7	7.6
pH	Initial	8.2	8.2	8.4	8.2	8.1	8.3
	Final	8.0	8.2	8.1	8.0	8.1	8.1
Cond. (µmhos/cm)	Initial	682	689	683	681	727	718
9 %							
Temp. (°C)	Initial	24.0	24.0	24.0	25.0	24.0	24.0
	Final	24.0	24.0	24.0	24.0	24.0	24.0
DO (mg/L)	Initial	8.1	8.4	8.3	8.3	8.3	8.3
	Final	7.6	7.6	7.5	7.5	7.6	7.6
pH	Initial	8.1	8.2	8.3	8.2	8.1	8.2
	Final	8.0	8.1	8.0	8.0	8.1	8.0
Cond. (µmhos/cm)	Initial	965	976	963	963	984	986
100 %							
Temp. (°C)	Initial	24.0	24.0	24.0	25.0	24.0	24.0
	Final	24.0	24.0	24.0	24.0	24.0	24.0
DO (mg/L)	Initial	8.4	8.6	8.9	8.6	8.3	8.6
	Final	7.7	7.8	7.6	7.6	–	–
pH	Initial	7.3	7.5	7.4	7.5	7.6	7.6
	Final	7.6	7.8	7.7	7.7	–	–
Cond. (µmhos/cm)	Initial	3170	3180	3160	3160	3180	3190

"–" = not measured

[3] % saturation (adjusted for actual temperature and barometric pressure)

[4] ≤100 bubbles/minute

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Fathead minnow
EPS 1/RM/22

Work Order : 234211
Sample Number : 52038

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo		
Location :	Waterloo ON	Sampled By :	SS/DS
Job Number :	L1980957	Date Collected :	2017-08-24
Substance :	L1980957-1 MS-08	Time Collected :	16:45
Sampling Method :	Grab	Date Received :	2017-08-25
Temp. on arrival :	15.0°C	Time Received :	12:15
Sample Description :	Cloudy, pale orange, mild odour.	Date Tested :	2017-08-25

Test Method : Test of Larval Growth and Survival Using Fathead Minnows. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/22 , 2nd ed. (February 2011).

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth from Biomass)	>100%	-	-
LC50	>100%	-	-

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2017-08-21	Analyst(s) :	EZ, RD, SEW
Organism Batch :	Fm17-08	Test Duration :	7 days
IC25 Growth (from Biomass) :	0.92 g/L	LC50 :	1.02 g/L*
95% Confidence Limits :	0.86 - 0.96 g/L	95% Confidence Limits :	0.97 - 1.06 g/L
Statistical Method :	Linear Interpolation (CETIS)[a]	Statistical Method :	Spearman-Kärber (CETIS)[a]
Historical Mean IC25 :	0.97 g/L	Historical Mean LC50 :	1.16 g/L
Warning Limits (± 2SD) :	0.84 - 1.13 g/L	Warning Limits (± 2SD) :	1.03 - 1.30 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Test Organism :	*Pimephales promelas*	Test Type :	Static Renewal
Organism Batch :	Fm17-08	Control/Dilution Water :	Well water (no chemicals added)
Organism Age :	~07:00 - 22:50 h at start of test	Test Volume / Replicate :	300 mL
Source :	In-house culture	Test Vessel :	420 mL polystyrene beaker
Culture Mortality/Diseased :	0 % (previous 7 days)	Depth of Test Solution :	8 cm
pH Adjustment :	None	Organisms per Replicate :	10
Sample Filtration :	None	Number of Replicates :	3
Hardness Adjustment :	None	Daily Renewal Method :	80-85% syphoned and replaced
Test Aeration :	None	Test Method Deviation(s):	None

COMMENTS

*Note: The reference toxicant test result fell outside of the 95% warning limits for historical data. No other unusual circumstances were observed and therefore the test result is considered acceptable.

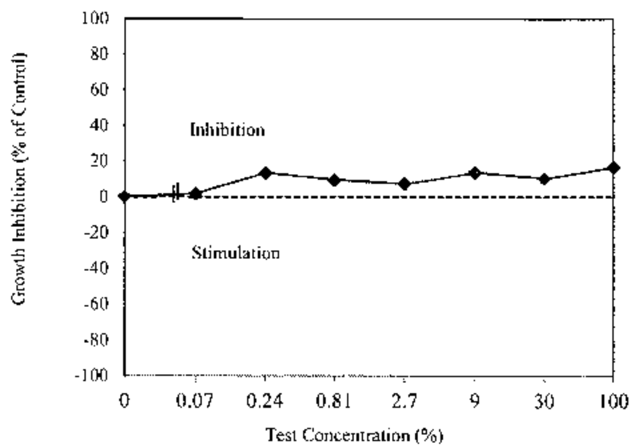
•All test validity criteria as specified in the test method cited above were satisfied.

•No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.

•Inflated swim bladders were confirmed in all test organisms used in this test.

Work Order : 234211
Sample Number : 52038

Fathead Minnow Growth Inhibition (based on Biomass)



REFERENCES

[a] CETIS™, © 2000-2013. V.1.8.7.17. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[b]Grubbs, F.E., 1969. Procedures for detecting outlying observations in samples. *Technometrics, 11* :1-21.

Date : 2017-09-21
yyyy-mm-dd

Approved By :
Project Manager

Work Order : 234211
Sample Number : 52038

CUMULATIVE DAILY CONTROL MORTALITY AND IMPAIRMENT (±SD)

Date :	2017-08-25	2017-08-26	2017-08-27	2017-08-28	2017-08-29	2017-08-30	2017-08-31	2017-09-01
	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)

FATHEAD MINNOW CUMULATIVE DAILY MORTALITY

Initiation Time : 15:20
Initiation Date : 2017-08-25
Completion Date : 2017-09-01

		Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Treatment Mean Mortality (± SD)
Date :		2017-08-25		2017-08-26		2017-08-27		2017-08-28		2017-08-29		2017-08-30		2017-08-31		2017-09-01		
Analyst(s):		EZ(RD)		TL		RD		EZ(RD)		EZ(RD)		EZ(RD)		NL		CG/SEW		
Concentration (%)	**Replicate**	Number Dead	**% Dead**	Number Dead	**% Dead**	Number Dead	**% Dead**	Number Dead	**% Dead**	Number Dead	**% Dead**	Number Dead	**% Dead**	Number Dead	**% Dead**	Number Dead	**% Dead**	%
	A	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
Control	B	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	**0.00 (±0.00)**
	C	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
	A	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
0.07	B	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	**0.00 (±0.00)**
	C	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
	A	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
0.24	B	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	**3.33 (±5.77)**
	C	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	1	**10**	
	A	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
0.81	B	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	**0.00 (±0.00)**
	C	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
	A	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
2.7	B	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	1	**10**	1	**10**	1	**10**	**3.33 (±5.77)**
	C	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
	A	0	**0**	0	**0**	0	**0**	1	**10**	1	**10**	1	**10**	1	**10**	1	**10**	
9	B	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	**3.33 (±5.77)**
	C	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
	A	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
30	B	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	**0.00 (±0.00)**
	C	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
	A	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	
100	B	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	**3.33 (±5.77)**
	C	0	**0**	0	**0**	0	**0**	0	**0**	0	**0**	1	**10**	1	**10**	1	**10**	

Aberrant behaviour or swimming impairment : None

Data Reviewed By: SF
Date : 2017-09-20

Work Order : 234211
Sample Number : 52038

FATHEAD MINNOW DRY WEIGHT AND BIOMASS DATA

Concentration (%)	Replicate	Number of Larvae Exposed	Replicate Mean Dry Weight (mg)	Treatment Mean Biomass (mg)	Standard Deviation
	A	10	0.855		
Control	B	10	0.780	0.818	0.038
	C	10	0.819		
	A	10	0.845		
0.07	B	10	0.779	0.802	0.037
	C	10	0.782		
	A	10	0.770		
0.24	B	10	0.710	0.709	0.061
	C	10	0.648		
	A	10	0.715		
0.81	B	10	0.831	0.741	0.080
	C	10	0.677		
	A	10	0.727		
2.7	B	10	0.730	0.758	0.051
	C	10	0.817		
	A	10	0.629		
9	B	10	0.718	0.708	0.074
	C	10	0.776		
	A	10	0.700		
30	B	10	0.694	0.734	0.064
	C	10	0.807		
	A	10	0.708		
100	B	10	0.711	0.682	0.048
	C	10	0.627[1]		

NOTES :

- [1]Outlier according to Grubbs Test[b]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.
- Control average dry weight per surviving organism = 0.818 mg

Data Reviewed By: SF

Date : 2017-09-20

Work Order : 234211
Sample Number: 52038

Fathead Minnow Water Chemistry Data

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	24.0	8.8	6.9	3140	60

		Day 0 - 1 2017-08-25	Day 1 - 2 2017-08-26	Day 2 - 3 2017-08-27	Day 3 - 4 2017-08-28	Day 4 - 5 2017-08-29	Day 5 - 6 2017-08-30	Day 6 - 7 2017-08-31
Sub-sample Used		1	1	1	2	2	3	3
Temperature (°C)		24.0	24.0	24.0	24.0	24.0	24.0	25.0
Dissolved Oxygen (mg/L)		8.8	9.5	9.9	9.4	9.5	9.6	9.6
Dissolved Oxygen % Sat.[2]		105	111	115	114	114	117	116
pH		6.9	7.0	7.0	7.0	7.0	7.0	7.1
Pre-aeration Time (min)[3]		20	20	20	20	20	20	20
Analyst(s) :	Initial	EZ(RD)	SEW	SEW	XD	EZ(RD)	EZ(RD)	EZ(RD)
	Final	SEW	SEW	XD	EZ(RD)	EZ(RD)	EZ(RD)	EZ(RD)
Control (0%)								
Temp.(°C)	Initial	24.0	24.0	24.0	25.0	24.0	24.0	25.0
	Final	24.0	24.0	24.0	24.0	24.0	24.0	24.5
DO % Sat.	Initial	96	100	98	99	99	100	100
DO (mg/L)	Initial	8.1	8.3	8.2	8.1	8.1	8.3	8.2
	Final	7.8	7.4	6.6	7.2	7.2	7.1	6.7
pH	Initial	8.3	8.3	8.3	8.3	8.2	8.3	8.3
	Final	8.1	8.1	7.8	7.9	8.1	8.0	7.9
Cond. (µmhos/cm)	Initial	678	675	673	679	683	680	711
0.07 %								
Temp.(°C)	Initial	24.0	24.0	24.0	25.0	24.0	24.0	25.0
	Final	24.0	24.0	24.0	24.0	24.0	24.0	24.5
DO (mg/L)	Initial	8.0	8.2	8.3	8.3	8.2	8.3	8.2
	Final	7.7	7.2	6.5	7.1	7.2	6.8	7.0
pH	Initial	8.2	8.2	8.4	8.2	8.1	8.3	8.5
	Final	8.1	8.1	7.8	7.9	8.1	7.9	7.9
Cond. (µmhos/cm)	Initial	682	689	683	681	727	718	738
9 %								
Temp.(°C)	Initial	24.0	24.0	24.0	25.0	24.0	24.0	25.0
	Final	24.0	24.0	24.0	24.0	24.0	24.0	24.5
DO (mg/L)	Initial	8.1	8.4	8.3	8.3	8.3	8.3	8.2
	Final	7.7	7.3	6.7	7.1	7.2	7.0	7.1
pH	Initial	8.1	8.2	8.3	8.2	8.1	8.2	8.4
	Final	8.0	8.0	7.8	7.8	7.6	7.9	7.9
Cond. (µmhos/cm)	Initial	965	976	963	963	984	986	993
100 %								
Temp.(°C)	Initial	24.0	24.0	24.0	25.0	24.0	24.0	25.0
	Final	24.0	24.0	24.0	24.0	24.0	24.0	24.5
DO (mg/L)	Initial	8.4	8.6	8.9	8.6	8.3	8.6	8.7
	Final	7.8	7.7	6.7	7.3	7.2	7.0	7.2
pH	Initial	7.3	7.5	7.4	7.5	7.6	7.6	7.5
	Final	7.5	7.7	7.5	7.5	7.6	7.5	7.5
Cond. (µmhos/cm)	Initial	3170	3180	3160	3160	3180	3190	3160

"-" = not measured

[2] % saturation (adjusted for actual temperature and barometric pressure)

[3] ≤100 bubbles/minute

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TOXICITY TEST REPORT
Pseudokirchneriella subcapitata
EPS 1/RM/25

Work Order : 234211
Sample Number : 52038

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo		
Location :	Waterloo ON	Sampled By :	SS/DS
Job Number :	L1980957	Date Collected :	2017-08-24
Substance :	L1980957-1 MS-08	Time Collected :	16:45
Sampling Method :	Grab	Date Received :	2017-08-25
Temp. on arrival :	15.0 °C	Time Received :	12:15
Sample Description :	Cloudy, pale orange, mild odour.	Date Tested :	2017-08-25

Test Method : Growth Inhibition Test Using a Freshwater Alga. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/25, 2nd ed. (March 2007).

72-h TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth)	>90.91%	-	-

The results reported relate only to the sample tested.

ZINC (AS ZINC SULPHATE) REFERENCE TOXICANT DATA

Date Tested :	2017-08-22	Statistical Method :	Nonlinear Regression (CETIS)[a]
Organism Batch :	Ps17-08	Historical Mean IC25 :	16.1 µg/L
Test Duration :	72 hours	Warning Limits (± 2SD) :	5.2 - 50.0 µg/L
IC25 Growth :	7.9 µg/L	Analyst(s) :	CZN
95% Confidence Limits :	7.0 - 8.9 µg/L		

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST ORGANISM

Test Organism :	*Pseudokirchneriella subcapitata*	Source :	In-house culture
Culture Origin :	University of Waterloo, Waterloo ON	Cell Density at 0-h :	9682 cells/mL
Strain Number :	CPCC 37	Inoculum Prepared :	00:35 h prior to test initiation
Organism Batch :	Ps17-08	Age (at start of test) :	4 days (in exponential growth)

•Algal growth curve is determined at least twice per year as required by the test method cited above.
•No unusual appearance or treatment of culture prior to testing.

TEST CONDITIONS

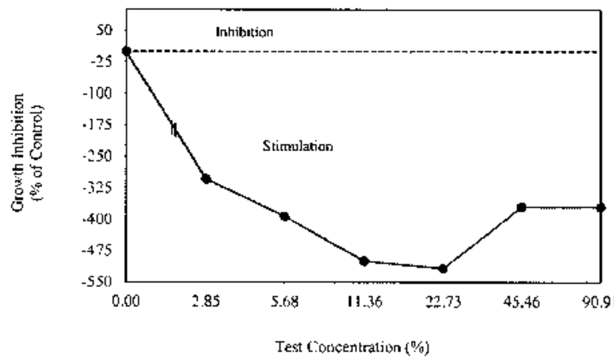
Test Type :	Static	Volume per Replicate :	220 µL
Test Duration :	72 hours	Control Replicates:	10
Mean Temperature (± SD):	24.8°C (± 0.3)	Test Replicates :	4
Sample Pre-aeration :	None	Concentrations Tested :	10 + Control
Sample Filtration :	0.45 µm preconditioned filter	Photoperiod :	Continuous light
Volume Filtered:	≥10 mL	Light Intensity :	3900-4360 lux
Control/Dilution Water :	Millipore Milli-Q (no chemicals added)	pH Adjustment :	None
Enrichment Medium :	Stock 2B: EDTA reduced to 25%	Hardness Adjustment :	None
Test Vessel :	U-shaped polystyrene microplate	Test Method Deviation(s) :	None

COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.

Work Order : 234211
Sample Number : 52038

Pseudokirchneriella subcapitata Growth Inhibition



CELL ENUMERATION AT 72-HOURS

Initiated By :	CZN	Sample pH (at 0 hours) :	7.1
Completion/Enumeration Date :	2017-08-28	Control pH (at 0 hours) :	6.5
Enumerated By :	AW	Control pH (at 72 hours) :	7.0
Enumeration Method :	Manual (haemocytometer)	Control Cell Increase Factor :	19.0 times growth

Concentration (%)	Cell Concentration (x 10000 cells/mL) Replicate 1	2	3	4	7	8	9	10	Cell Yield (x 10000 cells/mL) Mean	Standard Deviation	CV (%)	Stimulation (% of control)**
Control	24.0	20.5	16.0	15.5	22.0	17.0	17.0	15.5	17.47	3.28	18.76	–
0.18	–	–	–	–	–	–	–	–	–	–	–	–
0.35	–	–	–	–	–	–	–	–	–	–	–	–
0.71	–	–	–	–	–	–	–	–	–	–	–	–
1.42	–	–	–		–	–	–	–	–	–	–	–
2.85	68.0	72.5	74.0	–	–	–	–	–	70.53	3.12	4.43	303.75
5.68	82.0	85.0	94.0	–	–	–	–	–	86.03	6.24	7.26	392.47
11.36	90.0	105.0	122.5	–	–	–	–	–	104.87	16.27	15.51	500.28
22.73	113.0	101.0	112.5	–	–	–	–	–	107.87	6.79	6.29	517.45
45.46	83.0	81.5	85.0	–	–	–	–	–	82.20	1.76	2.14	370.53
90.91	75.5	91.0	83.0	–	–	–	–	–	82.20	7.75	9.43	370.53

NOTES : **Statistically significant stimulation, according to ANOVA/Dunnett Multiple Comparison Test (CETIS)[a], (a=0.05), with square-root transformation.
•Control replicates 5 and 6 used for pH measurement.
•The Mann-Kendall test shows that there is no inhibitory gradient (α=0.05).
•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not enumerated/not required

Data Reviewed By : JL
Date : 2017-09-21

REFERENCES

[a] CETIS™, © 2000-2013. V.1.8.7.17. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2017-09-21
yyyy-mm-dd

Approved By : [signature]
Project Manager

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TOXICITY TEST REPORT

Lemna minor
EPS 1/RM/37

Work Order : 234211
Sample Number : 52038

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Date Collected :	2017-08-24
Location :	Waterloo ON	Time Collected :	16:45
Substance :	L1980957-1 MS-08	Date Received :	2017-08-25
Job Number :	L1980957	Time Received :	12:15
Sampling Method :	Grab	Temp. on arrival :	15.0°C
Sampled By :	SS/DS	Date Tested :	2017-08-25
Sample Description :	Cloudy, pale orange, mild odour.		

Test Method : Test for Measuring the Inhibition of Growth using the Freshwater Macrophyte, *Lemna minor*. Method Development and Application Section, Environmental Technology Centre, Environment Canada. Ottawa, Ontario. Report EPS 1/RM/37, 2nd ed. (January 2007).

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Weight)	3.85%	1.71-6.10	Linear Interpolation (CETIS) a
IC25 (Frond Production)	1.73%	0.81*-4.26	Linear Interpolation (CETIS) a

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2017-09-06	Statistical Method :	Linear Interpolation (CETIS)[a]
Analyst(s) :	AS, SV	Historical Geometric Mean IC25 :	2.10 g/L
Test Duration :	7 days	Warning Limits (± 2SD) :	1.50 - 2.94 g/L
IC25 (Frond Production) :	1.85 g/L	Growth Medium :	Modified APHA
95% Confidence Limits :	1.53 - 2.32 g/L		

The reference toxicant test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Test Organism :	*Lemna minor* L., Strain 7730	Test Type :	Static (no sub-samples required)
Organism Batch :	Lm17-08	Control/Dilution Medium :	Modified APHA
Culture Origin :	UTCC 492	Medium Preparation Water :	Distilled Water
Test Organism Source :	Axenic in-house culture	Source of Water :	Morning Mist
Culture Medium :	Modified Hoaglands E+	Medium Preparation Chemicals :	Modified APHA stocks A, B, C (10 mL/L)
Age (on Test Day 0) :	10 days	Nutrient Spiking of Sample :	Modified APHA stocks A, B, C (10 mL/L)
Health Criteria (in APHA) :	16.8-fold frond increase in 7 days	Replicates per Concentration :	4
Organism Acclimation :	23:00 h in APHA medium	Test Volume per Replicate :	100 mL
Inoculum (Test Day 0) :	2 plants (3 fronds per plant)	Test Vessel :	250 mL glass Erlenmeyer flask
Sample Filtration :	1 µm (Whatman GF/C)	Depth of Test Solution :	4.0 cm
Sample Pre-aeration :	20 min. at ≤100 bubbles/min.	Photoperiod/Light Intensity :	Continuous, 4680 - 5370 lux
pH Adjustment :	None	Test Method Deviation(s) :	None
Hardness Adjustment :	None		

COMMENTS

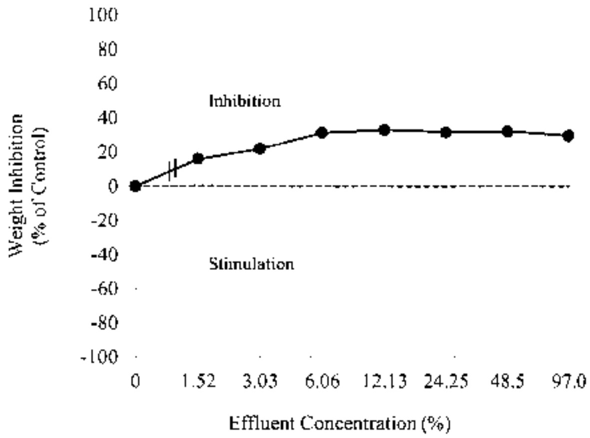
*Note: The lower confidence limit for IC25 (frond count) was less than the lowest concentration tested (1.56%).

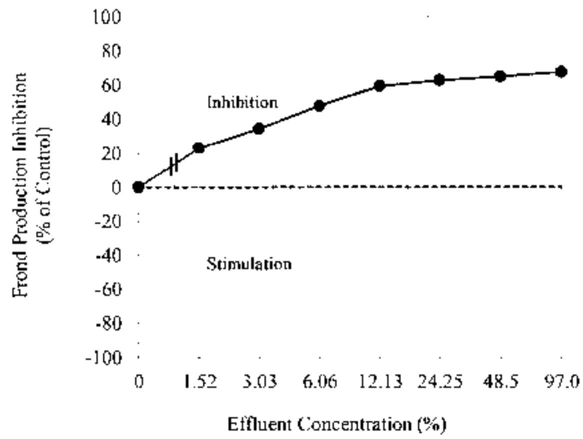
•All test validity criteria as specified in the test method cited above were satisfied.

•Statistical analysis could not be performed using non linear regression, since a suitable model could not be found. Therefore, test results were calculated using Linear Interpolation (CETIS)[a].

Work Order : 234211
Sample Number : 52038

Lemna minor Growth Inhibition





TEST MONITORING

Initiation Date : 2017-08-25
Intitiation Time : 14:30
Initiated By : AS

Termination Date : 2017-09-01
Termination Time : 13:30
Terminated By : SEW

Temperature Monitoring

Test Day	Date	Temperature (°C)
0 (unmodified sample)	2017-08-25	25.0
0	2017-08-25	24.0
1	2017-08-26	24.0
2	2017-08-27	24.0
3	2017-08-28	24.0
4	2017-08-29	24.0
5	2017-08-30	24.0
6	2017-08-31	24.0
7	2017-09-01	24.0

pH Monitoring

Concentration (%)	Day 0	Day 7
100 (unmodified sample)	7.1	–
Control	8.3	8.4
1.52	8.2	8.4
3.03	-	-
6.06	-	-
12.13	8.1	8.4
24.25	-	-
48.5	-	-
97.0	7.7	8.4

"–" = not required

REFERENCES

[a] CETIS™, © 2000-2013. V.1.8.7.17. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2017-09-21
yyyy-mm-dd

Approved By:
Project Manager

Lemna minor Frond Increase

Concentration (%)	Replicate	Frond Count Day 0*	Frond Count Day 7	Frond Increase	Mean Frond Increase	Standard Deviation	CV (%)	Frond/Root Appearance (Day 7)
	A	6	91	85				
Control	B	6	93	87	81.50	6.19	7.6	Fronds healthy, appearance normal in all replicates.
	C	6	87	81				
	D	6	79	73				
	A	6	67	61				
1.52	B	6	63	57	62.75	4.65	7.4	Fronds healthy, appearance normal in all replicates.
	C	6	73	67				
	D	6	72	66				
	A	6	75	69[1]				
3.03	B	6	59	53	53.50	11.59	21.7	Fronds healthy, appearance normal in all replicates.
	C	6	57	51				
	D	6	47	41				
	A	6	55	49				
6.06	B	6	51	45	42.50	5.51	13.0	Fronds healthy, appearance normal in all replicates.
	C	6	45	39				
	D	6	43	37				
	A	6	38	32				
12.13	B	6	36	30	33.00	2.45	7.4	Fronds smaller and pale with some chlorosis in all replicates.
	C	6	41	35				
	D	6	41	35				
	A	6	38	32				
24.25	B	6	36	30	30.25	3.10	10.2	Fronds smaller and pale with short roots and some chlorosis in all replicates.
	C	6	39	33				
	D	6	32	26				
	A	6	35	29				
48.5	B	6	36	30	28.50	3.87	13.6	Fronds smaller and pale with short roots and some chlorosis and slight necrosis in all replicates.
	C	6	38	32				
	D	6	29	23				
	A	6	28	22				
97.0	B	6	34	28	26.25	2.87	10.9	Fronds smaller and pale with short roots and some chlorosis and slight necrosis in all replicates.
	C	6	33	27				
	D	6	34	28				

NOTES: *No unusual appearance or treatment of culture prior to testing. Test inoculated with healthy plants.

•No stimulation of frond increase compared to the control was observed at any test level.

•A 14.6-fold increase in frond number was observed in the control over the testing period.

• [1]Outlier according to Grubbs Test (CETIS)[a]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.

"–" = not available/not required

Test Data Reviewed By : SF
Date : 2017-09-21

Work Order : 234211
Sample Number : 52038

Lemna minor Frond Weight Data

Concentration (%)	Replicate	Dry Weight of Fronds (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation
Control	A	10.20	9.85	0.35
	B	10.06		
	C	9.72		
	D	9.43		
1.52	A	8.26	8.30	0.60
	B	7.66		
	C	9.11		
	D	8.15		
3.03	A	8.59	7.69	0.69
	B	7.17		
	C	7.88		
	D	7.13		
6.06	A	7.22	6.78	0.39
	B	6.99		
	C	6.40		
	D	6.49		
12.13	A	6.27	6.61	0.51
	B	7.22		
	C	6.12		
	D	6.83		
24.25	A	6.79	6.73	0.65
	B	6.99		
	C	7.33		
	D	5.82		
48.5	A	6.46	6.71	0.40
	B	7.02		
	C	7.08		
	D	6.27		
97.0	A	6.64	6.94	0.27
	B	7.22		
	C	7.12		
	D	6.79		

NOTES :
- •No stimulation of weight compared to the control was observed at any test level.
- •No outlying data points were detected according to Grubbs Test (CETIS)[a].

"- " = not available/not required

Test Data Reviewed By : SF
Date : 2017-09-21

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 234211

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 Fax: (519) 763-4419

P.O. Number:	4500017476
Field Sampler Name (print):	SS/DS
Signature:	
Affiliation:	ALS ENV
Sample Storage (prior to shipping):	
Custody Relinquished by:	RH/CD
Date/Time Shipped:	25 Aug 17

Client	ALS Environmental Waterloo Q# 162705399-15
Phone:	519-886-6910
Fax:	519-886-9047
Contact:	Wayne Smith / Rick Hawthorne

Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	Daphnia magna Single Concentration	Daphnia magna LC50	Fathead Minnow Survival & Growth	Ceriodaphnia dubia Survival & Reproduction	Lemna minor Growth	Pseudokirchneriella subcapitata Growth	Other (please specify below) RISS	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
		L1980957-1														
2017-08-24	1645	MS-08	52038	15.0	X		X		X	X	X	X	X			1 Pail, 3 bladders
																"GRAB" as per label RP
		Bladder temp = 15.0°C														
		Pail temp = 15.0°C														plus 1x2L jar
		TL														RP

For Lab Use Only	
Received By:	TL/RP
Date:	2017-08-25
Time:	12:15
Storage Location:	
Storage Temp.(°C)	

CN

Please list any special requests or instructions:
~~Regular~~ BaFinland Toxicity Tests
Rush RBT/Daphnia Test w/weekend updates
Plus MMER Toxicity for Sublethal RISS Reporting

Standard COC rev 3 2016 09 01 TC

ALS Environmental

L1980957

WATERLOO

Subcontract Request Form

Subcontract To:

AQUATOX TESTING AND CONSULTING
11B NICHOLAS BEAVER ROAD
RR3
GUELPH,ON N1H 6H9

NOTES: Please reference on final report and invoice: PO# *L1980957*
ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 0 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1980957-1 MS-08		8/ 24/ 2017	E2
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	8/31/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	8/31/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______________ Date Shipped: ______________

Received By: ______________ Date Received: ______________

Verified By: ______________ Date Verified: ______________

Temperature: ______________

Sample Integrity Issues: ______________

Wednesday, September 13, 2017

Rick Hawthorne
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1708617
Project Name:
Project Number: L1980957

Dear Mr. Hawthorne:

One water sample was received from ALS Environmental, on 8/30/2017. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1708617

Radium-226:
The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1708617
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1980957
Client PO Number: L1980957

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1980957-1	1708617-1		WATER	24-Aug-17	

L1980957

1708617 WATERLOO

(ALS) Environmental

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# *L1980957*
ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 1 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
(1) **L1980957-1 MS-08**		8/ 24/ 2017	E2
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/13/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______ Date Shipped: ______

Received By: [signature] Date Received: 8/30/17 950

Verified By: ______ Date Verified: ______

Temperature: ______

Sample Integrity Issues: ______

Saturday, August 26, 2017 11:56 AM

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS Canada Workorder No: 1708617

Project Manager: SSS Initials: JC Date: 8/30/17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are Custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5. Are the COC and bottle labels complete and legible?		YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		YES	NO
12. Are all samples within holding times for the requested analyses?		YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	N/A	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	NO
16. Were the samples shipped on ice?		YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	NO

Cooler #:	~~Amb~~ 1						
Temperature (°C):	Amb						
No. of custody seals on cooler:	0						
DOT Survey/ Acceptance Information — External µR/hr reading:	9						
Background µR/hr reading:	11						

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

All ice melted

pH was 2.2 add 0.5ml HNO3 (Lot # 152495)
Final pH 1.9

If applicable, was the client contacted? YES / NO / NA Contact: ____________ Date/Time: ________

Project Manager Signature / Date: Shiloh Lessing

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

ORIGIN ID:YKFA (519) 886-6910
EDWARD HILL
ALS ENVIRONMENTAL
60 NORTHLAND RD.

WATERLOO, ON N2V2B8
CANADA CA

SHIP DATE: 28AUG17
ACTWGT: 15.00 KG
CAD: 110458504/INET3920
DIMS: 38x30x36 CM

BILL SENDER

TO SAMPLE LOGIN
ALS ENVIRONMENTAL FORT COLLINS
225 COMMERCE DRIVE

FORT COLLINS CO 80524 (US)
(800) 443-1611
INV:
PO:
REF:
DEPT:

2-D
Amy

FedEx
Express

E

10:30A
INTL PRIORITY

TRK# 0430 7701 2703 2099

XH FTCA

80524
CO-US DEN

Client:	ALS Environmental	**Date:**	*13-Sep-17*
Project:	L1980957	**Work Order:**	1708617
Sample ID:	L1980957-1	**Lab ID:**	1708617-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/24/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **8/31/2017**	PrepBy: **HCJ**
Ra-226	**0.030 (+/- 0.011)**	Y1	**0.0083**	**BQ/l**	NA	9/12/2017 11:38
Carr: BARIUM	*105*	Y1	*40-110*	*%REC*	DL = NA	9/12/2017 11:38

Client:	ALS Environmental	**Date:**	*13-Sep-17*
Project:	L1980957	**Work Order:**	1708617
Sample ID:	L1980957-1	**Lab ID:**	1708617-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/24/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Client: ALS Environmental
Work Order: 1708617
Project: L1980957

QC BATCH REPORT

Batch ID: **RE170831-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170831-1** Units: **BQ/l** Analysis Date: **9/12/2017 12:10**
Client ID: Run ID: **RE170831-1A** Prep Date: **8/31/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.80 (+/- 0.446)	0.00802	1.715		105	67-120					P
Carr: BARIUM	15300		16180		94.4	40-110					

LCSD Sample ID: **RE170831-1** Units: **BQ/l** Analysis Date: **9/12/2017 12:10**
Client ID: Run ID: **RE170831-1A** Prep Date: **8/31/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.67 (+/- 0.412)	0.0104	1.715		97.2	67-120		1.8	0.2	2.1	P,M3
Carr: BARIUM	15700		16190		96.7	40-110		15300			

MB Sample ID: **RE170831-1** Units: **BQ/l** Analysis Date: **9/12/2017 12:10**
Client ID: Run ID: **RE170831-1A** Prep Date: **8/31/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.00055 (+/- 0.0045)	0.0087									U
Carr: BARIUM	14900		16190		92.1	40-110					

The following samples were analyzed in this batch: 1708617-1

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1980957-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	647-253-0596 EXT 6010
	Company address below will appear on the final report
Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bimcore@alsglobal.com

Email 2 bimww@alsglobal.com

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax ap@baffinland.com

Email 2 commercial@baffinland.com

Select Service Level all E&P TATs with your AM - surcharges will apply

Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐; 3 day [P3] ☐; 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐; Same Day, Weekend or Statutory holiday [E0] ☑

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	23642 /Q42455
Job #:	MS-06
PO / AFE:	4500027854
LSD:	
ALS Lab Work Order # (lab use only)	L1980957 RH

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler: SS/DS

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	BIM-MMER-WT	Group 3	Sublethal Toxicity	Number of Containers
	MS-06	24-Aug-17	16:45	Water	E0	E0	E0	11

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C | FINAL COOLER TEMPERATURES °C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: B.WIDDOWSON	Date: 17 08 24	Time: 17:36	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

DA

Baffinland Iron Mine’s Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 02-SEP-17
Report Date: 22-SEP-17 12:55 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1985509
Project P.O. #: 4500027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1985509-1 MS-08 Sampled By: SS/TB on 30-AUG-17 @ 18:05 Matrix: WATER							
Physical Tests							
pH	6.43		0.10	pH units		02-SEP-17	R3817533
Total Suspended Solids	29.6		2.0	mg/L	05-SEP-17	06-SEP-17	R3820470
Total Dissolved Solids	2940	DLDS	20	mg/L		03-SEP-17	R3817984
Turbidity	95.1	PEHR	0.10	NTU		02-SEP-17	R3817708
L1985509-2 MS-08-DISCHARGE Sampled By: SS/TB on 30-AUG-17 @ 18:15 Matrix: WATER							
Physical Tests							
pH	6.39		0.10	pH units		02-SEP-17	R3817533
Total Suspended Solids	27.7		2.0	mg/L	05-SEP-17	06-SEP-17	R3820470
Total Dissolved Solids	2960	DLDS	20	mg/L		03-SEP-17	R3817984
Turbidity	83.9	PEHR	0.10	NTU		02-SEP-17	R3817708
L1985509-3 MS-08 Sampled By: SS/TB on 30-AUG-17 @ 11:50 Matrix: WATER							
Physical Tests							
Conductivity	2850		3.0	umhos/cm		05-SEP-17	R3819367
pH	6.50		0.10	pH units		02-SEP-17	R3817533
Total Suspended Solids	26.3		2.0	mg/L	05-SEP-17	06-SEP-17	R3820470
Total Dissolved Solids	2810	DLM	80	mg/L		05-SEP-17	R3820567
Turbidity	78.3	PEHR	0.10	NTU		02-SEP-17	R3817708
Cyanides							
Cyanide, Total	0.0078		0.0020	mg/L		05-SEP-17	R3819126
Total Metals							
Aluminum (Al)-Total	0.324	DLHC	0.050	mg/L	05-SEP-17	05-SEP-17	R3820163
Antimony (Sb)-Total	<0.0010	DLHC	0.0010	mg/L	05-SEP-17	05-SEP-17	R3820163
Arsenic (As)-Total	<0.0010	DLHC	0.0010	mg/L	05-SEP-17	05-SEP-17	R3820163
Barium (Ba)-Total	0.0295	DLHC	0.0020	mg/L	05-SEP-17	05-SEP-17	R3820163
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	05-SEP-17	05-SEP-17	R3820163
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	05-SEP-17	05-SEP-17	R3820163
Boron (B)-Total	<0.10	DLHC	0.10	mg/L	05-SEP-17	05-SEP-17	R3820163
Cadmium (Cd)-Total	0.00025	DLHC	0.00010	mg/L	05-SEP-17	05-SEP-17	R3820163
Calcium (Ca)-Total	86.3	DLHC	5.0	mg/L	05-SEP-17	05-SEP-17	R3820163
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	05-SEP-17	05-SEP-17	R3820163
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	05-SEP-17	05-SEP-17	R3820163
Cobalt (Co)-Total	0.242	DLHC	0.0010	mg/L	05-SEP-17	05-SEP-17	R3820163
Copper (Cu)-Total	<0.010	DLHC	0.010	mg/L	05-SEP-17	05-SEP-17	R3820163
Iron (Fe)-Total	12.4	DLHC	0.50	mg/L	05-SEP-17	05-SEP-17	R3820163
Lead (Pb)-Total	0.00080	DLHC	0.00050	mg/L	05-SEP-17	05-SEP-17	R3820163
Lithium (Li)-Total	0.022	DLHC	0.010	mg/L	05-SEP-17	05-SEP-17	R3820163
Magnesium (Mg)-Total	404	DLHC	0.50	mg/L	05-SEP-17	05-SEP-17	R3820163
Manganese (Mn)-Total	16.6	DLHC	0.0050	mg/L	05-SEP-17	05-SEP-17	R3820163

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1985509-3 MS-08 Sampled By: SS/TB on 30-AUG-17 @ 11:50 Matrix: WATER							
Total Metals							
Molybdenum (Mo)-Total	<0.00050	DLHC	0.00050	mg/L	05-SEP-17	05-SEP-17	R3820163
Nickel (Ni)-Total	0.261	DLHC	0.0050	mg/L	05-SEP-17	05-SEP-17	R3820163
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	05-SEP-17	05-SEP-17	R3820163
Potassium (K)-Total	3.07	DLHC	0.50	mg/L	05-SEP-17	05-SEP-17	R3820163
Rubidium (Rb)-Total	0.0054	DLHC	0.0020	mg/L	05-SEP-17	05-SEP-17	R3820163
Selenium (Se)-Total	0.00410	DLHC	0.00050	mg/L	05-SEP-17	05-SEP-17	R3820163
Silicon (Si)-Total	1.2	DLHC	1.0	mg/L	05-SEP-17	05-SEP-17	R3820163
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	05-SEP-17	05-SEP-17	R3820163
Sodium (Na)-Total	65.6	DLHC	5.0	mg/L	05-SEP-17	05-SEP-17	R3820163
Strontium (Sr)-Total	0.059	DLHC	0.010	mg/L	05-SEP-17	05-SEP-17	R3820163
Sulfur (S)-Total	650	DLHC	5.0	mg/L	05-SEP-17	05-SEP-17	R3820163
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	05-SEP-17	05-SEP-17	R3820163
Thallium (Tl)-Total	0.00016	DLHC	0.00010	mg/L	05-SEP-17	05-SEP-17	R3820163
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	05-SEP-17	05-SEP-17	R3820163
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	05-SEP-17	05-SEP-17	R3820163
Titanium (Ti)-Total	<0.0050	DLUI	0.0050	mg/L	05-SEP-17	05-SEP-17	R3820163
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	05-SEP-17	05-SEP-17	R3820163
Uranium (U)-Total	0.00151	DLHC	0.00010	mg/L	05-SEP-17	05-SEP-17	R3820163
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	05-SEP-17	05-SEP-17	R3820163
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	05-SEP-17	05-SEP-17	R3820163
Zirconium (Zr)-Total	<0.0030	DLHC	0.0030	mg/L	05-SEP-17	05-SEP-17	R3820163
Radiological Parameters							
Ra-226	0.023		0.0070	Bq/L	11-SEP-17	19-SEP-17	R3822525
L1985509-4 MS-08-DISCHARGE Sampled By: SS/TB on 30-AUG-17 @ 12:15 Matrix: WATER							
Physical Tests							
pH	6.44		0.10	pH units		02-SEP-17	R3817533
Total Suspended Solids	27.1		2.0	mg/L	05-SEP-17	06-SEP-17	R3820470
Total Dissolved Solids	2540	DLDS	20	mg/L		03-SEP-17	R3817984
Turbidity	87.3	PEHR	0.10	NTU		02-SEP-17	R3817708

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Aluminum (Al)-Total	MS-B	L1985509-3
Matrix Spike	Barium (Ba)-Total	MS-B	L1985509-3
Matrix Spike	Calcium (Ca)-Total	MS-B	L1985509-3
Matrix Spike	Cobalt (Co)-Total	MS-B	L1985509-3
Matrix Spike	Iron (Fe)-Total	MS-B	L1985509-3
Matrix Spike	Lithium (Li)-Total	MS-B	L1985509-3
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1985509-3
Matrix Spike	Manganese (Mn)-Total	MS-B	L1985509-3
Matrix Spike	Nickel (Ni)-Total	MS-B	L1985509-3
Matrix Spike	Potassium (K)-Total	MS-B	L1985509-3
Matrix Spike	Rubidium (Rb)-Total	MS-B	L1985509-3
Matrix Spike	Silicon (Si)-Total	MS-B	L1985509-3
Matrix Spike	Sodium (Na)-Total	MS-B	L1985509-3
Matrix Spike	Strontium (Sr)-Total	MS-B	L1985509-3
Matrix Spike	Sulfur (S)-Total	MS-B	L1985509-3
Matrix Spike	Uranium (U)-Total	MS-B	L1985509-3
Matrix Spike	Zinc (Zn)-Total	MS-B	L1985509-3

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.

Test Method References:

<table>
<tr><th>ALS Test Code</th><th>Matrix</th><th>Test Description</th><th>Method Reference**</th></tr>
<tr><td>CN-TOT-WT</td><td>Water</td><td>Cyanide, Total</td><td>ISO 14403-2</td></tr>
<tr><td colspan="4">Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference</td></tr>
<tr><td>EC-WT</td><td>Water</td><td>Conductivity</td><td>APHA 2510 B</td></tr>
<tr><td colspan="4">Water samples can be measured directly by immersing the conductivity cell into the sample.</td></tr>
<tr><td>MET-T-CCMS-WT</td><td>Water</td><td>Total Metals by CRC ICPMS</td><td>EPA 200.2/6020A (mod)</td></tr>
<tr><td colspan="4">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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>PH-WT</td><td>Water</td><td>pH</td><td>APHA 4500 H-Electrode</td></tr>
<tr><td colspan="4">Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days</td></tr>
<tr><td>RA226-MMER-FC</td><td>Water</td><td>Ra226 by Alpha Scint, MDC=0.01 Bq/L</td><td>EPA 903.1</td></tr>
<tr><td>SOLIDS-TDS-WT</td><td>Water</td><td>Total Dissolved Solids</td><td>APHA 2540C</td></tr>
<tr><td colspan="4">A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5C overnight and then 180–10C for 1hr.</td></tr>
<tr><td>SOLIDS-TSS-WT</td><td>Water</td><td>Suspended solids</td><td>APHA 2540 D-Gravimetric</td></tr>
<tr><td colspan="4">A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1C for a minimum of four hours or until a constant weight is achieved.</td></tr>
<tr><td>TURBIDITY-WT</td><td>Water</td><td>Turbidity</td><td>APHA 2130 B</td></tr>
</table>

Reference Information

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
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 weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
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.

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-TOT-WT	**Water**							
Batch R3819126								
WG2608454-3 DUP		**L1985172-1**						
Cyanide, Total		0.0070	0.0072		mg/L	1.7	20	05-SEP-17
WG2608454-2 LCS								
Cyanide, Total			92.5		%		80-120	05-SEP-17
WG2608454-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	05-SEP-17
WG2608454-4 MS		**L1985172-1**						
Cyanide, Total			88.5		%		70-130	05-SEP-17
EC-WT	**Water**							
Batch R3819367								
WG2608464-12 DUP		**WG2608464-11**						
Conductivity		1230	1240		umhos/cm	0.2	10	05-SEP-17
WG2608464-10 LCS								
Conductivity			101.7		%		90-110	05-SEP-17
WG2608464-9 MB								
Conductivity			<3.0		umhos/cm		3	05-SEP-17
MET-T-CCMS-WT	**Water**							
Batch R3820163								
WG2608302-4 DUP		**WG2608302-3**						
Aluminum (Al)-Total		0.324	0.344		mg/L	6.2	20	05-SEP-17
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	05-SEP-17
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	05-SEP-17
Barium (Ba)-Total		0.0295	0.0290		mg/L	1.6	20	05-SEP-17
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	05-SEP-17
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	05-SEP-17
Boron (B)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	05-SEP-17
Cadmium (Cd)-Total		0.00025	0.00025		mg/L	0.7	20	05-SEP-17
Calcium (Ca)-Total		86.3	86.5		mg/L	0.2	20	05-SEP-17
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	05-SEP-17
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	05-SEP-17
Cobalt (Co)-Total		0.242	0.244		mg/L	0.5	20	05-SEP-17
Copper (Cu)-Total		<0.010	0.010	RPD-NA	mg/L	N/A	20	05-SEP-17
Iron (Fe)-Total		12.4	12.8		mg/L	3.5	20	05-SEP-17
Lead (Pb)-Total		0.00080	0.00061	J	mg/L	0.00019	0.001	05-SEP-17
Lithium (Li)-Total		0.022	0.022		mg/L	1.5	20	05-SEP-17

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3820163								
WG2608302-4 DUP		**WG2608302-3**						
Magnesium (Mg)-Total		404	421		mg/L	4.1	20	05-SEP-17
Manganese (Mn)-Total		16.6	16.9		mg/L	1.3	20	05-SEP-17
Molybdenum (Mo)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	05-SEP-17
Nickel (Ni)-Total		0.261	0.264		mg/L	1.4	20	05-SEP-17
Phosphorus (P)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	05-SEP-17
Potassium (K)-Total		3.07	3.11		mg/L	1.3	20	05-SEP-17
Rubidium (Rb)-Total		0.0054	0.0056		mg/L	5.0	20	05-SEP-17
Selenium (Se)-Total		0.00410	0.00425		mg/L	3.5	20	05-SEP-17
Silicon (Si)-Total		1.2	1.2		mg/L	3.8	20	05-SEP-17
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	05-SEP-17
Sodium (Na)-Total		65.6	65.4		mg/L	0.3	20	05-SEP-17
Strontium (Sr)-Total		0.059	0.057		mg/L	2.2	20	05-SEP-17
Sulfur (S)-Total		650	651		mg/L	0.2	25	05-SEP-17
Thallium (Tl)-Total		0.00016	<0.00010	RPD-NA	mg/L	N/A	20	05-SEP-17
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	05-SEP-17
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	25	05-SEP-17
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	05-SEP-17
Titanium (Ti)-Total		<0.0050	<0.0050	RPD-NA	mg/L	0.0	20	05-SEP-17
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	05-SEP-17
Uranium (U)-Total		0.00151	0.00144		mg/L	4.9	20	05-SEP-17
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	05-SEP-17
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	05-SEP-17
Zirconium (Zr)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	05-SEP-17
WG2608302-2 LCS								
Aluminum (Al)-Total			107.9		%		80-120	05-SEP-17
Antimony (Sb)-Total			105.4		%		80-120	05-SEP-17
Arsenic (As)-Total			107.9		%		80-120	05-SEP-17
Barium (Ba)-Total			109.8		%		80-120	05-SEP-17
Beryllium (Be)-Total			99.7		%		80-120	05-SEP-17
Bismuth (Bi)-Total			104.7		%		80-120	05-SEP-17
Boron (B)-Total			101.3		%		80-120	05-SEP-17
Cadmium (Cd)-Total			105.5		%		80-120	05-SEP-17
Calcium (Ca)-Total			102.4		%		80-120	05-SEP-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3820163								
WG2608302-2 LCS								
Chromium (Cr)-Total			105.7		%		80-120	05-SEP-17
Cesium (Cs)-Total			107.4		%		80-120	05-SEP-17
Cobalt (Co)-Total			105.2		%		80-120	05-SEP-17
Copper (Cu)-Total			105.1		%		80-120	05-SEP-17
Iron (Fe)-Total			98.1		%		80-120	05-SEP-17
Lead (Pb)-Total			104.2		%		80-120	05-SEP-17
Lithium (Li)-Total			96.9		%		80-120	05-SEP-17
Magnesium (Mg)-Total			112.4		%		80-120	05-SEP-17
Manganese (Mn)-Total			107.6		%		80-120	05-SEP-17
Molybdenum (Mo)-Total			105.1		%		80-120	05-SEP-17
Nickel (Ni)-Total			105.1		%		80-120	05-SEP-17
Phosphorus (P)-Total			115.6		%		70-130	05-SEP-17
Potassium (K)-Total			101.8		%		80-120	05-SEP-17
Rubidium (Rb)-Total			105.4		%		80-120	05-SEP-17
Selenium (Se)-Total			97.8		%		80-120	05-SEP-17
Silicon (Si)-Total			107.9		%		60-140	05-SEP-17
Silver (Ag)-Total			107.7		%		80-120	05-SEP-17
Sodium (Na)-Total			106.5		%		80-120	05-SEP-17
Strontium (Sr)-Total			101.3		%		80-120	05-SEP-17
Sulfur (S)-Total			99.3		%		70-130	05-SEP-17
Thallium (Tl)-Total			104.8		%		80-120	05-SEP-17
Tellurium (Te)-Total			103.3		%		80-120	05-SEP-17
Thorium (Th)-Total			103.9		%		70-130	05-SEP-17
Tin (Sn)-Total			104.2		%		80-120	05-SEP-17
Titanium (Ti)-Total			106.3		%		80-120	05-SEP-17
Tungsten (W)-Total			106.2		%		80-120	05-SEP-17
Uranium (U)-Total			104.8		%		80-120	05-SEP-17
Vanadium (V)-Total			107.8		%		80-120	05-SEP-17
Zinc (Zn)-Total			100.1		%		80-120	05-SEP-17
Zirconium (Zr)-Total			104.2		%		80-120	05-SEP-17
WG2608302-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	05-SEP-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	05-SEP-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	05-SEP-17

ALS Environmental

Quality Control Report

Workorder: L1985509 Report Date: 22-SEP-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3820163								
WG2608302-1 MB								
Barium (Ba)-Total			<0.00020		mg/L		0.0002	05-SEP-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	05-SEP-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	05-SEP-17
Boron (B)-Total			<0.010		mg/L		0.01	05-SEP-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	05-SEP-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	05-SEP-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	05-SEP-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	05-SEP-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	05-SEP-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	05-SEP-17
Iron (Fe)-Total			<0.050		mg/L		0.05	05-SEP-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	05-SEP-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	05-SEP-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	05-SEP-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	05-SEP-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	05-SEP-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	05-SEP-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	05-SEP-17
Potassium (K)-Total			<0.050		mg/L		0.05	05-SEP-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	05-SEP-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	05-SEP-17
Silicon (Si)-Total			<0.10		mg/L		0.1	05-SEP-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	05-SEP-17
Sodium (Na)-Total			<0.50		mg/L		0.5	05-SEP-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	05-SEP-17
Sulfur (S)-Total			<0.50		mg/L		0.5	05-SEP-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	05-SEP-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	05-SEP-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	05-SEP-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	05-SEP-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	05-SEP-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	05-SEP-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	05-SEP-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3820163								
WG2608302-1 MB								
Vanadium (V)-Total			<0.00050		mg/L		0.0005	05-SEP-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	05-SEP-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	05-SEP-17
WG2608302-5 MS		**WG2608302-3**						
Aluminum (Al)-Total			N/A	MS-B	%		-	05-SEP-17
Antimony (Sb)-Total			99.4		%		70-130	05-SEP-17
Arsenic (As)-Total			104.5		%		70-130	05-SEP-17
Barium (Ba)-Total			N/A	MS-B	%		-	05-SEP-17
Beryllium (Be)-Total			95.7		%		70-130	05-SEP-17
Bismuth (Bi)-Total			99.6		%		70-130	05-SEP-17
Boron (B)-Total			94.7		%		70-130	05-SEP-17
Cadmium (Cd)-Total			103.6		%		70-130	05-SEP-17
Calcium (Ca)-Total			N/A	MS-B	%		-	05-SEP-17
Chromium (Cr)-Total			104.7		%		70-130	05-SEP-17
Cesium (Cs)-Total			101.2		%		70-130	05-SEP-17
Cobalt (Co)-Total			N/A	MS-B	%		-	05-SEP-17
Copper (Cu)-Total			97.9		%		70-130	05-SEP-17
Iron (Fe)-Total			N/A	MS-B	%		-	05-SEP-17
Lead (Pb)-Total			98.3		%		70-130	05-SEP-17
Lithium (Li)-Total			N/A	MS-B	%		-	05-SEP-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	05-SEP-17
Manganese (Mn)-Total			N/A	MS-B	%		-	05-SEP-17
Molybdenum (Mo)-Total			102.5		%		70-130	05-SEP-17
Nickel (Ni)-Total			N/A	MS-B	%		-	05-SEP-17
Phosphorus (P)-Total			114.9		%		70-130	05-SEP-17
Potassium (K)-Total			N/A	MS-B	%		-	05-SEP-17
Rubidium (Rb)-Total			N/A	MS-B	%		-	05-SEP-17
Selenium (Se)-Total			103.1		%		70-130	05-SEP-17
Silicon (Si)-Total			N/A	MS-B	%		-	05-SEP-17
Silver (Ag)-Total			101.0		%		70-130	05-SEP-17
Sodium (Na)-Total			N/A	MS-B	%		-	05-SEP-17
Strontium (Sr)-Total			N/A	MS-B	%		-	05-SEP-17
Sulfur (S)-Total			N/A	MS-B	%		-	05-SEP-17
Thallium (Tl)-Total			99.8		%		70-130	05-SEP-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3820163								
WG2608302-5 MS		**WG2608302-3**						
Tellurium (Te)-Total			109.7		%		70-130	05-SEP-17
Thorium (Th)-Total			97.6		%		70-130	05-SEP-17
Tin (Sn)-Total			99.6		%		70-130	05-SEP-17
Titanium (Ti)-Total			109.1		%		70-130	05-SEP-17
Tungsten (W)-Total			102.5		%		70-130	05-SEP-17
Uranium (U)-Total			N/A	MS-B	%		-	05-SEP-17
Vanadium (V)-Total			103.7		%		70-130	05-SEP-17
Zinc (Zn)-Total			N/A	MS-B	%		-	05-SEP-17
Zirconium (Zr)-Total			93.8		%		70-130	05-SEP-17
PH-WT	**Water**							
Batch R3817533								
WG2607882-5 DUP		**L1985435-1**						
pH		8.64	8.67	J	pH units	0.03	0.2	02-SEP-17
WG2607882-4 LCS								
pH			7.01		pH units		6.9-7.1	02-SEP-17
SOLIDS-TDS-WT	**Water**							
Batch R3817984								
WG2608089-3 DUP		**L1985509-1**						
Total Dissolved Solids		2940	2920		mg/L	0.7	20	03-SEP-17
WG2608089-2 LCS								
Total Dissolved Solids			101.5		%		85-115	03-SEP-17
WG2608089-1 MB								
Total Dissolved Solids			<10		mg/L		10	03-SEP-17
Batch R3820567								
WG2608467-3 DUP		**L1985509-3**						
Total Dissolved Solids		2810	2830		mg/L	0.7	20	05-SEP-17
WG2608467-2 LCS								
Total Dissolved Solids			100.6		%		85-115	05-SEP-17
WG2608467-1 MB								
Total Dissolved Solids			<10		mg/L		10	05-SEP-17
SOLIDS-TSS-WT	**Water**							
Batch R3820470								
WG2608348-3 DUP		**L1983769-1**						
Total Suspended Solids		348	317		mg/L	9.5	20	06-SEP-17
WG2608348-2 LCS								

ALS Environmental

Quality Control Report

Workorder: L1985509 Report Date: 22-SEP-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TSS-WT	**Water**							
Batch R3820470								
WG2608348-2 LCS								
Total Suspended Solids			97.9		%		85-115	06-SEP-17
WG2608348-1 MB								
Total Suspended Solids			<2.0		mg/L		2	06-SEP-17
TURBIDITY-WT	**Water**							
Batch R3817708								
WG2608020-3 DUP		**L1985509-1**						
Turbidity		95.1	94.2		NTU	1.0	15	02-SEP-17
WG2608020-2 LCS								
Turbidity			99.8		%		85-115	02-SEP-17
WG2608020-1 MB								
Turbidity			<0.10		NTU		0.1	02-SEP-17

Quality Control Report

Workorder: L1985509 Report Date: 22-SEP-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity							
	1	30-AUG-17 18:05	02-SEP-17 00:00	48	54	hours	EHTR
	2	30-AUG-17 18:15	02-SEP-17 00:00	48	54	hours	EHTR
	3	30-AUG-17 11:50	02-SEP-17 00:00	48	60	hours	EHTR
	4	30-AUG-17 12:15	02-SEP-17 00:00	48	60	hours	EHTR

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1985509 were received on 02-SEP-17 13:50.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Wednesday, September 20, 2017

Rick Hawthorne
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1709138
Project Name:
Project Number: L1985509

Dear Mr. Hawthorne:

One water sample was received from ALS Environmental, on 9/7/2017. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1709138

Radium-226:
The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1709138
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1985509
Client PO Number: L1985509

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1985509-3	1709138-1		WATER	30-Aug-17	

1709138

L1985509

WATERLOO

ALS Environmental

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# *L1985509*
ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 1 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1985509-3 MS-08		8/ 30/ 2017	E1
1	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/21/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______ Date Shipped: ______

Received By: JAvery Date Received: 9/7/17 @ 1140

Verified By: ______ Date Verified: ______

Temperature: ______

Sample Integrity Issues: ______

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS WATERLOO Workorder No: 1709138

Project Manager: SSS Initials: JA Date: 9/7/17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are Custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5. Are the COC and bottle labels complete and legible?		YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		YES	NO
12. Are all samples within holding times for the requested analyses?		YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ___ < green pea ___ > green pea	N/A	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ___ dusting ___ moderate ___ heavy	N/A	YES	NO
16. Were the samples shipped on ice?		YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	NO

Cooler #:	1							
Temperature (°C):	7.8							
No. of custody seals on cooler:	0							
DOT Survey/ Acceptance Information — External µR/hr reading:	6							
Background µR/hr reading:	10							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

If applicable, was the client contacted? YES / NO / NA Contact: ______ Date/Time: ______

Project Manager Signature / Date: [signature]

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

1709138

EXPRESS 12:00

UCV83.0.17 12 - H13

TDY

30524 FORT COLLINS, UNITED STATES OF AMERICA

Origin:
YHM

US – DEN – DEN

C

Day

Time
X12

Date:
2017-09-06

Pce/Shpt Weight
/13.2 LB

Piece
1/1

ontent Description
IATER SAMPLES FOR TESTING

WAYBILL 38 2858 9730

(2L)US80524+50002001 9A

(J) JD01 4600 8047 7013 0622

0/11

SAMPLE SUMMARY REPORT

Client:	ALS Environmental	**Date:**	*20-Sep-17*
Project:	L1985509	**Work Order:**	1709138
Sample ID:	L1985509-3	**Lab ID:**	1709138-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/30/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **9/11/2017**	PrepBy: **HCJ**
Ra-226	**0.023 (+/- 0.0099)**	Y1	**0.007**	**BQ/l**	NA	9/19/2017 11:57
Carr: BARIUM	*104*	Y1	*40-110*	*%REC*	DL = NA	9/19/2017 11:57

Client:	ALS Environmental	**Date:**	*20-Sep-17*
Project:	L1985509	**Work Order:**	1709138
Sample ID:	L1985509-3	**Lab ID:**	1709138-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/30/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
LT - Result is less than requested MDC but greater than achieved MDC.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Date: *9/20/2017 8:58:*

Client: ALS Environmental
Work Order: 1709138
Project: L1985509

QC BATCH REPORT

Batch ID: **RE170911-2-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170911-2** Units: **BQ/l** Analysis Date: **9/19/2017 13:10**
Client ID: Run ID: **RE170911-2B** Prep Date: **9/11/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.74 (+/- 0.430)	0.015	1.715		101	67-120					P,M3
Carr: BARIUM	15500		16140		96.2	40-110					

MB Sample ID: **RE170911-2** Units: **BQ/l** Analysis Date: **9/19/2017 12:37**
Client ID: Run ID: **RE170911-2B** Prep Date: **9/11/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.0025 (+/- 0.0046)	0.0081									U
Carr: BARIUM	16100		16140		99.5	40-110					

The following samples were analyzed in this batch: 1709138-1

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1985509-COFC

COC Number: 15 -

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	647-253-0596 EXT 6010
	Company address below will appear on the final report
Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: bimcore@alsglobal.com

Email 2: bimww@alsglobal.com

Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: ap@baffinland.com

Email 2: commercial@baffinland.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☑ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	23642 /Q42455
Job #:	MS-08
PO / AFE:	4500027854
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L1985509 AK 02B

ALS Contact:

Sampler: SS/TB

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	pH,TSS,TDS,Turbidity	BIM-MMER-DEL	Number of Containers
	MS-08	30-Aug-17	18:05	Water	E1		1
	MS-08-Discharge	30-Aug-17	18:15	Water	E1		1
	MS-08	30-Aug-17	11:50	Water	E1	E1	4
	MS-08-Discharge	30-Aug-17	12:15	Water	E1		1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C:

FINAL COOLER TEMPERATURES °C: 9.9

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ben Widdowson	Date: 17 08 31	Time: 9:03	Received by:	Date:	Time:	Received by: AK	Date: 02/09/2017	Time: 13:50

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 10-SEP-17
Report Date: 02-OCT-17 11:15 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1988827

Project P.O. #: 4500027854
Job Reference: MS-08-RECIRC
C of C Numbers:
Legal Site Desc:

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1988827-1 MS-08							
Sampled By: BP/TB on 04-SEP-17 @ 18:00							
Matrix: Water							
Physical Tests							
Conductivity	3420		3.0	umhos/cm		14-SEP-17	R3828556
pH	5.75		0.10	pH units		10-SEP-17	R3823700
Total Suspended Solids	13.2		2.0	mg/L		11-SEP-17	R3823668
Total Dissolved Solids	3420		20	mg/L		11-SEP-17	R3823677
Turbidity	57.2		0.10	NTU		10-SEP-17	R3823704
Cyanides							
Cyanide, Total	0.0067		0.0020	mg/L		15-SEP-17	R3829507
Total Metals							
Aluminum (Al)-Total	0.171	DLHC	0.050	mg/L	14-SEP-17	14-SEP-17	R3829137
Antimony (Sb)-Total	<0.0010	DLHC	0.0010	mg/L	14-SEP-17	14-SEP-17	R3829137
Arsenic (As)-Total	<0.0010	DLHC	0.0010	mg/L	14-SEP-17	14-SEP-17	R3829137
Barium (Ba)-Total	0.0281	DLHC	0.0020	mg/L	14-SEP-17	14-SEP-17	R3829137
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	14-SEP-17	14-SEP-17	R3829137
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	14-SEP-17	14-SEP-17	R3829137
Boron (B)-Total	<0.10	DLHC	0.10	mg/L	14-SEP-17	14-SEP-17	R3829137
Cadmium (Cd)-Total	0.00034	DLHC	0.00010	mg/L	14-SEP-17	14-SEP-17	R3829137
Calcium (Ca)-Total	98.4	DLHC	5.0	mg/L	14-SEP-17	14-SEP-17	R3829137
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	14-SEP-17	14-SEP-17	R3829137
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	14-SEP-17	14-SEP-17	R3829137
Cobalt (Co)-Total	0.373	DLHC	0.0010	mg/L	14-SEP-17	14-SEP-17	R3829137
Copper (Cu)-Total	<0.010	DLHC	0.010	mg/L	14-SEP-17	14-SEP-17	R3829137
Iron (Fe)-Total	28.9	DLHC	0.50	mg/L	14-SEP-17	14-SEP-17	R3829137
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	14-SEP-17	14-SEP-17	R3829137
Lithium (Li)-Total	0.030	DLHC	0.010	mg/L	14-SEP-17	14-SEP-17	R3829137
Magnesium (Mg)-Total	515	DLHC	0.50	mg/L	14-SEP-17	14-SEP-17	R3829137
Manganese (Mn)-Total	22.0	DLHC	0.050	mg/L	14-SEP-17	15-SEP-17	R3829137
Molybdenum (Mo)-Total	<0.00050	DLHC	0.00050	mg/L	14-SEP-17	14-SEP-17	R3829137
Nickel (Ni)-Total	0.398	DLHC	0.0050	mg/L	14-SEP-17	14-SEP-17	R3829137
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	14-SEP-17	14-SEP-17	R3829137
Potassium (K)-Total	3.56	DLHC	0.50	mg/L	14-SEP-17	14-SEP-17	R3829137
Rubidium (Rb)-Total	0.0060	DLHC	0.0020	mg/L	14-SEP-17	14-SEP-17	R3829137
Selenium (Se)-Total	0.00567	DLHC	0.00050	mg/L	14-SEP-17	14-SEP-17	R3829137
Silicon (Si)-Total	1.5	DLHC	1.0	mg/L	14-SEP-17	14-SEP-17	R3829137
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	14-SEP-17	14-SEP-17	R3829137
Sodium (Na)-Total	50.2	DLHC	5.0	mg/L	14-SEP-17	14-SEP-17	R3829137
Strontium (Sr)-Total	0.072	DLHC	0.010	mg/L	14-SEP-17	14-SEP-17	R3829137
Sulfur (S)-Total	866	DLHC	5.0	mg/L	14-SEP-17	14-SEP-17	R3829137
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	14-SEP-17	14-SEP-17	R3829137
Thallium (Tl)-Total	0.00012	DLHC	0.00010	mg/L	14-SEP-17	14-SEP-17	R3829137
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	14-SEP-17	14-SEP-17	R3829137
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	14-SEP-17	14-SEP-17	R3829137

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1988827-1 MS-08							
Sampled By: BP/TB on 04-SEP-17 @ 18:00							
Matrix: Water							
Total Metals							
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	14-SEP-17	14-SEP-17	R3829137
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	14-SEP-17	14-SEP-17	R3829137
Uranium (U)-Total	0.00092	DLHC	0.00010	mg/L	14-SEP-17	14-SEP-17	R3829137
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	14-SEP-17	14-SEP-17	R3829137
Zinc (Zn)-Total	0.032	DLHC	0.030	mg/L	14-SEP-17	14-SEP-17	R3829137
Zirconium (Zr)-Total	<0.0030	DLHC	0.0030	mg/L	14-SEP-17	14-SEP-17	R3829137
Radiological Parameters							
Ra-226	0.022		0.0066	Bq/L	21-SEP-17	29-SEP-17	R3842975

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Cyanide, Total	K	L1988827-1
Comments:	interference. Ran many dilutions.		
Matrix Spike	Cyanide, Total	MS-B	L1988827-1
Matrix Spike	Aluminum (Al)-Total	MS-B	L1988827-1
Matrix Spike	Barium (Ba)-Total	MS-B	L1988827-1
Matrix Spike	Boron (B)-Total	MS-B	L1988827-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L1988827-1
Matrix Spike	Iron (Fe)-Total	MS-B	L1988827-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1988827-1
Matrix Spike	Manganese (Mn)-Total	MS-B	L1988827-1
Matrix Spike	Potassium (K)-Total	MS-B	L1988827-1
Matrix Spike	Silicon (Si)-Total	MS-B	L1988827-1
Matrix Spike	Sodium (Na)-Total	MS-B	L1988827-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L1988827-1
Matrix Spike	Sulfur (S)-Total	MS-B	L1988827-1
Matrix Spike	Uranium (U)-Total	MS-B	L1988827-1

Sample Parameter Qualifier key listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

ALS Test Code	Matrix	Test Description	Method Reference**
EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ALS Test Code	Matrix	Test Description	Method Reference**
MET-T-CCMS-WT	Water	Total Metals 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.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ALS Test Code	Matrix	Test Description	Method Reference**
PH-BF	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

ALS Test Code	Matrix	Test Description	Method Reference**
RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SOLIDS-TDS-BF	Water	Total Dissolved Solids	APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 180 +/- 2C for 1hr.

ALS Test Code	Matrix	Test Description	Method Reference**
SOLIDS-TSS-BF	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104 +/- 1C for a minimum of four hours or until a constant weight is achieved.

ALS Test Code	Matrix	Test Description	Method Reference**
TURBIDITY-BF	Water	Turbidity	APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

** 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:

Reference Information

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
BF	ALS ENVIRONMENTAL - BAFFIN ISLAND, NUNAVUT, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

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 weight of sample

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

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.

ALS Environmental

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-TOT-WT	**Water**							
Batch R3829507								
WG2616641-16 DUP		**L1991276-3**						
Cyanide, Total		44.4	40.6		mg/L	9.0	20	15-SEP-17
WG2616641-31 DUP		**L1988827-1**						
Cyanide, Total		0.0067	0.0066		mg/L	0.3	20	15-SEP-17
WG2616641-14 LCS								
Cyanide, Total			101.1		%		80-120	15-SEP-17
WG2616641-13 MB								
Cyanide, Total			<0.0020		mg/L		0.002	15-SEP-17
WG2616641-15 MS		**L1991276-3**						
Cyanide, Total			N/A	MS-B	%		-	15-SEP-17
WG2616641-32 MS		**L1988827-1**						
Cyanide, Total			65.0	K	%		70-130	15-SEP-17
COMMENTS: interference. Ran many dilutions.								
EC-WT	**Water**							
Batch R3828556								
WG2615688-16 DUP		**WG2615688-15**						
Conductivity		5050	5050		umhos/cm	0.0	10	14-SEP-17
WG2615688-14 LCS								
Conductivity			102.0		%		90-110	14-SEP-17
WG2615688-13 MB								
Conductivity			<3.0		umhos/cm		3	14-SEP-17
MET-T-CCMS-WT	**Water**							
Batch R3829137								
WG2616209-4 DUP		**WG2616209-3**						
Aluminum (Al)-Total		0.155	0.149		mg/L	4.0	20	14-SEP-17
Antimony (Sb)-Total		0.00111	0.00104		mg/L	6.5	20	14-SEP-17
Arsenic (As)-Total		0.00119	0.00123		mg/L	3.2	20	14-SEP-17
Barium (Ba)-Total		0.0483	0.0494		mg/L	2.2	20	14-SEP-17
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-SEP-17
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-SEP-17
Boron (B)-Total		0.126	0.125		mg/L	0.7	20	14-SEP-17
Cadmium (Cd)-Total		<0.000010	0.000013	RPD-NA	mg/L	N/A	20	14-SEP-17
Calcium (Ca)-Total		49.8	48.2		mg/L	3.1	20	14-SEP-17
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-SEP-17
Cesium (Cs)-Total		0.000024	0.000024		mg/L	0.8	20	14-SEP-17
Cobalt (Co)-Total		0.00017	0.00018		mg/L	2.9	20	14-SEP-17

ALS Environmental

Quality Control Report

Workorder: L1988827 Report Date: 02-OCT-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3829137								
WG2616209-4 DUP		**WG2616209-3**						
Copper (Cu)-Total		0.0012	0.0014	J	mg/L	0.0003	0.002	14-SEP-17
Iron (Fe)-Total		0.243	0.265		mg/L	8.6	20	14-SEP-17
Lead (Pb)-Total		0.00124	0.00124		mg/L	0.4	20	14-SEP-17
Lithium (Li)-Total		0.0037	0.0034		mg/L	8.4	20	14-SEP-17
Magnesium (Mg)-Total		8.52	8.43		mg/L	1.1	20	14-SEP-17
Manganese (Mn)-Total		0.0523	0.0525		mg/L	0.2	20	14-SEP-17
Molybdenum (Mo)-Total		0.00291	0.00276		mg/L	5.1	20	14-SEP-17
Nickel (Ni)-Total		0.00775	0.00765		mg/L	1.3	20	14-SEP-17
Phosphorus (P)-Total		0.081	0.099		mg/L	19	20	14-SEP-17
Potassium (K)-Total		4.93	5.08		mg/L	3.0	20	14-SEP-17
Rubidium (Rb)-Total		0.00218	0.00217		mg/L	0.8	20	14-SEP-17
Selenium (Se)-Total		0.000132	0.000130		mg/L	1.2	20	14-SEP-17
Silicon (Si)-Total		1.42	1.44		mg/L	1.2	20	14-SEP-17
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-SEP-17
Sodium (Na)-Total		75.7	75.1		mg/L	0.8	20	14-SEP-17
Strontium (Sr)-Total		0.245	0.240		mg/L	2.1	20	14-SEP-17
Sulfur (S)-Total		15.7	16.2		mg/L	3.2	25	14-SEP-17
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	14-SEP-17
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	14-SEP-17
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	14-SEP-17
Tin (Sn)-Total		0.00021	0.00020		mg/L	3.2	20	14-SEP-17
Titanium (Ti)-Total		0.00565	0.00529		mg/L	6.6	20	14-SEP-17
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	14-SEP-17
Uranium (U)-Total		0.000336	0.000334		mg/L	0.7	20	14-SEP-17
Vanadium (V)-Total		0.00063	0.00067		mg/L	6.8	20	14-SEP-17
Zinc (Zn)-Total		0.0068	0.0069		mg/L	1.1	20	14-SEP-17
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	14-SEP-17
WG2616209-2 LCS								
Aluminum (Al)-Total			90.5		%		80-120	14-SEP-17
Antimony (Sb)-Total			97.4		%		80-120	14-SEP-17
Arsenic (As)-Total			91.1		%		80-120	14-SEP-17
Barium (Ba)-Total			88.2		%		80-120	14-SEP-17
Beryllium (Be)-Total			87.9		%		80-120	14-SEP-17

Quality Control Report

Workorder: L1988827 Report Date: 02-OCT-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3829137								
WG2616209-2 LCS								
Bismuth (Bi)-Total			94.4		%		80-120	14-SEP-17
Boron (B)-Total			94.7		%		80-120	14-SEP-17
Cadmium (Cd)-Total			91.0		%		80-120	14-SEP-17
Calcium (Ca)-Total			94.8		%		80-120	14-SEP-17
Chromium (Cr)-Total			90.6		%		80-120	14-SEP-17
Cesium (Cs)-Total			102.5		%		80-120	14-SEP-17
Cobalt (Co)-Total			91.2		%		80-120	14-SEP-17
Copper (Cu)-Total			88.6		%		80-120	14-SEP-17
Iron (Fe)-Total			90.5		%		80-120	14-SEP-17
Lead (Pb)-Total			97.3		%		80-120	14-SEP-17
Lithium (Li)-Total			93.7		%		80-120	14-SEP-17
Magnesium (Mg)-Total			93.6		%		80-120	14-SEP-17
Manganese (Mn)-Total			92.8		%		80-120	14-SEP-17
Molybdenum (Mo)-Total			95.7		%		80-120	14-SEP-17
Nickel (Ni)-Total			89.7		%		80-120	14-SEP-17
Phosphorus (P)-Total			92.8		%		70-130	14-SEP-17
Potassium (K)-Total			88.0		%		80-120	14-SEP-17
Rubidium (Rb)-Total			91.3		%		80-120	14-SEP-17
Selenium (Se)-Total			92.3		%		80-120	14-SEP-17
Silicon (Si)-Total			98.5		%		60-140	14-SEP-17
Silver (Ag)-Total			100.6		%		80-120	14-SEP-17
Sodium (Na)-Total			89.6		%		80-120	14-SEP-17
Strontium (Sr)-Total			95.5		%		80-120	14-SEP-17
Sulfur (S)-Total			91.2		%		70-130	14-SEP-17
Thallium (Tl)-Total			96.8		%		80-120	14-SEP-17
Tellurium (Te)-Total			97.1		%		80-120	14-SEP-17
Thorium (Th)-Total			98.6		%		70-130	14-SEP-17
Tin (Sn)-Total			91.5		%		80-120	14-SEP-17
Titanium (Ti)-Total			89.9		%		80-120	14-SEP-17
Tungsten (W)-Total			101.3		%		80-120	14-SEP-17
Uranium (U)-Total			97.9		%		80-120	14-SEP-17
Vanadium (V)-Total			91.3		%		80-120	14-SEP-17
Zinc (Zn)-Total			84.1		%		80-120	14-SEP-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3829137								
WG2616209-2 LCS								
Zirconium (Zr)-Total			94.4		%		80-120	14-SEP-17
WG2616209-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	14-SEP-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	14-SEP-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	14-SEP-17
Barium (Ba)-Total			<0.00020		mg/L		0.0002	14-SEP-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	14-SEP-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	14-SEP-17
Boron (B)-Total			<0.010		mg/L		0.01	14-SEP-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	14-SEP-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	14-SEP-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	14-SEP-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	14-SEP-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	14-SEP-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	14-SEP-17
Iron (Fe)-Total			<0.050		mg/L		0.05	14-SEP-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	14-SEP-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	14-SEP-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	14-SEP-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	14-SEP-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	14-SEP-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	14-SEP-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	14-SEP-17
Potassium (K)-Total			<0.050		mg/L		0.05	14-SEP-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	14-SEP-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	14-SEP-17
Silicon (Si)-Total			<0.10		mg/L		0.1	14-SEP-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	14-SEP-17
Sodium (Na)-Total			<0.50		mg/L		0.5	14-SEP-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	14-SEP-17
Sulfur (S)-Total			<0.50		mg/L		0.5	14-SEP-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	14-SEP-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	14-SEP-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	14-SEP-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3829137								
WG2616209-1 MB								
Tin (Sn)-Total			<0.00010		mg/L		0.0001	14-SEP-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	14-SEP-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	14-SEP-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	14-SEP-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	14-SEP-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	14-SEP-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	14-SEP-17
WG2616209-5 MS		**WG2616209-3**						
Aluminum (Al)-Total			N/A	MS-B	%		-	14-SEP-17
Antimony (Sb)-Total			95.4		%		70-130	14-SEP-17
Arsenic (As)-Total			98.1		%		70-130	14-SEP-17
Barium (Ba)-Total			N/A	MS-B	%		-	14-SEP-17
Beryllium (Be)-Total			91.9		%		70-130	14-SEP-17
Bismuth (Bi)-Total			87.0		%		70-130	14-SEP-17
Boron (B)-Total			N/A	MS-B	%		-	14-SEP-17
Cadmium (Cd)-Total			90.1		%		70-130	14-SEP-17
Calcium (Ca)-Total			N/A	MS-B	%		-	14-SEP-17
Chromium (Cr)-Total			97.1		%		70-130	14-SEP-17
Cesium (Cs)-Total			99.3		%		70-130	14-SEP-17
Cobalt (Co)-Total			96.1		%		70-130	14-SEP-17
Copper (Cu)-Total			92.4		%		70-130	14-SEP-17
Iron (Fe)-Total			N/A	MS-B	%		-	14-SEP-17
Lead (Pb)-Total			91.8		%		70-130	14-SEP-17
Lithium (Li)-Total			109.1		%		70-130	14-SEP-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	14-SEP-17
Manganese (Mn)-Total			N/A	MS-B	%		-	14-SEP-17
Molybdenum (Mo)-Total			96.8		%		70-130	14-SEP-17
Nickel (Ni)-Total			91.4		%		70-130	14-SEP-17
Phosphorus (P)-Total			100.1		%		70-130	14-SEP-17
Potassium (K)-Total			N/A	MS-B	%		-	14-SEP-17
Rubidium (Rb)-Total			95.5		%		70-130	14-SEP-17
Selenium (Se)-Total			95.1		%		70-130	14-SEP-17
Silicon (Si)-Total			N/A	MS-B	%		-	14-SEP-17
Silver (Ag)-Total			93.1		%		70-130	14-SEP-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3829137								
WG2616209-5 MS		**WG2616209-3**						
Sodium (Na)-Total			N/A	MS-B	%		-	14-SEP-17
Strontium (Sr)-Total			N/A	MS-B	%		-	14-SEP-17
Sulfur (S)-Total			N/A	MS-B	%		-	14-SEP-17
Thallium (Tl)-Total			92.7		%		70-130	14-SEP-17
Tellurium (Te)-Total			85.8		%		70-130	14-SEP-17
Thorium (Th)-Total			87.0		%		70-130	14-SEP-17
Tin (Sn)-Total			93.2		%		70-130	14-SEP-17
Titanium (Ti)-Total			87.4		%		70-130	14-SEP-17
Tungsten (W)-Total			99.4		%		70-130	14-SEP-17
Uranium (U)-Total			N/A	MS-B	%		-	14-SEP-17
Vanadium (V)-Total			100.6		%		70-130	14-SEP-17
Zinc (Zn)-Total			89.6		%		70-130	14-SEP-17
Zirconium (Zr)-Total			83.6		%		70-130	14-SEP-17
PH-BF	**Water**							
Batch R3823700								
WG2612988-2 DUP		**L1988827-1**						
pH		5.75	5.75	J	pH units	0.00	0.2	10-SEP-17
WG2612988-1 LCS								
pH			6.97		pH units		6.9-7.1	10-SEP-17
SOLIDS-TDS-BF	**Water**							
Batch R3823677								
WG2612982-3 DUP		**L1988825-1**						
Total Dissolved Solids		595	595		mg/L	0.0	20	11-SEP-17
WG2612982-2 LCS								
Total Dissolved Solids			98.8		%		85-115	11-SEP-17
WG2612982-1 MB								
Total Dissolved Solids			<20		mg/L		20	11-SEP-17
SOLIDS-TSS-BF	**Water**							
Batch R3823668								
WG2612981-3 DUP		**L1988827-1**						
Total Suspended Solids		13.2	14.0		mg/L	5.9	25	11-SEP-17
WG2612981-2 LCS								
Total Suspended Solids			94.4		%		85-115	11-SEP-17
WG2612981-1 MB								
Total Suspended Solids			<2.0		mg/L		2	11-SEP-17

Quality Control Report

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-BF	**Water**							
Batch R3823704								
WG2612992-3 DUP		**L1988827-1**						
Turbidity		57.2	56.3		NTU	1.6	15	10-SEP-17
WG2612992-2 LCS								
Turbidity			104.0		%		70-130	10-SEP-17
WG2612992-1 MB								
Turbidity			<0.10		NTU		0.1	10-SEP-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L1988827 Report Date: 02-OCT-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity							
	1	04-SEP-17 18:00	10-SEP-17 14:00	48	140	hours	EHTR
pH							
	1	04-SEP-17 18:00	10-SEP-17 14:00	4	6	days	EHTR

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1988827 were received on 10-SEP-17 10:47.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Friday, September 29, 2017

Rick Hawthorne
ALS Environmental
60 Northland Rd, Unit 1
Waterloo Canada, ON N2V 2B8

Re: ALS Workorder: 1709358
Project Name:
Project Number: L1988827

Dear Mr. Hawthorne:

One water sample was received from ALS Environmental, on 9/19/2017. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Shiloh J. Summy
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1709358

Radium-226:
The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1709358
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L1988827
Client PO Number: L1988827

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L1988827-1	1709358-1		WATER	04-Sep-17	

ALS Environmental

L1988827

WATERLOO

1709358

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# *L1988827*
ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 1 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1988827-1 MS-08		9/ 4/ 2017	E
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/29/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______ Date Shipped: ______

Received By: [signature] Date Received: 9/19/17

Verified By: ______ Date Verified: ______

Temperature: ______

Sample Integrity Issues: ______

hursday, September 14, 2017 9:34 AM

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS Waterloo Workorder No: 1709358

Project Manager: SJPS Initials: [illegible] Date: 9/19/17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	**NO**
2. Are custody seals on shipping containers intact?	NONE	**YES**	NO
3. Are Custody seals on sample containers intact?	**NONE**	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		**YES**	NO
5. Are the COC and bottle labels complete and legible?		**YES**	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		**YES**	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	**YES**	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	**YES**	NO
9. Are all aqueous non-preserved samples pH 4-9?	**N/A**	YES	NO
10. Is there sufficient sample for the requested analyses?		**YES**	NO
11. Were all samples placed in the proper containers for the requested analyses?		**YES**	NO
12. Are all samples within holding times for the requested analyses?		**YES**	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		**YES**	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	**N/A**	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	**NO**
16. Were the samples shipped on ice?		**YES**	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: **#2** #4	RAD ONLY	**YES**	NO

Cooler #:	1						
Temperature (°C):	4.2						
No. of custody seals on cooler:	0						
External µR/hr reading:	9						
Background µR/hr reading:	0						

DOT Survey/ Acceptance Information

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? **YES** / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

* COC not signed.

If applicable, was the client contacted? YES / NO / **NA** Contact: ______ Date/Time: ______

Project Manager Signature / Date: Shilah Lunny

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

1709358

ORIGIN ID:YKFA (519) 886-6910
EDWARD HILL
ALS ENVIRONMENTAL
60 NORTHLAND RD

WATERLOO, ON N2V2B8
CANADA CA

SHIP DATE: 18SEP17
ACTWGT: 5.00 KG
CAD: 110458504/INET3920
DIMS: 30x23x28 CM

BILL SENDER

TO SAMPLE LOGIN
ALS ENVIRONMENTAL FORT COLLINS
225 COMMERCE DR

9-0

FORT COLLINS CO 80524 (US)
(800) 443-1511 REF:
INV:
PO: DEPT:

549J1/FF19/104C

FedEx
Express

E

TRK# 0430 7702 8346 1560

10:30A
INTL PRIORITY

XH FTCA

80524
CO-US DEN

ALS Environmental
www.alsglobal.com

Client:	ALS Environmental	**Date:**	*29-Sep-17*
Project:	L1988827	**Work Order:**	1709358
Sample ID:	L1988827-1	**Lab ID:**	1709358-1
Legal Location:		**Matrix:**	WATER
Collection Date:	9/4/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**		Prep Date: **9/21/2017**		PrepBy: **HCJ**
Ra-226	**0.022 (+/- 0.0091)**	Y1	**0.0066**	**BQ/l**	NA	9/29/2017 12:28
Carr: BARIUM	*101*	Y1	*40-110*	*%REC*	DL = NA	9/29/2017 12:28

Client:	ALS Environmental	**Date:**	*29-Sep-17*
Project:	L1988827	**Work Order:**	1709358
Sample ID:	L1988827-1	**Lab ID:**	1709358-1
Legal Location:		**Matrix:**	WATER
Collection Date:	9/4/2017	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Date: *9/29/2017 4:09:*

Client: ALS Environmental
Work Order: 1709358
Project: L1988827

QC BATCH REPORT

Batch ID: **RE170921-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE170921-1** Units: **BQ/l** Analysis Date: **9/29/2017 13:09**
Client ID: Run ID: **RE170921-1A** Prep Date: **9/21/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.81 (+/- 0.448)	0.00864	1.715		106	67-120					P
Carr: BARIUM	15400		16190		95.3	40-110					

LCSD Sample ID: **RE170921-1** Units: **BQ/l** Analysis Date: **9/29/2017 13:09**
Client ID: Run ID: **RE170921-1A** Prep Date: **9/21/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.78 (+/- 0.441)	0.00801	1.715		104	67-120		1.81	0.04	2.1	P
Carr: BARIUM	16100		16190		99.2	40-110		15400			

MB Sample ID: **RE170921-1** Units: **BQ/l** Analysis Date: **9/29/2017 13:09**
Client ID: Run ID: **RE170921-1A** Prep Date: **9/21/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.00045 (+/- 0.0035)	0.0068									U
Carr: BARIUM	15700		16190		97	40-110					

The following samples were analyzed in this batch: 1709358-1

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1988827-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	847-253-0596 EXT 6010
	Company address below will appear on the final report
Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	
Quality Control (QC) Report with Report ☑ YES ☐ NO	
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Email 1 or Fax	bimcore@alsglobal.com
Email 2	bimww@alsglobal.com
Email 3	
Invoice Distribution	
Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Email 1 or Fax	ap@baffinland.com
Email 2	commercial@baffinland.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]	☐ Standard TAT if received by 3 pm - business days - no surcharges apply				
PRIORITY (Business Days)	4 day [P4] ☐	EMERGENCY	1 Business day [E1]	☑
	3 day [P3] ☐		Same Day, Weekend or Statutory holiday [E0]	☐
	2 day [P2] ☐			
Date and Time Required for all E&P TATs:			dd-mmm-yy hh:mm	

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information	
ALS Account # / Quote #:	23642 /Q42455
Job #:	MS-08-Recirc
PO / AFE:	4500027854
LSD:	
ALS Lab Work Order # (lab use only)	L1988827

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler: BP/TB

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	pH,TSS,TDS,Turbidity	BIM-MMER-DEL	Number of Containers
	MS-08	4-Sep-17	18:00	Water		E1	

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐		SIF Observations	Yes ☐ No ☐
Ice Packs ☐	Ice Cubes ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated ☐			
INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: 17 09 08	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Baffinland Iron Mine's Corporation
(Oakville)
ATTN: Allan Knight
2275 Upper Middle Rd. E.
Suite #300
Oakville ON L6H 0C3

Date Received: 07-SEP-17
Report Date: 13-SEP-17 12:25 (MT)
Version: FINAL

Client Phone: 416-364-8820

Certificate of Analysis

Lab Work Order #: L1987246
Project P.O. #: 4500027854
Job Reference: MS-08
C of C Numbers:
Legal Site Desc:

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

** 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:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
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 weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
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.

Quality Control Report

Client: Baffinland Iron Mine’s Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3
Contact: Allan Knight

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed

Quality Control Report

Workorder: L1987246 Report Date: 13-SEP-17

Client: Baffinland Iron Mine's Corporation (Oakville)
2275 Upper Middle Rd. E. Suite #300
Oakville ON L6H 0C3

Contact: Allan Knight

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT
Rainbow Trout

Work Order : 234306
Sample Number : 52192

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	Not provided
Location :	Waterloo ON	Time Collected :	14:50
Job Number :	L1987246-1	Date Collected :	2017-09-05
Substance :	L1987246-1 MS-08	Date Received :	2017-09-07
Sampling Method :	Not provided	Date Tested :	2017-09-08
Sample Description :	Cloudy, orange, odourless.	Temp. on arrival :	18.0°C

Test Method : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	30.0 %

The results reported relate only to the sample tested.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	T17-13		
Date Tested (yyyy-mm-dd) :	2017-09-06	Historical Mean LC50 :	3688 mg/L
LC50 (95% Confidence Limits) :	3561 mg/L (3380 - 3751)	Warning Limits (± 2SD) :	3132 - 4343 mg/L
Statistical Method :	Spearman-Kärber	Analyst(s) :	FS, SV, DK

TEST FISH

Control Fish Sample Size :	10	Cumulative stock tank mortality:	0 % (prev. 7 days)
Mean Fish Weight (± 2 SD) :	0.58 ± 0.42 g	Mean Fish Fork Length (± 2 SD) :	38.6 ± 7.5 mm
Range of Weights :	0.34 - 0.92 g	Range of Fork Lengths (mm) :	32 - 44 mm
Fish Loading Rate :	0.3 g/L		

TEST CONDITIONS

Test Organism :	*Oncorhynchus mykiss*	Volume Tested (L) :	20
Sample Treatment :	None	Number of Replicates :	1
pH Adjustment :	None	Organisms Per Replicate :	10
Test Aeration :	Yes	Total Organisms Per Test Level :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Test Method Deviation(s) :	None

Date: 2017-09-13
yyyy-mm-dd

Approved by: [signature]
Project Manager

AQUATOX

Work Order: 234306
Sample Number: 52192

Total Pre-Aeration Time (h)		pH	D.O. (mg/L)	Cond. (µmhos/cm)	Temp. (°C)	O_2 Sat. (%)*
0:30	Initial Water Chemistry:	5.1	9.5	3632	14.5	–
	Chemistry after 30min air:	5.2	9.6	3636	15.0	98

0 hours

Date & Time 2017-09-08 9:10
Technician: FS

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*
100	0	0	5.2	9.6	3636	15.0	98
Control	0	0	8.0	9.6	844	14.5	100

Notes:

24 hours

Date & Time 2017-09-09 9:10
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	1	0	–	–	–	15.0
Control	0	0	–	–	–	15.0

Notes:

48 hours

Date & Time 2017-09-10 9:10
Technician: DK

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	1	0	–	–	–	14.5
Control	0	0	–	–	–	14.5

Notes:

72 hours

Date & Time 2017-09-11 9:10
Technician: FS

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	1	0	–		–	15.0
Control	0	0	–			15.0

Notes:

96 hours

Date & Time 2017-09-12 9:10
Technician: CZN/FS

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100	3	0	5.5	9.4	3691	15.0
Control	0	0	8.3	9.6	819	15.0

Notes:

Control organisms showing stress: 0
Organism Batch : T17-13

"–" = not measured/not required
Number immobile does not include number of mortalities.
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: JC
Date: 2017-09-13

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna

Work Order :	234306
Sample Number :	52192

SAMPLE IDENTIFICATION

Company :	ALS Laboratory Group, Waterloo	Sampled By :	Not provided
Location :	Waterloo ON	Time Collected :	14:50
Job Number :	L1987246-1	Date Collected :	2017-09-05
Substance :	L1987246-1 MS-08	Date Received :	2017-09-07
Sampling Method :	Not provided	Date Tested :	2017-09-08
Sample Description :	Cloudy, orange, odourless.	Temp. on arrival :	18.0° C

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-h TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	100.0 %

The results reported relate only to the sample tested.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Organism Batch :	Dm17-20		
Date Tested (yyyy/mm/dd) :	2017-08-29	Historical Mean LC50 :	5.8 g/L
LC50 (95% Confidence Limits) :	5.8 g/L (4.9 - 6.8)	Warning Limits (± 2SD) :	5.1 - 6.5 g/L
Statistical Method :	Binomial	Analyst(s) :	AW, CZN, SV

Daphnia magna CULTURE HEALTH DATA

Time to First Brood :	8.4 days	Mean Young Per Brood :	25.9
Culture Mortality :	0.5% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Test Organisms / Replicate :	10
Test Aeration :	None	Total Organisms / Test Level :	30
Organism Batch :	Dm17-20	Organism Loading Rate :	15.0 mL/organism
		Test Method Deviation(s) :	None

Date: 2017-09-13
yyyy-mm-dd

Approved by: [signature]
Project Manager

Accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA)

AQUATOX

TOXICITY TEST REPORT

Daphnia magna

Work Order: 234306
Sample Number: 52192

	Hardness (mg/L as $CaCO_3$)	Hardness Adjustment	pH	D.O. (mg/L)	Cond. (μmhos/cm)	Temp. (°C)	O_2 Sat. (%)*	Total Pre-Aeration Time (h) @ 30 mL/min/L
Initial Water Chemistry:	1000	None	5.7	8.9	3560	21.0	105	0:30

0 hours

Date & Time 2017-09-08 10:10
Technician: CG

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.	O_2 Sat. (%)*	Hardness
100A	0	0	5.9	8.7	3580	21.0	101	1000
100B	0	0	5.9	8.7	3580	21.0	101	1000
100C	0	0	5.9	8.7	3580	21.0	101	1000
Control A	0	0	8.4	8.7	562	21.0	100	220
Control B	0	0	8.4	8.7	562	21.0	100	220
Control C	0	0	8.4	8.7	562	21.0	100	220

Notes:

24 hours

Date & Time 2017-09-09 10:10
Technician: SV

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	–	8	–	–	–	21.0
100B	–	10	–	–	–	21.0
100C	–	8				21.0
Control A	–	0	–	–	–	21.0
Control B	–	0	–	–	–	21.0
Control C	–	0				21.0

Notes:

48 hours

Date & Time 2017-09-10 10:10
Technician: SV

Test Conc. (%)	Mortality	Immobility	pH	D.O.	Cond.	Temp.
100A	10	0	5.2	8.7	3550	21.0
100B	10	0	5.2	8.7	3770	21.0
100C	10	0	5.1	8.8	3640	21.0
Control A	0	0	8.5	8.8	567	21.0
Control B	0	0	8.5	8.8	569	21.0
Control C	0	0	8.5	8.8	580	21.0

Notes:

Control organisms showing stress: 0
Organism Batch : Dm17-20

Number immobile does not include number of mortalities.

– = not measured/not required
* adjusted for actual temp. & barometric pressure

Test Data Reviewed By: I
Date: 2017-09-13

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 234306

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 Fax: (519) 763-4419

P.O. Number:	4500017476
Field Sampler Name (print):	
Signature:	
Affiliation:	
Sample Storage (prior to shipping):	
Custody Relinquished by:	
Date/Time Shipped:	

Client:	ALS Environmental Waterloo Q# 162705399-15
Phone:	519 - 886 - 6910
Fax:	519 - 886 - 9047
Contact:	Wayne Smith / Rick Hawthorne

Sample Identification					Analyses Requested									Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
5-Sept-17	1450	L1987246-1 MS-08	52192	18.0	X		X									

For Lab Use Only	
Received By:	CG/DK
Date:	2017-09-07
Time:	1425
Storage Location:	
Storage Temp.(C):	

Please list any special requests or instructions:
Regular Baffinland Toxicity Tests

ALS Environmental

L1987246

WATERLOO

Subcontract Request Form

Subcontract To:

AQUATOX TESTING AND CONSULTING
11B NICHOLAS BEAVER ROAD
RR3
GUELPH,ON N1H 6H9

NOTES:	Please reference on final report and invoice: PO# *L1987246* ALS requires QC data to be provided with your final results.

Please see enclosed 1 **sample(s) in** 0 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1987246-1 MS-08		9/ 5/ 2017	
	Special Request Aquatox (SPECIAL REQUEST2-AQT 14)	9/27/2017	
	Special Request Aquatox (SPECIAL REQUEST-AQT 14)	9/27/2017	

Subcontract Info Contact: Rick Hawthorne (519) 886-6910

Analysis and reporting info contact: Rick Hawthorne
60 NORTHLAND ROAD, UNIT 1
WATERLOO,ON N2V 2B8
Phone: (519) 886-6910 Email: Rick.Hawthorne@alsglobal.com

Please email confirmation of receipt to: **Rick.Hawthorne@alsglobal.com**

Shipped By: ______________________ Date Shipped: ______________________

Received By: ______________________ Date Received: ______________________

Verified By: ______________________ Date Verified: ______________________

Temperature: ______________________

Sample Integrity Issues: ______________________________________

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1987246-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	Baffinland Iron Mines Corp.
Contact:	Allan Knight
Phone:	647-253-0596 EXT 6010
	Company address below will appear on the final report
Street:	2275 Upper Middle Rd. E., Suite #300
City/Province:	Oakville, ON
Postal Code:	L6H 0C3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: blmcore@alsglobal.com
Email 2: bimww@alsglobal.com
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@baffinland.com
Email 2: commercial@baffinland.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐
EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: 23642 /Q42455
Job #: MS-08
PO / AFE: 4500027854
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#
Major/Minor Code: | Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only) L1987246 BN

ALS Contact: | Sampler: BP/TB

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	Group 3	Number of Containers
	MS-08	5-Sep-17	14:50	Water	R	1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO
Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C:
FINAL COOLER TEMPERATURES °C: 4.3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Release: Brenden Peachey	2017-09-05	Time:	Received by:	Date:	Time:	Received by: BN	Date: 7-Sept-17	Time: 1000

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

OCTOBER 2015 FRONT

APPENDIX C

SAMPLING PROGRAM - QUALITY ASSURANCE AND QUALITY CONTROL PLAN

Baffinland Iron Mines Corporation

Surface Water Sampling Program – Quality Assurance and Quality Control Plan

BAF-PH1-830-P16-0001

Rev 2

Prepared By: Katherine Babin
Department: Environment
Title: Environmental Coordinator
Date: March 29, 2017
Signature:

Andrew Vermeer on behalf of KB

Approved By: Wayne McPhee
Department: Sustainable Development
Title: Director Sustainable Development
Date: March 29, 2017
Signature:

DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
01/15/2014	0	JM	EM	Approved for Use
03/14/16	1	WB	EM	Approved for Use
03/29/17	2	KB KB	WM WM	Approved For Use

TRACK CHANGES TABLE

A review and update of the Surface Water Sampling Program – Quality Assurance and Quality Control Plan has been undertaken, with the following salient revisions to the March 14, 2016 version (BAF-PH1-830-P16-0001, Rev 1).

Index of Major Changes/Modifications in Revision 2

Item No.	Description of Change	Relevant Section
1	Addition of MMER sampling protocol and clarification of QA/QC definitions	Section 4 Section 7

TABLE OF CONTENTS

1 INTRODUCTION 6

1.1 PURPOSE AND SCOPE 6

1.2 REGULATORY REQUIRMENTS 7

1.3 RELATIONSHIPS TO OTHER MANAGEMENT PLANS 7

2 BAFFINLAND POLICIES 8

2.1 HEALTH, SAFETY AND ENVIRONMENT POLICY 8

2.2 SUSTAINABLE DEVELOPMENT POLICY 9

3 ENVIRONMENTAL RESPONSIBILITIES 12

3.1 ROLES AND RESPONSIBILITIES 12

3.2 TRAINING AND AWARENESS 14

4 WATER SAMPLE COLLECTION 15

4.1 GENERAL 15

4.2 WATER QUALITY MONITORING LOCATIONS 15

4.3 WATER SAMPLING METHODS AND EQUIPMENT 16

4.3.1 GENERAL SAMPLING PROCEDURES 16
4.3.2 LAKE SAMPLING 17
4.3.3 RIVER SAMPLING 18
4.3.4 METAL MINING EFFLUENT REGULATIONS (MMER) 18
4.3.5 SAMPLING FOR TOXICITY TESTING 19
4.3.6 IN-SITU WATER QUALITY 19

5 SEDIMENT SAMPLE COLLECTION 20

5.1 SEDIMENT MONITORING LOCATIONS 20

5.2 SEDIMENT SAMPLING METHODS AND EQUIPMENT 20

5.2.1 GENERAL SAMPLING PROCEDURES 21
5.2.2 RIVER AND GRAB SAMPLING 21
5.2.3 LAKE SAMPLING 21

6 BENTHIC INVERTEBRATES SAMPLE COLLECTION 22

6.1 BENTHIC INVERTEBRATE MONITORING LOCATIONS 22

6.2 BENTHIC INVERTEBRATE SAMPLING METHODS AND EQUIPMENT 22

7 QA/QC *23*

7.1 SAMPLING PROGRAMS WITH MULTIPLE SAMPLING STATIONS 23

7.2 SAMPLING PROGRAMS WITH LIMITED SAMPLING STATIONS 23

7.3 QA/QC ANALYSIS 23

8 SAMPLE MANAGEMENT *24*

8.1 SAMPLE LABELING 24

8.2 SAMPLE STORAGE AND HANDLING 25

8.3 SAMPLE SUBMISSION AND CHAIN OF CUSTODY 25

9 LABORATORY ANALYSIS *26*

9.1 LABORATORY ACCREDITATION 26

9.2 ANALYTICAL DETECTION LIMITS 26

9.3 LABORATORY ANALYTICAL METHODS 27

9.4 ANALYTICAL LABORATORY QA/QC PROCEDURES 27

9.5 SUMMARY OF ANALYTICAL PROCEDURES 28

10 DATA MANAGEMENT AND REPORTING *30*

10.1 DATA MANAGEMENT 30

10.2 REPORTING 30

11 REFERENCES *31*

List of Tables

Table 3-1: Baffinland Senior Management 12
Table 3-2: Baffinland Project Environmental Department (Onsite) 13
Table 7-1: Purpose, Description and Frequency of QA/QC Samples 24
Table 9-1: Summary of Analytes, Water and Soil Sample Volumes, Preservatives and Sample Storage Time for ALS Environmental 28

List of Appendices

Appendix A - Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan (INAC, 1996).

Appendix B - COC Example Forms

Appendix C - Analytical Laboratory Accreditation and Licencing

Appendix D - Laboratory Analytical Methods

Appendix E - Analytical Laboratory QA/QC Procedures

1 INTRODUCTION

As required by Baffinland Iron Mines Corporation's (Baffinland) Type A Water Licence No. 2AM-MRY1325 Amendment No. 1 (Type A Water Licence) and Type B Water Licence No. 2BE-MRY1421 (Type B Water Licence) for the Mary River Project (Project), a review of Project Environmental Management and Monitoring Plans (EEMPs) was completed. This Quality Assurance and Quality Control (QA/QC) Plan was updated to meet the requirements of the Type A and B water licences. Further and continual modifications and revisions to this Plan shall be completed based on changes to operations, QA/QC procedures, and protocols. Updates to this Plan shall be completed in accordance to the terms and conditions of Baffinland's water licences, QIA Commercial Lease – Q13C301, issued September 6, 2013, the amended Project Certificate No. 005 issued by the Nunavut Impact Review Board (NIRB) and any subsequent requirements which may be issued.

This QA/QC Plan has been reviewed to fulfill the requirement of Part I, Item 16 of License No. 2AM-MRY1325 Amendment No. 1 approved by the Nunavut Water Board to Baffinland Iron Mines Corporation (Baffinland) on July 21, 2015.

In accordance with the stipulations of the Type A Water Licence No. 2AM-MRY1325 Amendment No. 1, this QA/QC Plan has been prepared following the general recommendations presented in *Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan (*INAC, 1996). A copy of the guidelines is included in Appendix A.

1.1 PURPOSE AND SCOPE

The purpose of this Plan is to identify Baffinland's framework for accurate and effective QA/QC management by providing instruction for standardised field sampling and laboratory analytical procedures.

For the purposes of this report, QA/QC is defined as:

- ***Quality Assurance*** - System of activities used to achieve quality control.
- ***Quality Control*** - Set of best practice methods and procedures used to ensure quality of data in terms of precision, accuracy and reliability.

The QA/QC best practices outlined in this management plan are designed to provide guidance to field staff and analytical laboratories in order to maintain a high level of confidence in the water quality, soil, and benthic data generated from Project Sites.

1.2 REGULATORY REQUIRMENTS

Baffinland's QA/QC Plan is regulated by the Nunavut Water Board (NWB) and is subject to Baffinland's Type A Water Licence No. 2AM-MRY1325 Amendment No. 1 which provides specific Terms and Conditions for the management of QA/QC procedures at the Project Sites.

Both federal and territorial legislation regulates water and soil quality and benthic communities in Nunavut. This legislation expects a professional standard and level of confidence when evaluating these parameters and therefore apply to this QA/QC management plan.

1.3 RELATIONSHIPS TO OTHER MANAGEMENT PLANS

This Plan is intended for use in conjunction with the following Plans:

1. Air Quality and Noise Abatement Management Plan (BAF-PH1-830-P16-0002)
2. Aquatic Effects and Monitoring Plan (BAF-PH1-830-P16-0039)
3. Environmental Protection Plan (BAF-PH1-830-P16-0008)
4. Fresh Water Supply, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010)
5. Hazardous Materials and Hazardous Waste Management Plan (BHF-PH1-830-P16-0011)
6. Interim Mine Closure and Reclamation Plan (BAF-PH1-830-P16-0012)
7. Surface Water and Aquatic Ecosystem Management Plan (BAF-PH1-830-P16-0026)
8. Terrestrial Environmental Management and Monitoring Plan (BAF-PH1-830-P16-0027)
9. Waste Management Plan (BAF-PH1-830-P16-0028)

2 BAFFINLAND POLICIES

2.1 HEALTH, SAFETY AND ENVIRONMENT POLICY

This Baffinland Iron Mines Corporation Policy on Health, Safety and Environment is a statement of our commitment to achieving a safe, healthy and environmentally responsible workplace. We will not compromise this policy for the achievement of any other organizational goals.

We implement this Policy through the following commitments:

1. Continual improvement of safety, occupational health and environmental performance
2. Meeting or exceeding the requirements of regulations and company policies
3. Integrating sustainable development principles into our decision-making processes
4. Maintaining an effective Health, Safety and Environmental Management System
5. Sharing and adopting improved technologies and best practices to prevent injuries, occupational illnesses and environmental impacts
6. Engaging stakeholders through open and transparent communication.
7. Efficiently using resources, and practicing responsible minimization, reuse, recycling and disposal of waste.
8. Reclamation of lands to a condition acceptable to stakeholders.

Our commitment to provide the leadership and action necessary to accomplish this policy is exemplified by the following principles:

- As evidenced by our motto "Safety First, Always" and our actions Health and safety of personnel and protection of the environment are values not priorities.
- All injuries, occupational illnesses and environmental impacts can be prevented.
- Employee involvement and active contribution through courageous leadership is essential for preventing injuries, occupational illnesses and environmental impacts.
- Working in a manner that is healthy, safe and environmentally sound is a condition of employment.
- All operating exposures can be safeguarded.
- Training employees to work in a manner that is healthy, safe and environmentally sound is essential.
- Prevention of personal injuries, occupational illnesses and environmental impacts is good business.
- Respect for the communities in which we operate is the basis for productive relationships.

We have a responsibility to provide a safe workplace and utilize systems of work to meet this goal. All employees must be clear in understanding the personal responsibilities and accountabilities in relation to the tasks we undertake.

The health and safety of all people working at our operation and responsible management of the environment are core values to Baffinland. In ensuring our overall profitability and business success every Baffinland and business partner employee working at our work sites is required to adhere to this Policy.

Brian Penney
Chief Executive Officer
March 2017

2.2 SUSTAINABLE DEVELOPMENT POLICY

At Baffinland Iron Mines Corporation (Baffinland), we are committed to conducting all aspects of our business in accordance with the principles of sustainable development & corporate responsibility and always with the needs of future generations in mind. Baffinland conducts its business in accordance with the Universal Declaration of Human Rights and ArcelorMittal's Human Rights Policy which applies to all employees and affiliates globally.

Everything we do is underpinned by our responsibility to protect the environment, to operate safely and fiscally responsibly and with utmost respect for the cultural values and legal rights of Inuit. We expect each and every employee, contractor, and visitor to demonstrate courageous leadership in personally committing to this policy through their actions. The Sustainable Development and Human Rights Policy is communicated to the public, all employees and contractors and it will be reviewed and revised as necessary on a regular basis. These four pillars form the foundation of our corporate responsibility strategy:

1. Health and Safety
2. Environment
3. Upholding Human Rights of Stakeholders
4. Transparent Governance

1.0 HEALTH AND SAFETY

- We strive to achieve the safest workplace for our employees and contractors; free from occupational injury and illness, where everyone goes home safe everyday of their working life. Why? Because our people are our greatest asset. Nothing is as important as their health and safety. Our motto is "Safety First, Always".
- We report, manage and learn from injuries, illnesses and high potential incidents to foster a workplace culture focused on safety and the prevention of incidents.
- We foster and maintain a positive culture of shared responsibility based on participation, behaviour, awareness and promoting active courageous leadership. We allow our employees and contractors the right to stop any work if and when they see something that is not safe.

2.0 ENVIRONMENT

- Baffinland employs a balance of the best scientific and traditional Inuit knowledge to safeguard the environment.

- Baffinland applies the principles of pollution prevention, waste reduction and continuous improvement to minimize ecosystem impacts, and facilitate biodiversity conservation.
- We continuously seek to use energy, raw materials and natural resources more efficiently and effectively. We strive to develop more sustainable practices.
- Baffinland ensures that an effective closure strategy is in place at all stages of project development to ensure reclamation objectives are met.

3.0 UPHOLDING HUMAN RIGHTS OF STAKEHOLDERS

- We respect human rights, the dignity of others and the diversity in our workforce. Baffinland honours and respects the unique cultural values and traditions of Inuit.
- Baffinland does not tolerate discrimination against individuals on the basis of race, colour, gender, religion, political opinion, nationality or social origin, or harassment of individuals freely employed.
- Baffinland contributes to the social, cultural and economic development of sustainable communities in the North Baffin Region.
- We honour our commitments by being sensitive to local needs and priorities through engagement with local communities, governments, employees and the public. We work in active partnership to create a shared understanding of relevant social, economic and environmental issues, and take their views into consideration when making decisions.
- We expect our employees and contractors, as well as community members, to bring human rights concerns to our attention through our external grievance mechanism and internal human resources channels. Baffinland is committed to engaging with our communities of interest on our human rights impacts and to reporting on our performance.

4.0 TRANSPARENT GOVERNANCE

- Baffinland will take steps to understand, evaluate and manage risks on a continuing basis, including those that may impact the environment, employees, contractors, local communities, customers and shareholders.
- Baffinland endeavours to ensure that adequate resources are available and that systems are in place to implement risk-based management systems, including defined standards and objectives for continuous improvement.
- We measure and review performance with respect to our safety, health, environmental, socio-economic commitments and set annual targets and objectives.
- Baffinland conducts all activities in compliance with the highest applicable legal & regulatory requirements and internal standards.
- We strive to employ our shareholder's capital effectively and efficiently and demonstrate honesty and integrity by applying the highest standards of ethical conduct.

4.1 FURTHER INFORMATION

Please refer to the following policies and documents for more information on Baffinland's commitment to operating in an environmentally and socially responsible manner:

Health, Safety and Environment Policy
Workplace Conduct Policy
Inuktitut in the Workplace Policy
Site Access Policy
Hunting and Fishing (Harvesting) Policy
Annual Report to Nunavut Impact Review Board
ArcelorMittal Canada Sustainability and Corporate Responsibility Report

If you have questions about Baffinland's commitment to upholding human rights, please direct them to contact@baffinland.com.

Brian Penney
Chief Executive Officer
March 2017

3 ENVIRONMENTAL RESPONSIBILITIES

3.1 ROLES AND RESPONSIBILITIES

The Baffinland Environmental Team is organised into two parts, on site as well as off site. The organisational structure for the Mary River Project in relation to the environment discipline is shown in Table 3-1 and 3-2 below.

TABLE 3-1: BAFFINLAND SENIOR MANAGEMENT

Baffinland Senior Management	
Position	**Responsibilities and Accountabilities**
Chief of Operations	- Reports to Baffinland's CEO - Overall accountability for the operation of the Project - Allocation of resources (human and financial) for the implementation of Baffinland's commitments and objectives related to health, safety and environment during operation - Accountable for on-site environmental, health and safety performance during operation
VP Sustainable Development	- Reports to Baffinland's CEO - Establish corporate environmental policies and objectives - Monitors and reports on Baffinland's performance related to environmental policies and objectives - Liaise with regulatory authorities - Obtains necessary permits and authorizations - Monitors compliance with terms and conditions of permits and licences
Chief Procurement Officer	- Reports to Baffinland's CEO - Accountable for procurement and purchasing - Ensure that environmental commitments, policies and objectives are included in all contract documents

Baffinland Senior Management	
Position	**Responsibilities and Accountabilities**
Director Inuit, Government and Stakeholder Relations	- Reports to VP Sustainable Development - Accountable for external communication (Governments, media, NGO, others) related to Baffinland's press release and overall communication of site incidents/events - Community liaisons report to position
Director of Sustainable Development	- Reports directly to VP Sustainable Development and indirect reporting and coordination with Chief of Operations - Liaises with the senior management, regulators and stakeholders - Ensures effective monitoring and auditing of environmental performance of departments and contractors on site and identifies opportunities for improvement - Monitors compliance with permits, licenses and authorizations - Ensures all regulatory environmental monitoring and reporting requirements (monthly, annual) are met - Leads and coordinates site permitting requirements. - Initiates and oversees environmental studies

Baffinland's Project Environmental Department provides direction and oversight for environmental activities on-site. Project departmental accountabilities and responsibilities are identified in Table 3-2.

TABLE 3-2: BAFFINLAND PROJECT ENVIRONMENTAL DEPARTMENT (ONSITE)

Baffinland Project Environmental Department (Onsite)	
Position	**Responsibilities and Accountabilities**
Environmental Superintendent	- Reports to Director of Sustainable Development and indirect reporting and coordination with Chief of Operations - Overall accountability for environmental staff and performance at site - Coordinates implementation and monitors the performance of the Environmental Management System at site - Serves as the liaison for regulators during onsite inspections and visits - Provides ongoing environmental education and environmental awareness training to all employees and contract workers - Oversees investigations and reporting of environmental incidents to regulatory bodies, stakeholders and senior management - Reviews updates for management plans
Environmental Coordinator	- Reports to the Environmental Superintendent - Specific accountabilities for environmental monitoring and reporting - Provides day to day direction to Environmental staff onsite - Serves as a liaison for regulators during onsite inspections and visits. - Provides ongoing environmental education and environmental awareness training to all employees and contract workers

Baffinland Project Environmental Department (Onsite)	
Position	**Responsibilities and Accountabilities**
	- Assists with environmental database management - Prepare updates for management plans - Assist with monitoring and sampling activities as per the project's management plans
Environmental Monitor and Technician	- Reports to the Environmental Superintendent or designate - Assists with environmental database management - Assists with monitoring and sampling activities as per the Project's management plans
QIA Monitor	- Works alongside the Baffinland Environment Department to ensure the proper implementation of all environmental management and monitoring plans - Acts as the QIA liaison for onsite environmental matters
Environmental Support Groups (Consultants, etc.)	- Assists with sampling, monitoring and reporting activities as required by permits, licenses and environmental management plans - Provides technical expertise to various environmental studies

3.2 TRAINING AND AWARENESS

All site personnel (including contractors) are required to obtain a general level of environmental awareness and understanding of their obligations regarding compliance with regulatory requirements, commitments and best practices. Site personnel receive prescribed environmental training as part of Baffinland's Mary River Project Site Orientation.

Environment personnel performing environmental monitoring programs are required to understand and be proficient with the QA/QC procedures outlined in this management plan.

4 WATER SAMPLE COLLECTION

4.1 GENERAL

The samples will be collected following the general recommendations presented in *Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan* (INAC, 1996). A copy of the guidelines is included in Appendix A.

A summary of recommended water sample containers, sample volumes, sample preservatives and maximum sample holding times is presented in Table 9.1. Laboratory parameters such as pH, turbidity, BOD, nitrite, nitrate, total phosphorus, faecal coliforms, chlorophyll-a and pheophytin typically have maximum sample storage times varying from four (4) to 72 hours. Due to the remoteness of the site, it may not always be possible to get laboratory analysis done within the sample holding time window. Every effort will be made to get samples analysed within the preferred holding time window.

Every effort will be made to prevent accidental freezing of water samples (due to on-site climatic conditions) which could affect analytical results for parameters.

For a complete list of the required sample analyses at each monitoring station, please refer to the following documents:

- Baffinland's Type A Water Licence No. 2AM-MRY1325
- Baffinland's Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039)
- Metal Mining Effluent Regulations (Environment and Climate Change Canada)

4.2 WATER QUALITY MONITORING LOCATIONS

The QA/QC Plan addresses the collection of freshwater surface water quality samples related to monitoring programs being carried out in support of Baffinland's Mary River Project, namely:

1. Collection of environmental surface water samples from area lakes, streams and rivers.
2. Collection of effluent samples from the current and future wastewater treatment facilities located at the Mine Site, Milne Port and Steensby Port.
3. Collection of drinking water samples from camp potable water sources.
4. Collection of surface water discharges from ore stockpiles and waste rock dumps.
5. Collection of surface water discharges from future bulk sample open pits.
6. Collection of water samples from fuel berms and dispensing facilities.
7. Collection of water samples from land-farm facilities and maintenance shops.
8. Collection of effluent samples from oily water treatment systems.
9. Collection of surface water discharges from landfill facilities at the Mine Site.

10. Collection of water samples representative of general site drainage before, during and after construction on Project Sites and the Tote Road.
11. Collection of water samples downstream of active Quarry locations
12. Measurement of water sample field parameters (e.g. pH, conductivity, temperature etc.).

Exact locations and sampling frequency for designated monitoring stations are presented in Baffinland's Type A Water Licence No. 2AM-MRY1325 and Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039).

4.3 WATER SAMPLING METHODS AND EQUIPMENT

Water samples specified under Baffinland's Type A Water Licence, Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039) and the Federal Metal Mining Effluent Regulations are characterised by the following procedures.

4.3.1 GENERAL SAMPLING PROCEDURES

Generally, sampling procedures will consist of the following:

1. Sampler will wear a fresh pair of disposable nitrile gloves for each sampling event.
2. A fresh sample bottle(s) will be used at each monitoring station. Sample bottles will not be re-used.
3. Sampling will be carried out by either: i) rinsing the sample bottle with source water three times before immersing the sample bottle to fill it (after which preservative is added, as required), or ii) if the sample bottles are provided pre-charged with preservatives then it is generally convenient to transfer water samples from the source to the sample bottle using a 1-2L plastic jug. Plastic jugs will be rinsed in the source water three times before filling the sample bottle. A dedicated jug will be used for different sample types (e.g. sewage effluent, hydrocarbon impacted stormwater). Sample jugs will be replaced on a regular basis.
4. Rinse water will be disposed of so that it does not contaminate the source water where the sample will be collected e.g. downstream of the sampling location, or on the shore or berm edge.
5. Bottles labeled as "certified sterile" do not need to be rinsed.
6. For samples requiring preservatives, the sample bottle will be filled to the top (or to the indicator line marked on the bottle), the preservative will be added and the bottle securely sealed. Note that for some volatile contaminants (e.g. BTEX), the sample bottle must be filled with zero headspace.
7. Care will be taken to avoid disturbance of sediments and inclusion of disturbed suspended solids in the sample.
8. Sample details e.g. date, sample ID and analysis will be clearly marked on the bottle in permanent ink.
9. For dissolved metals analyses, if possible, the water sample will be filtered in the field immediately after sampling using a 0.45µm disposable filter and syringe. A fresh syringe and filter must be used at each monitoring station.

10. All samples will be sealed by ensuring their lids are tightly secured before placing the bottles into the coolers. Glass bottles will be protected with bubble wrap or other cushioning material.
11. All field parameters, notes, photo references and general observations shall be recorded in a notebook or log sheet to later be uploaded to Baffinland's environmental database.
12. All samples will be placed in an iced cooler as soon as possible after collection.

4.3.1.1 SAMPLE PRESERVATION

Sample bottles and preservative will be stored under clean conditions on site. Sample bottles will have the appropriate volume of preservative added in the field immediately after sample collection to minimize chemical alterations. Alternatively, sample bottles will be supplied by the analytical laboratory with preservatives already added. Ensure that the preservative container does not come in contact with the sample or inside of the sample bottle/lid. If a water sample requires filtration (e.g., analysis of dissolved metals), preservative must be added following filtration.

4.3.2 LAKE SAMPLING

For monitoring of water quality arising from vertical stratification in lakes, a depth sampler will be used (e.g. a 'Van Dorn' or 'Kemmerer'). Generally, depth samplers consist of a clear polycarbonate sample tube with two spring mounted rubber bungs, one located at each end. The depth sampler is lowered to the correct depth attached to a cord, whereupon a metal weight is released. The weight slides down the cord and strikes a release mechanism button which releases the two bungs which then seal both ends of the tube. The water sample is then pulled back to the surface.

Regardless of the brand, water samplers that are used will be suitable for collection of water samples for ultra-low metals analyses i.e. will have acrylic or PVC construction and silicone seals.

For depth sampling, the following considerations will be taken into account to ensure sample QA/QC:

1. Sampling station locations will be dependent upon the monitoring program objectives and the lake dimensions. When sampling from a watercraft all efforts will be made to anchor the boat stationary. Map coordinates for lake sampling stations will be recorded using a handheld GPS unit.
2. A vertical stratification profile (if required), profiling in-situ water quality measurements (e.g pH, temperature, dissolved oxygen, conductivity and turbidity), will be determined using a water quality multi-meter (e.g. YSI Sonde) equipped with a long cord with metre intervals marked on it.
3. Depending upon the purpose of the monitoring program, water quality samples may be collected from the different stratified layers. The depth sampler must be slowly lowered in the 'open' position (i.e. to let water enter it) until it reaches the required depth.
4. The depth sampler will be held at this depth temporarily to allow flushing of water inside the apparatus.
5. The metal weight (messenger) will be released (to activate the closing mechanism) and the depth sampler will be pulled back to the surface. Field measurements can be taken at depth or by filling a bottle with the sampled water and taking measurements from that immediately after sampling.

6. When collecting samples close to the lake bed care must be taken to ensure that the depth sampler does not disturb lake bed sediments (which could contaminate the sample).
7. Depending upon the lake area and depth, multiple sampling stations will likely be required to adequately characterize lake water quality.

4.3.3 RIVER SAMPLING

Depending upon the size of the water body, river sampling methods are the same as those presented in Sections 4.3.1 and 4.3.2. To avoid inclusion of floating detritus in the sample, the sample bottle must be fully immersed in the river water. Care will be taken to ensure that disturbed sediments are not included in the sample.

For river sampling, the additional following considerations will be taken into account to ensure sample QA/QC:

1. Grasp the bottle well below the neck and remove the lid, taking care not to touch the inside of the lid.
2. Facing upstream, plunge the bottle beneath the surface of the water to a depth of 20 cm (if possible) with the opening facing downward, then tilt the bottle opening upward into the current to fill.
3. Once the bottle is full, remove the bottle from the water in one motion by forcing the opening upward and into the current and seal the bottle securely.

When selecting water quality monitoring station locations on rivers, care will be taken where a tributary joins a river, since complete mixing of the two waters may not be achieved within several hundred metres downstream of the confluence (or further). When in doubt, vertical profile monitoring across the river's width using a field parameter such as pH, temperature or conductivity will be used to assess if complete mixing has occurred.

4.3.4 METAL MINING EFFLUENT REGULATIONS (MMER)

Water samples from stations that fall under MMER must be taken from a designated sampling port which the mine does no longer exercise control over the quality of discharge. Samples taken from these designated ports can be composite samples or grab samples.

The general sampling procedures of section 4.3.1 should be followed, and the additional considerations will be taken into account to ensure MMER QA/QC is met:

1. MMER sampling should be performed by trained personnel, and if possible a second person should be present for verification purposes.
2. Notification must be given ahead of time to a certified laboratory to ensure MMER acute lethality and sub-lethal toxicity samples can be analysed.
3. In-situ water quality monitoring will accompany all external samples taken (Refer to Section 4.3.6)

4. After collecting samples and preserving as needed, a chain of custody (COC) seal shall be applied to each bottle cap.
5. All sampling activities, notes, flow volumes, photo references and general observations shall be kept in a dedicated MMER field log book.
6. MMER samples shall be sent to the ALS lab with their own COC and should not be combined with samples from other monitoring programs.

For more information and technical guidance, Environment and Climate Change Canada's 2001 *Guidance Document for the Sampling and Analysis of Metal Mining Effluents* should be consulted.

4.3.5 SAMPLING FOR TOXICITY TESTING

Sampling for lethal toxicity testing is a condition of Baffinland's Type A Water Licence for various monitoring programs. Sub-lethal toxicity testing is a condition of Environmental Effects Monitoring (EEM) and Metal Mining Effluent Regulations (MMER). Depending on the regulatory and analysis requirements, one or more 4L effluent samples are required. Depending upon the objectives of the toxicity testing, variables that will require confirmation prior to testing include:

- Type of effluent sample to be collected e.g. instantaneous grab sample, or composite sample collected over a period of time
- Type of dilution water to be used by the testing laboratory e.g. standard synthetic laboratory dilution water, receiving water collected upstream of the discharge etc.
- Preferred test organism e.g. *Daphnia magna* and/or rainbow trout

Details concerning laboratory methods are presented in Appendix D. For further details concerning acute lethality testing refer to Environment Canada (2002) and USEPA (2002). For further details concerning sub-lethal testing refer to Environment Canada (2012)

4.3.6 IN-SITU WATER QUALITY

Measurement of field parameters (e.g. temperature, pH, conductivity, redox potential, or dissolved oxygen, etc.), where warranted, will be carried out for each sample at the time of sampling. The required set of field parameters will vary according to sample type and monitoring objectives. The exact methods used for monitoring field parameters will depend upon the type of monitoring probes being used. Field staff will read and be familiar with the instruction manual for the equipment being used on site, and follow manufacturer's instructions for specifics on proper calibration, use, storage, and maintenance.

Field staff will rinse the monitoring probe three times with the water to be monitored before immersing the probe in the water. Generally, the user will ensure that the probe being used has had sufficient time to equilibrate in the water before the reading is taken. This is generally regarded as the point at which the reading has stabilized.

Field parameter data will be recorded in notebooks, or preferably in a custom form designed for this purpose. A copy of the data should be retained on site.

4.3.6.1 MONITORING PROBE CALIBRATION

Monitoring probes will be stored and calibrated in accordance with manufacturers' instructions. All probes will be calibrated regularly per sampling program requirements and a written record of the calibration results will be maintained on site. Field staff will ensure that calibration solutions are of the correct specification and that they have not passed their expiry date (if applicable). Monitoring probes will be stored as per manufacturers' recommendations.

5 SEDIMENT SAMPLE COLLECTION

For a complete list of the required sample analyses at pre-established monitoring station, please refer to Baffinland's Type A Water Licence and the Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039). Every effort will be made to get samples analysed within the preferred holding time window conforming to the specified protocols for sediment sampling. A summary of recommended sediment sample containers, sample volumes, and maximum sample holding times is presented in Table 9.1. Field observations and parameters if warranted should be recorded during the collection of sediment samples.

5.1 SEDIMENT MONITORING LOCATIONS

The QA/QC Plan addresses the collection of sediment samples related to monitoring programs being carried out in support of Baffinland's Mary River Project, namely:

1. Collection of environmental sediment samples from area lakes, streams and rivers.
2. Collection of sediment samples from fuel berms and dispensing facilities.
3. Collection of sediment samples from landfarm facilities.
4. Collection of sediment samples from remediation and reclamation projects.
5. Collection of sediment samples evaluating spills and releases.

5.2 SEDIMENT SAMPLING METHODS AND EQUIPMENT

Sediment samples specified under Baffinland's Type A Water Licence and Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039) are characterised by the following procedures.

5.2.1 GENERAL SAMPLING PROCEDURES

Generally, sampling procedures will consist of the following:

1. Sampler will wear a fresh pair of disposable nitrile gloves for each sampling event.
2. A fresh sample bottle(s) will be used at each monitoring station. Sample bottles will not be re-used.
3. Sample details e.g. date, sample ID and analysis will be clearly marked on the sample jar in permanent ink.
4. All samples will be sealed by ensuring their lids are tightly secured before placing the bottles into the coolers.
5. All samples will be placed in an iced cooler as soon as possible after collection.

5.2.2 RIVER AND GRAB SAMPLING

The collection of river and grab samples will follow the general procedures stated in 5.2.1 and will entail the following additional QA/QC considerations:

1. Sampling station locations will be dependent upon the monitoring program objectives and the sample location.
2. A clean spatula or spoon will be utilized to obtain a representative sample of the sediment for analyses.
3. If composite samples are required by the monitoring program, a sterile container will be utilised to deposit and homogenize the subsamples, until the composite sample is fully mixed. The composite sample will then be transferred to the identified sample jars by alternating aliquots.
4. The quantity and holding time of samples obtained will depend on the prescribed analysis.

5.2.3 LAKE SAMPLING

For monitoring of sediment character and quality in lakes, a depth sampler will be used. The preferred sample apparatus for lake sediment samples are gravity percussion corers, since they allow for retrieval and analysis of sediment profiles. A *Petite Ponar* can also be used but will not provide sediment profiles. Generally, forms of gravity percussion corers consist of a clear polycarbonate sample core tube attached to a weighted upper head assembly and a seal mechanism. The top two centimeters of sediment from the core samples will be retained for laboratory analysis unless sampling objectives state otherwise.

Sediment lake sampling procedures will follow the general procedures stated in Section 5.2.1 and the following additional QA/QC considerations for a gravity percussion corer:

1. Sampling station locations will be dependent upon the monitoring program objectives and the lake dimensions. When sampling from a watercraft all efforts will be made to anchor the boat stationary. Map coordinates for all lake sampling station locations will be recorded using a handheld GPS unit.

2. The corer will be positioned perpendicular to the water surface prior to release. The penetration depth of the core tube is affected by the depth of water, angle of corer deployment and substrate type.
3. Once the corer is embedded in the substrate, the stainless steel messenger will be sent down the corer rope to release the ball-type seal. This seal creates a vacuum in the core tube, retaining the sampled sediment.
4. Upon retrieval, the bottom of the core tube will be plugged using an extruding plug prior to breaking the air-water interface. This procedure will prevent sample loss.
5. An extruding apparatus will be used to force the extruding plug through the core tube moving the sediment sample to the end of tube allowing the top two centimetres to be scooped out and placed in a clean stainless steel bowl for sample homogenisation.
6. Multiple core samples (generally three or more) are required per sample station to obtain the required sample volume. The multiple core samples are homogenized in the stainless steel bowl, removing any excess water or debris.
7. The sample containers will be filled by alternating aliquots between each of the containers.
8. After the top two centimeters are retained, the remaining, unused sediments within the core tube will be placed into a bucket and only released once all core sampling is complete at that particular station.
9. Depending upon the lake area and depth, multiple sampling stations will likely be required to adequately characterize lake sediment quality.

6 BENTHIC INVERTEBRATES SAMPLE COLLECTION

For a complete list of required analyses at pre-established monitoring stations, see Baffinland's Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039). Samples will be submitted to an analytical laboratory for processing and taxonomic identification. Laboratory methods for benthic invertebrate samples will be in accordance with guidance provided by EC, 2012. Field observations and parameters if warranted should be recorded during the collection of benthic invertebrate samples.

6.1 BENTHIC INVERTEBRATE MONITORING LOCATIONS

This QA/QC Plan addresses the collection of benthic invertebrate samples related to monitoring programs being carried out in support of Baffinland's Mary River Project, namely:

- Collection of benthic invertebrate samples from Project area and reference lakes, streams and rivers to determine potential mine related effects on benthic invertebrate communities.

6.2 BENTHIC INVERTEBRATE SAMPLING METHODS AND EQUIPMENT

Benthic Invertebrate samples follow the same general procedures outlined in Section 5.2.1. Benthic invertebrates can be collected from either depositional (lake) or erosional (stream) sample locations. A

Petite Ponar is utilised when sampling depositional environments while a *Surber sampler* is utilised when sampling erosional environments. For a complete list of depositional and erosional sample methods see Baffinland's Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039). Benthic invertebrate samples will be carefully sieved through 500 µm mesh. All materials, including invertebrates, retained by the mesh will be transferred to labelled plastic jars and fixed with 10% buffered formalin. Fixed and labelled samples will be shipped to an analytical laboratory for processing and archiving.

7 QA/QC

For monitoring of QA/QC during sample collection and shipping, a set of QA/QC samples will be routinely submitted for analysis from prescribed sampling programs. Sampling programs will each have separate QA/QC samples submitted with the regular water samples. Descriptions of the QA/QC samples that will be used are presented on Table 7.1. Ten percent of all samples will consist of field blanks, travel blanks and field duplicates. For example, a monitoring program with 30 samples would consist of 27 monitoring samples and 3 QA/QC samples. Equipment blanks, if required, are performed on an as needed basis to ensure sampling equipment is properly maintained and free of contaminants, and do not count towards the ten percent of QA/QC samples.

7.1 SAMPLING PROGRAMS WITH MULTIPLE SAMPLING STATIONS

For sampling programs with multiple sampling locations (SNP, AEMP) QA/QC samples will be performed randomly to avoid bias, and care will be taken to ensure that the same stations are not sampled repeatedly for QA/QC samples.

7.2 SAMPLING PROGRAMS WITH LIMITED SAMPLING STATIONS

Sampling programs with limited sampling stations (e.g. MMER) will require at least one QA/QC sample per sampling round. A field duplicate, field blank or travel blank must be taken during each sampling session. This may result in over sampling for QA/QC, but will ensure there is sufficient data to identify any anomalies.

7.3 QA/QC ANALYSIS

In the interest of transparency, the analytical laboratories will also be instructed to report the results of their own in-house QA/QC testing (e.g. results of random replicate analyses of submitted samples).

The results of QA/QC analyses will be routinely reviewed by Baffinland or their designate, and any anomalous results will be promptly investigated with the assistance of the analytical laboratory. Once the reason for the anomalous results is identified, Baffinland will ensure that operating procedures of field staff and/or the analytical laboratory will be altered in order to address the issue. Compliance monitoring and data management for water license sampling will be conducted by Baffinland, with the assistance of a designate as required.

TABLE 7-1: Purpose, Description and Frequency of QA/QC Samples

QA/QC Plan	Purpose	Description	Frequency	Prepared By
Field blank	Identification of potential contaminants arising from sample collection. The field blank bottle is prefilled with laboratory deionized water and is handled in the same way as regular sample bottles (i.e., opened and closed during the sample collection). The bottle is submitted as a routine sample.	Bottle contains prefilled deionized water. Bottle is handled the same as one would handle the samples.	Ten percent of all samples collected will be QA/QC.	Analytical laboratory
Travel blank	Identification of potential contaminants arising from sample storage, shipping and laboratory handling. The travel blank accompanies the samples to the laboratory but is not taken out into the field, or opened.	Sealed bottle containing deionized water provided by analytical laboratory.	Ten percent of all samples collected will be QA/QC.	Analytical laboratory
Field duplicate	Assesses sample variability and precision of laboratory analytical methods. Collected from a randomly selected location, split from a homogenized sample and analyzed separately in the laboratory. The duplicate samples are handled and analyzed in an identical manner in the laboratory.	Duplicate sample selected at random. A large sterile bottle is used to collect the water. Water is then poured equally into two sets of pre-labelled bottles.	Ten percent of all samples collected will be QA/QC.	Field Staff
Equipment blank	Assesses cross contamination from field water sampling equipment (e.g. Kemmerer). Rinse deionized water through water sampling equipment and transfer to sample bottles.	Bottle contains deionized water that has been rinsed through the sampling equipment.	Collected prior and after completion of sampling program (if required/ as needed). Not included in the ten percent calculation of other QA/QC samples.	Field Staff

8 SAMPLE MANAGEMENT

8.1 SAMPLE LABELING

Accurate sample labelling is essential for subsequent interpretation of field data. Ensure that labels are legible and written with permanent ink (pen, marker, etc.). For a complete list of the predetermined sample labels at monitoring station, please refer to Baffinland's Type A Water Licence and the Aquatic Effects Monitoring Plan (BAF-PH1-830-P16-0039).

A consistent format for identifying samples must be followed if a predetermined sample label does not exist in order to facilitate accurate sample tracking and to ensure sample labels are interpreted in the same manner by all personnel involved in the program.

Samples must be uniquely identified with the following information:

- Sample ID
- Collection date and time
- Project identifier
- Company name

QA/QC samples will be labeled by the following conventions:

- Field Duplicate: 01 following the sample label
- Field Blank: 02 following the sample label
- Travel Blank: 03 following the sample label
- Equipment Blank: 04 following the sample label

8.2 SAMPLE STORAGE AND HANDLING

Physical, chemical and biochemical reactions may take place in the sample container between the time of sample collection and laboratory analysis. Samples will be placed in iced coolers and shipped to the analytical laboratory as soon as possible after collection, consulting stipulated analytical holding times, to minimize these changes. Care will be taken to ensure that bottles are stored upright and are packed securely within the cooler; glass bottles should be wrapped in bubble wrap. Preferably, leak-proof ice packs will be used for cooling the samples. If loose ice is used, ice should be securely sealed in plastic bags to prevent leakage of melt water.

Biological samples (e.g. benthic invertebrates) preserved using formalin or Lugol's solution can be held at room temperature until submission to the analytical laboratory.

8.3 SAMPLE SUBMISSION AND CHAIN OF CUSTODY

A chain of custody (COC) form will accompany all samples being submitted to ensure that the required analyses are completed, and to confirm receipt of samples by the laboratory (see example form presented in Appendix B). Prior to shipment, samples should be carefully prepared for shipping and sample bottles listed on the COC must be reconciled with what has physically been placed in the shipping container. The collection of samples that are time sensitive needs to coincide with shipping schedules, travel time to the laboratory, and laboratory business hours. A record of all COCs submitted for analysis must be kept on site. Information on the COC form will include:

1. Project name and project assignment number.

2. Address of analytical laboratory, name of contact person and contact details.
3. Contact details and name of sampler.
4. Date and time of sampling.
5. Whether the sample has been filtered, or whether laboratory filtration is required.
6. List of sample I.D.'s, sample type (e.g. lake water, sewage effluent, etc.), number of sample bottles per sample and analysis requested.
7. Urgency of analysis (e.g. rush or normal). For rush samples the analytical laboratory should be notified ahead of time.
8. Whether sample contains preservative and if so, what preservative and when it was added.
9. Submission date and time.
10. Comments on any unusual conditions and other important information.

9 LABORATORY ANALYSIS

9.1 LABORATORY ACCREDITATION

Laboratory analysis of samples is performed by an on-site accredited analytical laboratory and an off-site accredited analytical laboratory. The on-site laboratory is operated by ALS Canada LTD. and is located at the Mine Site. A select set of basic analytical parameters (e.g. pH, TSS, turbidity etc.), are performed by the on-site laboratory. The off-site laboratory, ALS Environmental, located in Waterloo, ON, run by ALS Canada Ltd. performs the majority of analyse required. Toxicity testing is performed by Aquatox Testing & Consulting Inc, located in Guelph, ON. Details of ALS analytical laboratory licencing and accreditation are presented in Appendices C.

9.2 ANALYTICAL DETECTION LIMITS

ALS Limits of Reporting (LORs) are established using rigorous experimental and statistical procedures that begin with the determination of the Method Detection Limit (MDL) at 99%confidence. When detected at or above the MDL, ALS test results are considered to be qualitatively accurate, and a parameter can be reported with 99% confidence as being present in the sample.

It should be noted that on occasion, a loss of analytical sensitivity can be encountered due to excessively high concentrations of parameters within a sample or lack of provided sample matrix. If this is encountered, Baffinland or their designate will work with the analytical laboratory to try and resolve the problem and new samples will be taken if required. The detection limits on ALS analytical reports contains the LOR. The LOR may be the MDL as calculated, or a higher value. Required analytical laboratory detection limits are provided in Appendix D.

9.3 LABORATORY ANALYTICAL METHODS

Analytical methods used by the analytical laboratories for water analyses generally conform to the standard methods outlined in *Standard Methods for the Examination of Water and Wastewater* (APHA et al, 1989). Standard analytical methods for available analyses through ALS Environmental are provided in Appendix D.

9.4 ANALYTICAL LABORATORY QA/QC PROCEDURES

ALS Environmental adheres to a designated QA/QC Management System which includes documentation and document control, staff training and internal audits. The practices exceed accreditation requirements for high confidence in data reliability utilising but not limited to:

- Use of calibration verification standards and drift control standards.
- Use of surrogate standards and internal standards.
- Replicate analyses and blanks on submitted samples.
- Use of standard reference materials (SRM's) and matrix spikes.
- Standards Data Quality objectives are established for each QC sample, based on a combination of reference method objectives, customer requirements and historical test method performance. Where applicable, prescriptive elements of reference methods take precedence over internal

  Further details on the analytical laboratories in-house QA/QC protocols are presented in Appendix E.

9.5 SUMMARY OF ANALYTICAL PROCEDURES

TABLE 9-1: Summary of Analytes, Water and Soil Sample Volumes, Preservatives and Sample Storage Time for ALS Environmental

Inorganics	Analysis [1]	Water Container	Water Preservation	Additional Notes	Soil Container	Water / Soil Hold Time
ROUTINE INORGANICS AND PHYSICALS	Acidity and Alkalinity	0.5-1 L Plastic			125-250 mL Jar or Bag	14 Days / NA
	Anions (Br, Cl, SO4, F) and Electrical Conductivity	0.5-1 L Plastic			125-250 mL Jar or Bag	28 Days [7]/ Unlimited
	Bromate[19], Chlorate and Chlorite	125 mL Plastic	EDA (Ethylenediamine)		NA	28 Days (Chlorite 14 Days) / NA
	BOD, Colour and Turbidity	0.5-1 L Plastic			NA	2-4 Days [8] / NA
	COD and Phenols (4AAP)	125-250 mL Glass	1:1 Sulfuric Acid (H_2SO_4)		NA	28 Days / NA
	Cyanide, Total ,Weak Acid Dissociable,Free	145 mL Plastic	6N NaOH		125-250 mL Jar or Bag	14 Days / 14 Days
	Dissolved Oxygen	300 mL BOD bottle	1 each; $MnSO_4$ & alkaline iodide azide pillows		NA	8 Hours[20] / NA
	Dissolved or Total Inorganic Carbon (DIC or TIC)	125-250 mL Glass	.	Field Filter for Dissolved	125-250 mL Jar or Bag	14 Days / 28 Days
	Dissolved or Total Organic Carbon (DOC or TOC)	125-250 mL Glass	1:1 Sulfuric Acid (H_2SO_4)	Field Filter for Dissolved	125-250 mL Jar or Bag	28 Days / 28 Days
	Flashpoint	2 x 100-250 mL Amber Glass		Zero Headspace	125-250 mL Jar	7 Days / 7 Days
	pH	0.5-1 L Plastic			125-250 mL Jar or Bag	0.25 Hours / 30 Days [9]
	Solids (TS, TSS, TDS)	0.5-1 L Plastic			NA	7 Days / NA
	Sulfide	125 - 150 mL Plastic	Zinc Acetate & 6N NaOH		125-250 mL Jar or Bag	7 Days / 7 Days
	Sulfite	125 mL Plastic			NA	0.25 Hours / NA
NUTRIENTS	Ammonia Nitrogen	250 mL Glass or Plastic	1:1 Sulfuric Acid (H_2SO_4)		125-250 mL Jar or Bag	28 Days / 72 Hours
	Nitrate or Nitrite Nitrogen (and Ammonia unpreserved)	0.5-1 L Plastic			NA	2-7 Days [10] / 72 Hours
	Nitrogen, Kjeldahl, Organic, Total or Dissolved	250 mL Glass or Plastic	1:1 Sulfuric Acid (H_2SO_4)	Field Filter for Dissolved	NA	28 Days / NA
	Nutrients, Available (N,P,K,S)	NA			125-250 mL Jar or Bag	NA / 3 Days [11]
	Phosphorus, Reactive (orthophosphate)	0.5-1 L Plastic			NA	2-7 Days [12] / NA
	Phosphorus, Total Dissolved	250 mL Glass or Plastic	1:1 Sulfuric Acid (H_2SO_4)	Field Filter for Dissolved	NA	28 Days / NA
	Phosphorus, Total	250 mL Glass or Plastic	1:1 Sulfuric Acid (H_2SO_4)		NA	28 Days / NA
METALS	Chromium VI (Hexavalent)	125 mL Plastic	50 % NaOH (BC MoE) or 6N NaOH + Ammonium Buffer (OMoE)		125-250 mL Jar or Bag	28 Days / 30 Days
	Mercury, Methyl	250 mL FLPE	1:1 Hydrochloric Acid (HCl)[21]	Field Filter for Dissolved	125-250 mL Jar or Bag	6 Months / 28 Days
	Mercury, Total or Dissolved	40 mL Glass Vial	1:1 Hydrochloric Acid (HCl)	Field Filter for Dissolved	125-250 mL Jar or Bag	28 Days / 28 Days
	Metals, Total or Dissolved	125-250 mL Plastic	1:3 Nitric Acid (HNO_3) to pH<2	Field Filter for Dissolved	125-250 mL Jar or Bag	6 Months / 6 Months
Organics						
HYDRO-CARBONS	F1, Volatile Organic Compounds (VOCs), THMs, 1,4-Dioxane, Volatile Petroleum Hydrocarbons (VPH)	2 or 3 x 40 mL Glass Vials [2]	Sodium Bisulfate [4]	Zero Headspace	Field Methanol Kit [6]	14 Days / 40 Days [13]
		2 or 3 x 40 mL Glass Vials [2]	Sodium Bisulfate [4]	Zero Headspace	Hermetic Sampler kit [6]	14 Days / 48 Hours
	CCME CWS F1, BTEX	2 or 3 x 40 mL Glass Vials [2]	Sodium Bisulfate [4]	Zero Headspace	125 - 500 mL Jar	14 Days / 7 Days
	CCME CWS F2-F4	2 x 60 mL Amber Glass Vials [3]	Sodium Bisulfate		125 - 500 mL Jar	14 Days [14]/ 14 Days
	EPH or LEPH/HEPH	2 x 250 mL Amber Glass with Septa Cap	Sodium Bisulfate		125 - 500 mL Jar	14 Days / 14 Days
	Polycyclic Aromatic Hydrocarbons (PAHs)	2 x 0.25 - 1 L Amber Glass [5]	Sodium Bisulfate		125 - 500 mL Jar	14 Days / 14 Days
	Oil & Grease or Mineral Oil & Grease	2 x 0.25 - 1 L Glass	1:1 HCl or H_2SO_4		125 - 500 mL Jar	28 Days / 28 Days
TRACE ORGANICS	Alcohols	2 x 40 mL Glass Vials		Zero Headspace	125 - 500 mL Jar	7 Days / 7 Days
	Alkanolamines (MEA, DEA, DIPA)	250 mL Amber Glass			125 - 500 mL Jar	7 Days / 14 Days
	AOX	40 - 250 mL Amber Glass	1:3 Nitric Acid (HNO_3) to pH<2		125 - 500 mL Jar	6 months [15] / 28 Days
	C1 - C5 Gases	3 x 40 mL Blue Septa Vials	Sodium Bisulfate [4]	Zero Headspace	NA	14 Days / NA
	Dioxins and Furans, PBDE and PBB	2 x 1 L Amber Glass			125 - 500 mL Jar	Unlimited / Unlimited
	Formaldehyde/Aldehydes	2 x 40 mL Amber Glass Vials [2]	Ammonium Chloride+Copper Sulfate	Zero Headspace	125 - 500 mL Jar	7 Days / 5 Days
	Glycols	2 x 40 mL Amber Glass Vials			125 - 500 mL Jar	7 Days / 14 Days
	Hormones and Steroids	1 L Plastic			NA	28 Days / NA
	Naphthenic Acids	2 x 250 mL Amber Glass			125 - 500 mL Jar	14 Days / 14 Days
	Nitroaromatics and Nitrosamines (Explosives)	1 L Amber Glass			125 - 500 mL Jar	7 Days / 14 Days
	Nonylphenol & Ethoxylates, Bisphenol A (BPA)	1 L Amber Glass			125 - 500 mL Jar	28 Days / 14 Days
	PCB	2 x 0.25 - 1 L Amber Glass			125 - 500 mL Jar	Unlimited / Unlimited [16]

	Perfluorinated Chemicals (PFCs), PFOS, PFOA	1 L Plastic (PTFE free)			125-250 mL Jar or Bag	14 Days / 14 Days
	Phenolics, Chlorinated and Non-Chlorinated	2 x 0.5 - 1 L Amber Glass	Ascorbic Acid & Sodium Bisulfate [4]		125 - 500 mL Jar	14 Days / 14 Days
	Priority Pollutants (EPA 625 list) or SVOCs	2 x 1 L Amber Glass			125 - 500 mL Jar	7 Days / 14 Days [17]
	Resin Acids & Fatty Acids	2 x 0.5 - 1 L Amber Glass	Ascorbic Acid & NaOH		125 mL Jar	14 Days / 14 Days
	Sulfolane	2 x 0.5 - 1 L Amber Glass	Sodium Bisulfate [4]		125 mL Jar	14 Days / 14 Days
PESTICIDE RESIDUES	Carbamate Pesticides	1 L Amber Glass	Use Sodium Thiosulfate if chlorinated		125 - 500 mL Jar	7 Days / 14 Days
	Glyphosate / AMPA	1 L Plastic	Use Sodium Thiosulfate if chlorinated		125 - 500 mL Jar	14 Days / 14 Days
	Herbicides, Acidic	2 x 1 L Amber Glass	Sodium Bisulfate [4]		125 - 500 mL Jar	14 Days / 14 Days
	Organochlorine or Organophosphate Pesticides	2 x 1 L Amber Glass			125 - 500 mL Jar	7 Days / 14 Days
	Soil Sterilant Scan	1 L Amber Glass			250 g Poly Bag	7 Days / 14 Days
Micro						
MICRO-BIOLOGICAL	Coliforms-Fecal, Total, E-coli & HPC	100 - 300 mL Sterilized Plastic	Sodium Thiosulfate		500 mL Sterilized Jar	24-48 Hours [18] (24 - HPC) / NA
	Microtox	1 L Amber Glass			125-250 mL Jar or Bag	3 Days / 3 Days

1. Additional analyses with the same container type and preservation may be possible - consult the lab for details.

2. The number of 40 mL glass vials required (2 or 3) for BTEX & VOC varies by lab based on instrumentation. Consult the lab for details.

3. Please fill to the top of the marked line on the 60 mL Amber Glass Vials.

4. Use Sodium Thiosulfate instead of Sodium Bisulfate if sample is chlorinated.

5. OMoE has no preservation requirement for PAHs. 2 X 250 mL Amber Glass required for BC MoE and OMoE. For AB and SK and for Alkylated PAHs, ALS requires 2 x 1 L Amber Glass.

6. Soil sampling options depend on soil location and condition of soil. Field Methanol Kit consists of one 5g TerraCore® sampler or similar sampling device, two pre-weighed 40 mL glass vials with methanol preservative and a 125mL soil jar for moisture. Hermetic sampler kit consists of a T-handle, two 5g hermetic samplers and a 125mL soil jar for moisture. One additional parameter, such as metals or hydrocarbons can also be obtained from the 125mL soil jar.

7. 4 Days hold time for Electrical Conductivity only as per Ontario MISA.

8. 3 Days hold time for British Columbia as per BC Ministry of Environment (BC MoE), 4 Days hold time as per OMoE.

9. pH in water should be taken in the field as per BC MoE, 4 Days hold time for Ontario MISA and 28 Days hold time for OMoE. 30 Days hold time as received for pH in soil as per OMoE. One year hold time once soil is dried.

10. 3 Days hold time as per BC MoE, 5 Days hold time as per Ontario MISA and 7 Days hold time as per OMoE.

11. 3 Days hold time until received. Unlimited hold time once soil is dried.

12. 3 Days hold time as per BC MoE and 7 Days hold time as per OMoE.

13. 40 Days hold time as per BC MoE and 14 Days hold time as per OMoE. Recovered methanol extract from laboratory has a 40 Days hold time as per OMoE.

14. 40 Days hold time as per OMoE.

15 14 Days hold time as per Ontario MISA.

16. 14 Days hold time as per OMoE. Consult lab for container size if limited sample volume is available.

17. 14 Days hold time for water and 60 Days hold time for soil as per OMoE. Ontario labs require 2 x 250 mL Amber Glass + 500 mL Amber Glass.

18. 30 Hours hold time as per BC Drinking Water Regulation and 48 Hours as per OMoE.

19. Bromate alone does not require preservative.

20. 15 Minutes hold time as per OMoE - Field measurement by meter is recommended.

21. Use 1:1 Sulfuric Acid (H_2SO_4) for preservation of marine or brackish samples.

SEPTEMBER 2015 BACK

10 DATA MANAGEMENT AND REPORTING

10.1 DATA MANAGEMENT

All sample data collected by Baffinland or designate consultants from the various environmental programs required on Project sites will be stored electronically in a spreadsheet database (Microsoft Excel) or using alternative software designed specifically for environmental data management.

QA/QC measures relating to data validation will include the following**:**

1. Designation of a suitable person to act as the Database Manager (DM).
2. Upon receipt, laboratory analytical data will be reviewed by the DM to check for completeness, typos, outlying values, etc. The analytical laboratory will be immediately notified of any anomalous results.
3. At a suitable frequency (e.g. once per month) the spreadsheet database should be updated by the DM using: i) results provided in electronic format by the analytical laboratories, and ii) copies of the field parameter monitoring records forwarded from site
4. The DM will be responsible for ensuring that a third party (e.g. another staff member) carries out a QA/QC check on a minimum of ten percent of newly entered data.

10.2 REPORTING

All documents prepared by Baffinland or their designate for submission to the regulators will be reviewed by senior staff and Baffinland prior to issue, as per the company's standard practice and quality management system.

11 REFERENCES

1. APHA *et al*, 1989. Standard Methods for the Examination of Water and Wastewater; AHPA, AWWA and WPCF, 17th ed.
2. Environment Canada (EC). 2002 Metal Mining Effluent Regulations. http://laws-lois.justice.gc.ca
3. Environment Canada (EC). 2001 Guidance Document for the Sampling and Analysis of Metal Mining Effluent. http://publications.gc.ca/collections/Collection/En49-24-1-39E.pdf
4. Environment Canada (EC). 2012. Metal mining technical guidance for Environmental Effects Monitoring. ISBN 978-1-100-20496-3.
5. Environment Canada, 2002. Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring. http://www.ec.gc.ca/eem/English/MetalMining/Guidance/default.cfm.
6. INAC, 1996. Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class “A” Licenses in Meeting SNP Requirements and for Submission of a QA/QC Plan. Prepared by Department of Indian and Northern Affairs Canada Water Resources Division and the Northwest Territories Water Board, July 1996.
7. Nunavut Water Board, 2013. Baffinland Iron Mines Corp. – Class A Water License No: 2AM-MRY1325. Issued by the Nunavut Water Board, 2013.
8. USEPA, 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms; 5th Ed., USEPA, ref. No. EPA-821-R-02-012.

Appendix A

Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan (INAC, 1996).

QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC)

GUIDELINES

FOR USE BY CLASS "A" LICENSEES IN MEETING SNP REQUIREMENTS

AND FOR SUBMISSION OF A QA/QC PLAN

JULY 1996

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS CANADA
WATER RESOURCES DIVISION
AND THE
NORTHWEST TERRITORIES WATER BOARD

Table of Contents

1.0 Introduction and Definitions ... 1

2.0 Field Sampling ... 1

2.1 Sample Collection ... 1
2.1.1 Location ... 1
2.1.2 Sampling Equipment ... 2
2.1.3 Sampling Methods ... 3

2.2 Sample Handling ... 4
2.2.1 Preservation ... 4
2.2.2 Sample Identification ... 5
2.2.3 Transportation ... 5

3.0 Lab Analysis ... 6

3.1 Outside Laboratories ... 6
3.1.1 Lab Accreditation ... 6
3.1.2 Detection Limits ... 6
3.1.3 Methodology ... 6

3.2 In-House Laboratories ... 6
3.2.1 Identification of Analytical Laboratory/Detection Limits ... 7
3.2.2 For Overall Analytical Methods, Precision and Accuracy ... 7
3.2.3 Accuracy Requirements ... 7
3.2.4 Precision Requirements ... 8
3.2.5 Methodology ... 8

4.0 Reporting Requirements ... 9

4.1 General Submissions ... 9
4.2 Outside Laboratories ... 9
4.3 In-House Laboratories ... 9

Appendixes
Appendix 1 ... 11
Table 1 - Summary of Preservation Requirements

Appendix 2 ... 12
References

1.0 Introduction and Definitions

In order to assist Licensees in completing their Quality Assurance and Quality Control (QA/QC) Plan, the following guidelines are provided, which indicates the minimum information that should be included.

These Guidelines are divided into three sections:

1) Field Sampling
2) Lab Analysis
3) Reporting Requirements

It is recognized that there may be different interpretations as to what is covered by "Quality Assurance/Control" due to the fact that certain Licensees have their own laboratories, while others only use commercial laboratories. For licence purposes, "Quality Assurance" and "Quality Control" refer to the following:

Quality Assurance: is the system of activities designed to better ensure that quality control is done effectively; while

Quality Control: is the use of established procedures to achieve standards of measurement for the three principal components of quality: precision, accuracy and reliability.

2.0 Field Sampling

2.1 Sample Collection

2.1.1 <u>Location</u>

A QA/QC plan must identify the locations of all sampling stations and the markers used to identify the stations. If the Surveillance Network Program (SNP) of the Water Licence does not specify sampling locations, locations should be chosen with help from an Inspector.

Buoys and landmarks identify sampling stations in tailings ponds and lakes, while sign post positioning usually marks stream sample stations. Stations should be used repeatedly, with the same personnel and techniques to reduce operational error. The use of Global Positioning System (GPS) to identify Latitude and Longitude for sampling stations is recommended.

2.1.2 Sampling Equipment

The Plan must include a detailed section on the equipment used for sampling, the rationale behind the choices of equipment, and descriptions of how the equipment is maintained and calibrated. Equipment and bottles should be selected so that they do not contaminate or otherwise alter the concentrations of parameters of interest.

Sampling devices, sample bottles and filtration devices should be constructed of non-metallic material. Most samples are now collected in containers constructed of high density polyethylene plastic. However, there are some exceptions, when testing for oil and grease or phenols glass containers are to be used. When conducting a fish bioassay, plastic drums are used while hydrocarbon based containers are not to be used for the collection of organic samples.

This section should also identify whether new or used bottles are used for each sample analysis. New bottles are preferred, but sample containers may be used repeatedly with proper handling measures.

If old bottles are used, a detailed description should be included, noting how they are maintained, stored and cleaned. Usually, this will closely resemble the product manufacturer's instructions. An example of how bottles should be cleaned is outlined below:

- Rinse well with hot tap water for one minute or more.
- Empty bottle and add 30% HNO_3 to approximately 1/3 container capacity. Shake well for three to four minutes.
- Rinse vigorously with hot tap water for two minutes.
- Rinse thoroughly three times with tap water and three times with distilled water.
- Store with 0.2% HNO_3 for a minimum of one week.
- Rinse again with distilled water at least three times.

Bottles that are to be used for bacteria testing should be acid washed or autoclaved if possible.

Note: Additional information on bottle washing is also available from Water Resources Division.

2.1.3 Sampling Methods

This Section will include details on methods for sample collection and the equipment that is to be used for each station.

In lakes and ponds, regular sample bottles are used the majority of the time, but Van Dorn samples are often utilized. The sample or the sample bottle is usually lowered to mid depth and washed three times before collecting the sample on the fourth submersion. Approximately 2% of the sample container capacity should remain to provide for mixing, preservative addition and thermal expansion.

Stream water sampling is usually done by plunging a sample bottle toward the current and allowing it to fill. Once again, the bottle should be rinsed three times before filling and room should be left for preservative addition and mixing.

A glass bottle should be used when sampling for oil and grease with the sample being collected during the first submersion and not rinsed three times first.

This section should also describe how often field blanks and replicate samples will be collected. Field blanks are samples of distilled/deionized water that are to be treated in exactly the same manner as the other samples. Blanks should therefore be taken to the field and handled and preserved as part of the sample program. They indicate when a sample may be contaminated and are indicative of general sample integrity. Replicate samples (duplicates and triplicates) are two or three samples collected from the same station at the same time. They help to ensure sample precision at the laboratory.

2.2 Sample Handling

2.2.1 <u>Preservation</u>

After collection, most samples must be preserved in order to prevent chemical or biochemical changes to the sample. The QA/QC plan must describe how samples from each station are to be preserved.

Preservation is generally done by the addition of certain chemicals into the bottle immediately after the sample is collected. **Table 1** is a general guide to preservatives and their appropriate concentrations. The QA/QC plan should contain more detailed information on the concentrations and amount of preservatives that will be used.

2.2.2 Sample Identification

The plan should include a description of the system used to identify samples. The system must provide positive sample identification and ensure that the identification is maintained. It is advisable to keep a logbook of samples that have already been delivered.

The identification can be maintained by marking the bottle itself or a label, with a water resistant, non-smear felt pen. The information should be clear to persons uninvolved in the sampling and may include such details as company name, sample area, SNP number, time and date.

2.2.3 Transportation

The section on transportation will describe how sample integrity will be ensured from the time of collection to completion of delivery. Delivery to the lab should be done as soon as possible after the samples have been collected.

Usually, samples are sealed and stored upright in a box with other samples to provide a snug, immobile storage space during transfer. Any samples that require refrigeration for preservation should be kept cool during transport.

3.0 Lab Analysis

Because certain Class “A” Licensees have their own analytical laboratory and others rely on commercial laboratories, this section of the Guidelines is divided accordingly.

3.1 Outside Laboratories

3.1.1 Lab Accreditation

The Licensee will identify in the plan the name of the commercial laboratory that will be conducting the analyses. A letter must be provided from the commercial lab indicating that they are accredited to conduct analyses on each of the required sampling parameters. Ideally, the lab should be accredited by the Canadian Associated for Environmental Analytical Laboratories (C.A.E.A.L.) and should provide a certificate stating parameters for which they are accredited.

3.1.2 Detection Limits

Detection limits for the commercial lab should be identified for all parameters and should be reported when any SNP data is submitted.

3.1.3 Methodology

Descriptions should be included for any methods of analysis used that are not outlined in “Standard Methods for the Examination of Water and Wastewater”.

3.2 In House Laboratories

3.2.1 Identification of Analytical Laboratory/Detection Limits

Licensees using in-house labs shall identify their detection limits for all parameters and report them when any SNP data is submitted. The Licensee shall also identify the commercial lab they use to check for quality control.

3.2.2 For Overall Analytical Methods, Precision and Accuracy

The plan must describe how the Licensee will ensure precision and accuracy in their analytical methods. This includes what action will be taken if any sample results are found to be outside the appropriate ranges.

All analyses should be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater" or by other approved methods. In addition, the lab should analyze standard reference material for each parameter measured. For each parameter (group) to be measured, a complete description of the sampling procedure must be documented and adhered to.

If any sample results are outside the appropriate QA/QC ranges, attempts should be made to correct the problem and the sample shall be immediately re-analyzed. If any analysis indicates a violation of a licence condition, an Inspector shall be notified of the violation, any corrective action taken, and the results of retests.

3.2.3 Accuracy Requirements

The plan should document how the Licensee will go about ensuring accuracy in the laboratory. Accuracy is the measurement of how closely a value approximates a standard, or true value. The Licensee should identify the frequency at which certified or reference standards will be analyzed during each sampling period.

3.2.4 Precision Requirements

Precision is a measure of the closeness or repeatability of a set of values. This section will describe how and when replicate samples are taken to ensure lab precision. It is recommended that the Licensee take triplicates at one SNP station during each sampling period. If daily sampling is required at only one station, a duplicate sample should be taken each time, with a triplicate sample taken one a week.

3.2.5 Methodology

Descriptions should be included of any methods of analysis that are not taken from "Standard Methods for the Examination of Waste and Wastewater." Standard methods should be referenced.

4.0 Reporting Requirements

4.1 General Submission

The QA/QC plan will contain a section outlining what information will be reported in the monthly SNP reports. Any control charts or graphs which display the precision and accuracy of the methods used to analyze the samples should be submitted with the report. This includes warning and control limits used to determine acceptability of the data.

4.2 Outside Laboratories

The Licensee shall outline the number of replicate samples that will be collected and submitted with each SNP report. It is recommended that one set of duplicates or triplicates from an assigned SNP site, as well as the results from field blanks, be submitted with each required SNP report. This would serve as an internal/external check for the Licensee and the commercial lab.

4.3 In-House Laboratories

The Licensee shall outline the number of results from replicate samples that will be included with each required SNP report. It is recommended that two duplicate sets be collected per month at an assigned SNP site, with one set being sent to a commercial lab while the other is to be analyzed by the Licensee's lab. Analytical results from both labs should be submitted with each required SNP report. This would serve as an external check for the lab. Any results from a commercial lab should be presented on the lab's letterhead.

FOR FURTHER INFORMATION, CONTACT THE WATER RESOURCES DIVISION AT:

Box 1500
Yellowknife, NWT
X1A 2R3
(867) 669-2654 Phone
(867) 669-2716 Fax

Appendix 1
Table 1: General Summary of Special Sampling or Handling Techniques

Determination	Container	Minimum Sample Size (ml)	Preservation	Maximum Storage Recommended
BOD	Sterile polyethylene	1000	Refrigerate 4°C	24 hours
Conductivity	Polyethylene	500	Refrigerate 4°C	28 days
Total Cyanide	Polyethylene	500	Add NaOH to raise pH>12 refrigerate in dark	24 hours
Hardness	Polyethylene	100	Add Conc. HNO_3 to lower pH<2 OR (*) unpreserved	6 months
Metals, General	Polyethylene	250	For dissolved metals filter immediately, add Conc. $HN0_3$ to pH<2	6 months
Mercury	Glass (rinsed with 1 + 1 HNO_3)	500	Add Conc. HNO_3 or pH<2 or H_2SO_4 + 1 ml of 5% $K_2Cr_2O_7$, refrigerate 4°C	28 days
Nitrogen:				
Ammonia	Polyethylene	500	Analyze as soon as possible or add H_2S0_4 to pH<2, refrigerate OR (*) unpreserved	7 days
Nitrate	Polyethylene	100	Analyze as soon as possible or refrigerate	48 hours
Oil and Grease	Glass or wide-mouth calibrated	1000	Add H_2S0_4 to pH<2, refrigerate	28 days
pH	Polyethylene	--	Analyze immediately	2 hours
Suspended Solids	Polyethylene	--	Refrigerate	7 days
Temperature	Polyethylene	--	Analyze immediately	0
Turbidity	Polyethylene	--	Analyze same day; store in dark up to 24 hours, refrigerate	24 hours
Bacteria	Polyethylene (sterilized)	--	None: Keep cool	6 - 48 hours

(*) Unpreserved = check with lab that will be analyzing the samples

Appendix 2

References:

Gilbert, Andrew (1993). "Echo Bay Mines Ltd. Environmental Laboratory Quality Assurance Plan".

Soniassy, R. (1980). "A Guide for the Collection of Water and Effluent Samples"; pp 1-16; INAC

"Standard Methods for the Examination of Water and Wastewater" (1989); AHPA, AWWA and WPCF, 17th edition.

Water Resources Division, Indian and Northern Affairs Canada (1990). "Generic Quality Assurance (QA) Plan Guidelines for Use by the Licensees in Meeting SNP Requirements for Submission of a QA Plan"; INAC.

Appendix B

COC Example Forms

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Company:		Select Report Format: ☐ PDF ☐ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:		Quality Control (QC) Report with Report ☐ YES ☐ NO	PRIORITY (Business Days): 4 day [P4] ☐ / EMERGENCY: 1 Business day [E1] ☐
Phone:		☐ Compare Results to Criteria on Report - provide details below if box checked	3 day [P3] ☐ / Same Day, Weekend or Statutory holiday [E0] ☐
	Company address below will appear on the final report	Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	2 day [P2] ☐
Street:		Email 1 or Fax	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:		Email 2	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:		Email 3	Analysis Request
Invoice To	Same as Report To ☐ YES ☐ NO	Invoice Distribution	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
	Copy of Invoice with Report ☐ YES ☐ NO	Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax	
Contact:		Email 2	
Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center: / PO#	
Job #:		Major/Minor Code: / Routing Code:	
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: / Sampler:	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													Number of Containers

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)	SAMPLE CONDITION AS RECEIVED (lab use only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO		Frozen ☐ SIF Observations Yes ☐ No ☐
Are samples for human drinking water use? ☐ YES ☐ NO		Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
		Cooling Initiated ☐
		INIITIAL COOLER TEMPERATURES ºC / FINAL COOLER TEMPERATURES ºC

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Appendix C

Analytical Laboratory Accreditation and Licencing

Canadian Association for Laboratory Accreditation Inc.

CALA

Certificate of Accreditation

ALS Environmental (Waterloo)
ALS Canada Ltd.
60 Northland Rd. Unit 1
Waterloo, Ontario

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

CALA

Accreditation No.:	A3149
Issued On:	July 29, 2016
Accreditation Date:	January 3, 2005
Expiry Date:	January 27, 2019

ilac-MRA CALA

President & CEO

Ministry of the Environment and Climate Change

Safe Drinking Water Branch
Laboratory Licensing and Compliance Program

125 Resources Rd.
Etobicoke ON M9P 3V6
Tel: (416) 235 - 6370
Fax: (416) 235 - 6519

Ministère de l'Environnement et de l'Action en matière de changement climatique

Direction du contrôle de la qualité de l'eau potable
Programme de délivrance des permis et de conformité des laboratoires

125, Chemin Resources
Etobicoke ON M9P 3V6
Tél: (416) 235 - 6370
Téléc: (416) 235 - 6519

Ontario

Drinking-Water Testing Licence

Under the Drinking-Water Testing Services Regulation, O. Reg. 248/03 and the Safe Drinking Water Act, 2002

Licence #: 2290

This supercedes licence issued: Sep 06, 2016

Licensee: ALS Canada Ltd.

Located at: 60 Northland Rd. Unit #1
Waterloo ON N2V 2B8
Canada

The licensee is authorized to conduct the following drinking-water tests at the laboratory:

Class: Inorganic — **Technique - Sub-Technique:**

Test	Lab Method Code	Technique - Sub-Technique	Appendix #
4AAP-phenolics	WT-TM-1027	Colourimetry	C009
Alkalinity	WT-TM-1012	Titrimetry-Manual	C070
Alkalinity	WT-TM-1032	Colourimetry	C094
Aluminum	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Aluminum	NA-TM-1002	ICP-MS(Total-digested)	C032
Ammonia	WT-TM-1013	Colourimetry	C095
Antimony	NA-TM-1002	ICP-MS(Total-digested)	C032
Antimony	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Arsenic	NA-TM-1002	ICP-MS(Total-digested)	C032

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Class: Inorganic **Technique - Sub-Technique:**

Analyte	Lab Method Code	Technique - Sub-Technique	Appendix #
Arsenic	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Barium	NA-TM-1002	ICP-MS(Total-digested)	C032
Barium	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Beryllium	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Beryllium	NA-TM-1002	ICP-MS(Total-digested)	C032
Bismuth	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Bismuth	NA-TM-1002	ICP-MS(Total-digested)	C032
Boron	NA-TM-1002	ICP-MS(Total-digested)	C032
Boron	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Bromate	WT-TM-1503	LC-MS-MS	C114
Bromide	NA-TM-1001	IC	C003
Cadmium	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Cadmium	NA-TM-1002	ICP-MS(Total-digested)	C032
Calcium	NA-TM-1002	ICP-MS(Total-digested)	C032

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Class: Inorganic — **Technique - Sub-Technique:**

Analyte	Lab Method Code	Technique - Sub-Technique	Appendix #
Calcium	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Carbon; dissolved organic	WT-TM-1024	Combustion	C047
Carbon; total organic	WT-TM-1024	Combustion	C047
Chloride	NA-TM-1001	IC	C003
Chlorine; residual	WT-TM-1021	Colourimetry	C074
Chlorine; total	WT-TM-1021	Colourimetry	C074
Chromium	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Chromium	NA-TM-1002	ICP-MS(Total-digested)	C032
Chromium VI	WT-TM-1035	IC-UV/VIS	C157
Cobalt	NA-TM-1002	ICP-MS(Total-digested)	C032
Cobalt	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Copper	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Copper	NA-TM-1002	ICP-MS(Total-digested)	C032
Cyanate	WT-TM-1036	ISE	C161

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Class: Inorganic	Technique - Sub-Technique:
Cyanide; free	Colourimetry-WAD-CFA
Lab Method Code: NA-TM-1003	**Appendix #:** C004
Cyanide; free	Colourimetry-CFA
Lab Method Code: NA-TM-1003	**Appendix #:** C004
Cyanide; total	Colourimetry-SAD-CFA
Lab Method Code: NA-TM-1003	**Appendix #:** C004
Fluoride	IC
Lab Method Code: NA-TM-1001	**Appendix #:** C003
Iron	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Iron	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Lead	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Lead	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Lithium	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Lithium	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Magnesium	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Magnesium	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Manganese	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Manganese	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005

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Ontario

Class: Inorganic | **Technique - Sub-Technique:**

Parameter	Lab Method Code	Technique - Sub-Technique	Appendix #
Mercury	NA-TM-1005; NA-TP-2012	Spectrophotometric-CVAAS	C049
Molybdenum	NA-TM-1002	ICP-MS(Total-digested)	C032
Molybdenum	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Nickel	NA-TM-1002	ICP-MS(Total-digested)	C032
Nickel	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Nitrate (as nitrogen)	NA-TM-1001	IC	C003
Nitrilotriacetic acid	WT-TM-1007	Colourimetry	C036
Nitrite (as nitrogen)	NA-TM-1001	IC	C003
Nitrogen; ammonia+ammonium	WT-TM-1013	Colourimetry	C095
Nitrogen; nitrate+nitrite	NA-TM-1001	Calculation-IC	N/A
Nitrogen; total Kjeldahl	WT-TM-1041	Colourimetry-Digestion-Aquakem	C099
o-Phosphate	WT-TM-1025	Colourimetry-Total (non-filtered)(non-digested)	C098
Organic nitrogen	WT-TM-1041	Calculation-Colourimetry-Digestion-Aquakem	N/A
Perchlorate	WT-TM-1505	LC-MS-MS	C168

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Class: Inorganic	Technique - Sub-Technique:
Phosphorus	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Phosphorus	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Phosphorus; total	Colourimetry-Total (non-filtered) (digested)
Lab Method Code: WT-TM-1025	**Appendix #:** C011
Potassium	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Potassium	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Selenium	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Selenium	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Silicon	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Silicon	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Silver	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Silver	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Sodium	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Sodium	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Solids; volatile suspended	Gravimetry
Lab Method Code: WT-TM-1011	**Appendix #:** C010

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Class: Inorganic — **Technique - Sub-Technique:**

Analyte	Lab Method Code	Technique - Sub-Technique	Appendix #
Strontium	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Strontium	NA-TM-1002	ICP-MS(Total-digested)	C032
Sulphate	NA-TM-1001	IC	C003
Sulphide	WT-TM-1003	Colourimetry	C012
Sulphur	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Sulphur	NA-TM-1002	ICP-MS(Total-digested)	C032
Thallium	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Thallium	NA-TM-1002	ICP-MS(Total-digested)	C032
Tin	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Tin	NA-TM-1002	ICP-MS(Total-digested)	C032
Titanium	NA-TM-1002	ICP-MS (Total-non-digested)	C005
Titanium	NA-TM-1002	ICP-MS(Total-digested)	C032
Tungsten	NA-TM-1002	ICP-MS(Total-digested)	C032
Tungsten	NA-TM-1002	ICP-MS (Total-non-digested)	C005

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Class: Inorganic	Technique - Sub-Technique:
Uranium	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Uranium	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Vanadium	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Vanadium	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Zinc	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032
Zinc	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Zirconium	ICP-MS (Total-non-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C005
Zirconium	ICP-MS(Total-digested)
Lab Method Code: NA-TM-1002	**Appendix #:** C032

Class: Microbiological	Technique - Sub-Technique:
E. coli	MPN--24 hrs, Quanti-Tray
Lab Method Code: NATM1300	**Appendix #:** C183
E. coli	MF-mFC-BCIG
Lab Method Code: WT-TM-1200	**Appendix #:** C052
E. coli	MPN--18 hrs, Quanti-Tray
Lab Method Code: NATM1300	**Appendix #:** C183
Fecal coliforms	MPN--18 hrs, Quanti-Tray
Lab Method Code: NATM1300	**Appendix #:** C185
Fecal coliforms	MF-mFC
Lab Method Code: WT-TM-1200	**Appendix #:** C051
HPC	MF-HPC
Lab Method Code: WT-TM-1200	**Appendix #:** C030

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Ontario

Class: Microbiological	Technique - Sub-Technique:
HPC	MPN--44 hrs, Quanti-Tray
Lab Method Code: NATM1300	**Appendix #:** C184
Pseudomonas aeruginosa	MF-mPAC
Lab Method Code: WT-TM-1203	**Appendix #:** C091
Total coliform	MPN--24 hrs, Quanti-Tray
Lab Method Code: NATM1300	**Appendix #:** C183
Total coliform	MF-mEndo
Lab Method Code: WT-TM-1200	**Appendix #:** C002
Total coliform	MPN--18 hrs, Quanti-Tray
Lab Method Code: NATM1300	**Appendix #:** C183
Total coliform background	MF-mEndo
Lab Method Code: WT-TM-1200	**Appendix #:** C002

Class: Organic	Technique - Sub-Technique:
1,1,1,2-tetrachloroethane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,1,1-trichloroethane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,1,2,2-tetrachloroethane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,1,2-trichloroethane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,1-dichloroethane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,1-dichloroethene	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,2,4-trichlorobenzene	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
1,2-dibromoethane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113

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Ontario

Class: Organic	Technique - Sub-Technique:
1,2-dichlorobenzene	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,2-dichloroethane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,2-dichloropropane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,2-propanediol	GC-FID
Lab Method Code: WT-TM-1601	**Appendix #:** C090
1,3-dichlorobenzene	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
1,3-dichlorobenzene	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,3-propanediol	GC-FID
Lab Method Code: WT-TM-1601	**Appendix #:** C090
1,4-dichlorobenzene	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
1,4-dioxane	HSGC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C172
1-chloronaphthalene	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
1-methylnaphthalene	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
2,3,4,5-tetrachlorophenol	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
2,3,4,6-tetrachlorophenol	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
2,3,4-trichlorophenol	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015

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Class: Organic	Technique - Sub-Technique:	
2,3,5,6-tetrachlorophenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2,3,5-trichlorophenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2,4,5-T	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023
2,4,5-trichlorophenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2,4,6-trichlorophenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2,4-D	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023
2,4-dichlorophenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2,4-dimethylphenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2,4-dinitrophenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2,4-dinitrotoluene	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2,6-dichlorophenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2,6-dinitrotoluene	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2-chloronaphthalene	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
2-chlorophenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015

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Class: Organic **Technique - Sub-Technique:**

Parameter	Lab Method Code	Technique - Sub-Technique	Appendix #
2-hexanone	WT-TM-1406	GC-MS/FID	C113
2-methyl-4,6-dinitrophenol	WT-TM-1101/WT-TM-1300	GC-MS	C015
2-methylnaphthalene	WT-TM-1101/WT-TM-1300	GC-MS	C015
2-nitrophenol	WT-TM-1101/WT-TM-1300	GC-MS	C015
3,3'-dichlorobenzidine	WT-TM-1101/WT-TM-1300	GC-MS	C015
4-bromophenyl phenyl ether	WT-TM-1101/WT-TM-1300	GC-MS	C015
4-chloro-3-methylphenol	WT-TM-1101/WT-TM-1300	GC-MS	C015
4-chlorophenyl phenyl ether	WT-TM-1101/WT-TM-1300	GC-MS	C015
5-nitroacenaphthene	WT-TM-1101/WT-TM-1300	GC-MS	C015
a-BHC	WT-TM-1102/WT-TM-1302	GC-MS	C019
Acenaphthene	WT-TM-1101/WT-TM-1300	GC-MS	C015
Acenaphthylene	WT-TM-1101/WT-TM-1300	GC-MS	C015
Acetone	WT-TM-1406	GC-MS/FID	C113
a-Chlordane	WT-TM-1102/WT-TM-1302	GC-MS	C019

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Class: Organic | **Technique - Sub-Technique:**

Parameter	Lab Method Code	Technique - Sub-Technique	Appendix #
Acridine	WT-TM-1101/WT-TM-1300	GC-MS	C015
Alachlor	WT-TM-1107/WT-TM-1302	GC-MS	C023
Aldicarb	WT-TM-1502	LC-MS-MS	C135
Aldrin	WT-TM-1102/WT-TM-1302	GC-MS	C019
Aldrin+Dieldrin	WT-TM-1102/WT-TM-1302	Calculation-GC-MS	N/A
Anthracene	WT-TM-1101/WT-TM-1300	GC-MS	C015
Aroclor 1242	WT-TM-1105/WT-TM-1301	GC-MS	C017
Aroclor 1248	WT-TM-1105/WT-TM-1301	GC-MS	C017
Aroclor 1254	WT-TM-1105/WT-TM-1301	GC-MS	C017
Aroclor 1260	WT-TM-1105/WT-TM-1301	GC-MS	C017
Atrazine	WT-TM-1107/WT-TM-1302	GC-MS	C023
Atrazine + N-dealkylated metabolites	WT-TM-1107/WT-TM-1302	Calculation-GC-MS	N/A
Azinphos-methyl	WT-TM-1107/WT-TM-1302	GC-MS	C023
b-BHC	WT-TM-1102/WT-TM-1302	GC-MS	C019

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Ontario

Class: Organic — **Technique - Sub-Technique:**

Parameter	Lab Method Code	Technique - Sub-Technique	Appendix #
Bendiocarb	WT-TM-1107/WT-TM-1302	GC-MS	C023
Benzene	WT-TM-1406	GC-MS/FID	C113
Benzo(a)anthracene	WT-TM-1101/WT-TM-1300	GC-MS	C015
Benzo(a)pyrene	WT-TM-1101/WT-TM-1300	GC-MS	C015
Benzo(b)fluoranthene	WT-TM-1101/WT-TM-1300	GC-MS	C015
Benzo(g,h,i)perylene	WT-TM-1101/WT-TM-1300	GC-MS	C015
Benzo(k)fluoranthene	WT-TM-1101/WT-TM-1300	GC-MS	C015
Benzyl butyl phthalate	WT-TM-1101/WT-TM-1300	GC-MS	C015
Biphenyl	WT-TM-1101/WT-TM-1300	GC-MS	C015
Bis(2-chloroethoxy)methane	WT-TM-1101/WT-TM-1300	GC-MS	C015
Bis(2-chloroethyl)ether	WT-TM-1101/WT-TM-1300	GC-MS	C015
Bis(2-chloroisopropyl)ether	WT-TM-1101/WT-TM-1300	GC-MS	C015
Bis(2-ethylhexyl)phthalate	WT-TM-1101/WT-TM-1300	GC-MS	C015
Bisphenol A	WT-TM-1521	LC-MS-MS	C116

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Class: Organic	Technique - Sub-Technique:
Bromochloroacetic acid	GC-Derivatization/ECD
Lab Method Code: WT-TM-1604	**Appendix #:** C163
Bromodichloroacetic acid	GC-Derivatization/ECD
Lab Method Code: WT-TM-1604	**Appendix #:** C163
Bromodichloromethane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
Bromoform	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
Bromomethane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
Bromoxynil	GC-MS
Lab Method Code: WT-TM-1107/WT-TM-1302	**Appendix #:** C023
Camphene	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
Carbaryl	GC-MS
Lab Method Code: WT-TM-1107/WT-TM-1302	**Appendix #:** C023
Carbofuran	GC-MS
Lab Method Code: WT-TM-1107/WT-TM-1302	**Appendix #:** C023
Carbon disulfide	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
Carbon tetrachloride	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
Chlordane; total	Calculation-GC-MS
Lab Method Code: WT-TM-1102/WT-TM-1302	**Appendix #:** N/A
Chlorodibromoacetic acid	GC-Derivatization/ECD
Lab Method Code: WT-TM-1604	**Appendix #:** C163
Chloroethane	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113

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Ontario

Class: Organic	Technique - Sub-Technique:	
Chloroform	GC-MS/FID	
Lab Method Code: WT-TM-1406		**Appendix #:** C113
Chloromethane	GC-MS/FID	
Lab Method Code: WT-TM-1406		**Appendix #:** C113
Chlorpyrifos	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023
Chrysene	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
cis-1,2-dichloroethene	GC-MS/FID	
Lab Method Code: WT-TM-1406		**Appendix #:** C113
cis-1,3-dichloropropene	GC-MS/FID	
Lab Method Code: WT-TM-1406		**Appendix #:** C113
Cyanazine	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023
Dalapon	GC-Derivitatization/ECD	
Lab Method Code: WT-TM-1604		**Appendix #:** C163
d-BHC	GC-MS	
Lab Method Code: WT-TM-1102/WT-TM-1302		**Appendix #:** C019
DDT & Metabolites	Calculation-GC-MS	
Lab Method Code: WT-TM-1102/WT-TM-1302		**Appendix #:** N/A
de-Ethylated atrazine	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023
Diazinon	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023
Dibenzo(a,h)anthracene	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
Dibromoacetic acid	GC-Derivitatization/ECD	
Lab Method Code: WT-TM-1604		**Appendix #:** C163

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Class: Organic | **Technique - Sub-Technique:**

Dibromochloromethane — GC-MS/FID
Lab Method Code: WT-TM-1406 — **Appendix #:** C113

Dicamba — GC-MS
Lab Method Code: WT-TM-1107/WT-TM-1302 — **Appendix #:** C023

Dichloroacetic acid — GC-Derivitatization/ECD
Lab Method Code: WT-TM-1604 — **Appendix #:** C163

Dichlorodifluoromethane — GC-MS/FID
Lab Method Code: WT-TM-1406 — **Appendix #:** C113

Dichloromethane — GC-MS/FID
Lab Method Code: WT-TM-1406 — **Appendix #:** C113

Diclofop-methyl — GC-MS
Lab Method Code: WT-TM-1107/WT-TM-1302 — **Appendix #:** C023

Dieldrin — GC-MS
Lab Method Code: WT-TM-1102/WT-TM-1302 — **Appendix #:** C019

Diethyl phthalate — GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300 — **Appendix #:** C015

Diethylene glycol — GC-FID
Lab Method Code: WT-TM-1601 — **Appendix #:** C090

Dimethoate — GC-MS
Lab Method Code: WT-TM-1107/WT-TM-1302 — **Appendix #:** C023

Dimethyl phthalate — GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300 — **Appendix #:** C015

di-n-butyl phthalate — GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300 — **Appendix #:** C015

di-n-octyl phthalate — GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300 — **Appendix #:** C015

Dinoseb — GC-MS
Lab Method Code: WT-TM-1107/WT-TM-1302 — **Appendix #:** C023

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Class: Organic	Technique - Sub-Technique:	
Diphenyl ether **Lab Method Code:** WT-TM-1101/WT-TM-1300	GC-MS	**Appendix #:** C015
Diphenylamine **Lab Method Code:** WT-TM-1101/WT-TM-1300	GC-MS	**Appendix #:** C015
Diquat **Lab Method Code:** WT-TM-1506	LC-MS-MS	**Appendix #:** C134
Diuron **Lab Method Code:** WT-TM-1502	LC-MS-MS	**Appendix #:** C135
Endosulphan I **Lab Method Code:** WT-TM-1102/WT-TM-1302	GC-MS	**Appendix #:** C019
Endosulphan II **Lab Method Code:** WT-TM-1102/WT-TM-1302	GC-MS	**Appendix #:** C019
Endosulphan sulphate **Lab Method Code:** WT-TM-1102/WT-TM-1302	GC-MS	**Appendix #:** C019
Endrin **Lab Method Code:** WT-TM-1102/WT-TM-1302	GC-MS	**Appendix #:** C019
Endrin aldehyde **Lab Method Code:** WT-TM-1102/WT-TM-1302	GC-MS	**Appendix #:** C019
Ethane **Lab Method Code:** WT-TM-1602	GC-Headspace	**Appendix #:** C062
Ethene **Lab Method Code:** WT-TM-1602	GC-Headspace	**Appendix #:** C062
Ethylbenzene **Lab Method Code:** WT-TM-1406	GC-MS/FID	**Appendix #:** C113
Ethylene glycol **Lab Method Code:** WT-TM-1601	GC-FID	**Appendix #:** C090
Extractable petroleum hydrocarbons (F2: C10 to C16) **Lab Method Code:** NA-TM-1110	GC-FID	**Appendix #:** C068

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Class: Organic | **Technique - Sub-Technique:**

Parameter	Technique - Sub-Technique	Lab Method Code	Appendix #
Extractable petroleum hydrocarbons (F3: C16 to C34)	GC-FID	NA-TM-1110	C068
Extractable petroleum hydrocarbons (F4: C34 to C50)	GC-FID	NA-TM-1110	C068
Fluoranthene	GC-MS	WT-TM-1101/WT-TM-1300	C015
Fluorene	GC-MS	WT-TM-1101/WT-TM-1300	C015
Formaldehyde	GC-Derivitatization/ECD	WT-TM-1603	C162
g-Chlordane	GC-MS	WT-TM-1102/WT-TM-1302	C019
Glyphosate	LC-MS-MS	WT-TM-1504	C133
Heavy hydrocarbon (F4 Gravimetric)	GC-FID	WT-TM-1307/WT-TM-1112	C069
Heptachlor	GC-MS	WT-TM-1102/WT-TM-1302	C019
Heptachlor epoxide	GC-MS	WT-TM-1102/WT-TM-1302	C019
Heptachlor+Heptachlor Epoxide	Calculation-GC-MS	WT-TM-1102/WT-TM-1302	N/A
Hexachlorobenzene	GC-MS	WT-TM-1101/WT-TM-1300	C015
Hexachlorobutadiene	GC-MS	WT-TM-1101/WT-TM-1300	C015
Hexachlorocyclopentadiene	GC-MS	WT-TM-1101/WT-TM-1300	C015

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Class: Organic | **Technique - Sub-Technique:**

Analyte	Technique - Sub-Technique	Lab Method Code	Appendix #
Hexachloroethane	GC-MS	WT-TM-1101/WT-TM-1300	C015
Hexane	GC-MS/FID	WT-TM-1406	C113
Indeno(1,2,3-c,d)pyrene	GC-MS	WT-TM-1101/WT-TM-1300	C015
Indole	GC-MS	WT-TM-1101/WT-TM-1300	C015
Isophorone	GC-MS	WT-TM-1101/WT-TM-1300	C015
Lindane; total	GC-MS	WT-TM-1102/WT-TM-1302	C019
m/p-Cresol	GC-MS	WT-TM-1101/WT-TM-1300	C015
m/p-Xylene	GC-MS/FID	WT-TM-1406	C113
Malathion	GC-MS	WT-TM-1107/WT-TM-1302	C023
MCPA	GC-MS-Extraction	WT-TM-1107/WT-TM-1302	C023
Methane	GC-Headspace	WT-TM-1602	C062
Methoxychlor	GC-MS	WT-TM-1102/WT-TM-1302	C019
Methyl ethyl ketone	GC-MS/FID	WT-TM-1406	C113
Methyl isobutyl ketone	GC-MS/FID	WT-TM-1406	C113

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Class: Organic **Technique - Sub-Technique:**

Analyte	Technique - Sub-Technique
Metolachlor	GC-MS
Lab Method Code: WT-TM-1107/WT-TM-1302	**Appendix #:** C023
Metribuzin	GC-MS
Lab Method Code: WT-TM-1107/WT-TM-1302	**Appendix #:** C023
Mirex	GC-MS
Lab Method Code: WT-TM-1102/WT-TM-1302	**Appendix #:** C019
Monobromoacetic acid	GC-Derivitatization/ECD
Lab Method Code: WT-TM-1604	**Appendix #:** C163
Monochloroacetic acid	GC-Derivitatization/ECD
Lab Method Code: WT-TM-1604	**Appendix #:** C163
Monochlorobenzene	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
MTBE	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
Naphthalene	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
Nitrobenzene	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
n-Nitroso-di-n-propylamine	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
Nonylphenol	LC-MS-MS
Lab Method Code: WT-TM-1521	**Appendix #:** C116
Nonylphenol Diethoxylate	LC-MS
Lab Method Code: WT-TM-1521	**Appendix #:** C116
Nonylphenol Monoethoxylate	LC-MS
Lab Method Code: WT-TM-1521	**Appendix #:** C116
o,p'-DDD	GC-MS
Lab Method Code: WT-TM-1102/WT-TM-1302	**Appendix #:** C019

Class: Organic	Technique - Sub-Technique:
o,p'-DDE	GC-MS
Lab Method Code: WT-TM-1102/WT-TM-1302	**Appendix #:** C019
o,p'-DDT	GC-MS
Lab Method Code: WT-TM-1102/WT-TM-1302	**Appendix #:** C019
o-Cresol	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015
Octylphenol	LC-MS
Lab Method Code: WT-TM-1521	**Appendix #:** C116
Octylphenol diethoxylate	LC-MS
Lab Method Code: WT-TM-1521	**Appendix #:** C116
Octylphenol monoethoxylate	LC-MS
Lab Method Code: WT-TM-1521	**Appendix #:** C116
Oxychlordane	GC-MS
Lab Method Code: WT-TM-1102/WT-TM-1302	**Appendix #:** C019
o-Xylene	GC-MS/FID
Lab Method Code: WT-TM-1406	**Appendix #:** C113
p,p'-DDD	GC-MS
Lab Method Code: WT-TM-1102/WT-TM-1302	**Appendix #:** C019
p,p'-DDE	GC-MS
Lab Method Code: WT-TM-1102/WT-TM-1302	**Appendix #:** C019
p,p'-DDT	GC-MS
Lab Method Code: WT-TM-1102/WT-TM-1302	**Appendix #:** C019
Paraquat	LC-MS-MS
Lab Method Code: WT-TM-1506	**Appendix #:** C134
Parathion	GC-MS
Lab Method Code: WT-TM-1107/WT-TM-1302	**Appendix #:** C023
p-chloroaniline	GC-MS
Lab Method Code: WT-TM-1101/WT-TM-1300	**Appendix #:** C015

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Ontario

Class: Organic	Technique - Sub-Technique:	
Pentachlorophenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
Perylene	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
Petroleum hydrocarbons (F1: C6 to C10)	GC-MS/FID	
Lab Method Code: WT-TM-1406		**Appendix #:** C111
Phenanthrene	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
Phenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
Phorate	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023
Picloram	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023
p-nitrophenol	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
Polychlorinated biphenyls	GC-MS	
Lab Method Code: WT-TM-1105/WT-TM-1301		**Appendix #:** C017
Prometryn	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023
Pyrene	GC-MS	
Lab Method Code: WT-TM-1101/WT-TM-1300		**Appendix #:** C015
Simazine	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023
Styrene	GC-MS/FID	
Lab Method Code: WT-TM-1406		**Appendix #:** C113
Temephos	GC-MS	
Lab Method Code: WT-TM-1107/WT-TM-1302		**Appendix #:** C023

Ministry of the Environment and Climate Change

Safe Drinking Water Branch
Laboratory Licensing and Compliance Program

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Etobicoke ON M9P 3V6
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Ministère de l'Environnement et de l'Action en matière de changement climatique

Direction du contrôle de la qualité de l'eau potable
Programme de délivrance des permis et de conformité des laboratoires

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Ontario

Class: Organic	Technique - Sub-Technique:	
Terbufos **Lab Method Code:** WT-TM-1107/WT-TM-1302	GC-MS	**Appendix #:** C023
Tetrachloroethylene **Lab Method Code:** WT-TM-1406	GC-MS/FID	**Appendix #:** C113
Tetraethyl Lead **Lab Method Code:** WT-TM-1308	GC-MS	**Appendix #:** C159
Toluene **Lab Method Code:** WT-TM-1406	GC-MS/FID	**Appendix #:** C113
Total Haloacetic acids **Lab Method Code:** WT-TM-1604	Calculation-GC-Derivitatization/ECD	**Appendix #:** N/A
trans-1,2-dichloroethene **Lab Method Code:** WT-TM-1406	GC-MS/FID	**Appendix #:** C113
trans-1,3-dichloropropene **Lab Method Code:** WT-TM-1406	GC-MS/FID	**Appendix #:** C113
Triallate **Lab Method Code:** WT-TM-1107/WT-TM-1302	GC-MS	**Appendix #:** C023
Tribromoacetic acid **Lab Method Code:** WT-TM-1604	GC-Derivitatization/ECD	**Appendix #:** C163
Trichloroacetic acid **Lab Method Code:** WT-TM-1604	GC-Derivitatization/ECD	**Appendix #:** C163
Trichloroethylene **Lab Method Code:** WT-TM-1406	GC-MS/FID	**Appendix #:** C113
Trichlorofluoromethane **Lab Method Code:** WT-TM-1406	GC-MS/FID	**Appendix #:** C113
Trifluralin **Lab Method Code:** WT-TM-1107/WT-TM-1302	GC-MS	**Appendix #:** C023
Trihalomethanes; total **Lab Method Code:** WT-TM-1406	GC-MS/FID	**Appendix #:** C113

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Class: Organic — **Technique - Sub-Technique:**

Parameter	Lab Method Code	Technique - Sub-Technique	Appendix #
Vinyl chloride	WT-TM-1406	GC-MS/FID	C113
Xylene; total	WT-TM-1406	GC-MS/FID	C113

Class: Physical/Others — **Technique - Sub-Technique:**

Parameter	Lab Method Code	Technique - Sub-Technique	Appendix #
Apparent colour	WT-TM-1014	Colourimetry	C097
BOD (5 Day)	WT-TM-1002	Meter-D.O	C001
CBOD (5 Day)	WT-TM-1002	Meter-D.O	C001
COD	WT-TM-1006	Colourimetry-Reflux	C035
Conductivity	WT-TM-1028	Potentiometry	C108
Conductivity	WT-TM-1010	Potentiometry	C048
Hardness (as CaCO3)	NA-TM-1002	Calculation-ICP-MS	NA
Oil and Grease; mineral	WT-TM-1100	Gravimetry-Extraction	C033
Oil and Grease; total	WT-TM-1100	Gravimetry-Extraction	C033
pH	WT-TM-1001	Potentiometry	C026
pH	WT-TM-1028	Potentiometry	C106
Solids; total	WT-TM-1011	Gravimetry	C056

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Ontario

Class: Physical/Others	Technique - Sub-Technique:	
Solids; total dissolved	Gravimetry	
Lab Method Code: NA-TM-1004		**Appendix #:** C056
Solids; total suspended	Gravimetry	
Lab Method Code: WT-TM-1011		**Appendix #:** C010
Solids; total volatile	Gravimetry	
Lab Method Code: WT-TM-1011		**Appendix #:** C056
True colour	Colourimetry	
Lab Method Code: WT-TM-1014		**Appendix #:** C097
Turbidity	Nephelometry	
Lab Method Code: WT-TM-1004		**Appendix #:** C024

Subject to the following terms and conditions:
Terms and conditions are specified in Appendix 1.

Expiry Date: Sep 30, 2018

October 12, 2016
Date Issued

Director

Licence Number: 2290
Date Issued: October 12, 2016

Appendix 1 - Conditions

Pursuant to the *Safe Drinking Water Act, 2002*, S.O. 2002, c. 32, and the regulations made thereunder, this drinking-water testing services licence is issued subject to the following conditions.

Part I: Definitions

1.1 In this licence, unless the context otherwise requires, words and phrases shall be given the same meaning as those set out in the *Safe Drinking Water Act, 2002*, S.O. 2002, c. 32 and any regulations made in accordance with that Act.

1.2 In this licence

"accreditation body" means any body designated or established pursuant to section 64 of the SDWA;

"director" means a director appointed pursuant to s. 6 of the SDWA for the purposes of Part VII of the SDWA;

"laboratory" means the drinking-water testing laboratory located at 60 Northland Road, Unit #1, Waterloo, ON;

"licence" means this entire drinking water testing licence document, issued in accordance with Part VII of the SDWA, and includes this appendix, any schedules to it, and the application and other supporting documents listed in schedule "A" that are attached to and form part of this licence, except as otherwise specified in the conditions contain herein;

"licensee" means ALS Environmental (Waterloo);

"Ministry" means the Ministry of the Environment & Climate Change;

"protocol" means the document published by and available from the Ministry entitled "Protocol of Accepted Drinking-Water Testing Methods", Version 2.0 dated May 31, 2010.

"provincial officer" means a provincial officer designated pursuant to s. 8 of the SDWA;

"SDWA" means the *Safe Drinking Water Act, 2002*, S.O. 2002, c. 32, as amended.

Part II – Authorized Tests

2.1 Subject to the conditions of this licence, the licensee is authorized to provide a drinking-water testing service at the laboratory.

2.2 The licensee is only authorized to conduct drinking-water tests at the laboratory for the class and for the parameters set out in the licence.

2.3 Subject to conditions 2.4 and 2.5, the licensee shall only conduct drinking water tests at the laboratory for parameters using the methods that were listed in the application, and approved by this licence.

[Where applicable]

2.4 Despite condition 2.3, where the licensee listed a method for a parameter in the application for this licence, but the method is not designated as an acceptable testing method for that parameter in the protocol, the licensee is not authorized to use the method listed in the application for this licence, unless the method is specifically authorized under condition 2.5.

[Where applicable]

2.5 The licensee is specifically authorized to conduct drinking-water tests for the parameters listed below using the corresponding method listed below, despite the method not being designated as an acceptable testing method for that parameter in the protocol:

None

Accreditation

2.6 Except as authorized by condition 2.7, the licensee shall only conduct a drinking-water test if the laboratory is accredited by an accreditation body for the conduct of that test.

Non-accredited Tests [Where applicable]

2.7 In accordance with section 74 of the SDWA, the licensee is authorized to conduct the following tests for which the laboratory is not accredited by an accreditation body, using the method specified.

None

Part III: Operational Requirements

3.1. A copy of this licence shall be made readily available for reference by all persons responsible for all or part of the operation of the drinking-water testing laboratory.

3.2. A copy of this licence shall be made readily available to laboratory clients and for Ministry inspection.

3.3. The Certificate of Drinking Water Testing Licence shall be conspicuously displayed in a location at the laboratory which maximizes the likelihood of a client seeing it upon entry to the laboratory's sample receiving area.

Part IV: General

Compliance

4.1 The licensee shall operate the laboratory in accordance with the SDWA, including the statutory conditions enumerated in 75(3), any applicable regulations made thereunder, and this licence.

4.2 The licensee shall ensure that any person authorized to carry out a drinking-water test or any aspect of a drinking-water test at a laboratory has been informed of the SDWA, all applicable regulations made in accordance with that Act, and this licence and shall take all reasonable measures to ensure any such person complies with the same.

Interpretation

4.3 Where there is a conflict between the provisions of this licence and any other document, the following hierarchy shall be used to determine the provision that takes precedence:
   i. the SDWA;
   ii. any regulation made under the SDWA;
   iii. this licence;
   iv. any application or supporting documents listed in Schedule "A".

4.4 The conditions of this licence are severable. If any requirement of this licence, or the application of any requirement of this licence to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this licence shall not be affected thereby.

Other Legal Obligations

4.5 The issuance of, and compliance with the conditions of, this licence does not:
   i. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or
   ii. limit in any way the authority of the ministry to require certain steps be taken or to require the licensee to furnish any further information related to compliance with this licence.

Change of Licensee's Information

4.6 The licensee shall notify the director, in writing, of any of the following changes within 30 days of the change occurring,
   i. change of address of the laboratory; or
   ii. change of business name, and the notification shall include a copy of the most recent documentation filed under the *Business Names Act*, R.S.O. 1990, c. B17 or *Corporations Information Act*, R.S.O. 1990, c. C.39.

4.7 The licensee shall notify the director, in writing, of any changes to the following personnel identified on the licence application form whenever staffing changes are made

(a) Owner of the Laboratory;
(b) Laboratory Administrator;
(c) Laboratory Operator;
(d) Laboratory Director, and
(e) Laboratory Director Designate

4.8 As per section 73(6) of the SDWA this licence is not transferable without the consent of the Director.

Information

4.9 Any information requested, by the Ministry, concerning the drinking-water testing laboratory and its operation under this licence, including but not limited to any records required to be kept by this licence shall be provided to the Ministry, upon request.

4.10 Records required by or created in accordance with the SDWA, any regulations under the SDWA, or this licence shall be retained for at least 5 years in a location where a provincial officer who is inspecting the laboratory can conveniently view them.

4. 11 The receipt of any information by the Ministry or the failure of the Ministry to prosecute any person or to require any person to take any action, under this licence or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as an approval, waiver, or justification by the Ministry of any act or omission of any person that contravenes any term or condition of this approval or any statute, regulation or other legal requirement.

Part V: Special Conditions

1. Pursuant to subsection 10(1), clause (d) of O. Reg. 248/03, the chain of custody procedures submitted by the licensee as part of the application for this licence are approved.

2. When a sample is submitted to the licensee for a drinking-water test for a microbiological parameter, the licensee shall ensure that the test is conducted in a standardized timely manner and that microbiological plates are processed and read without extended overnight refrigerated incubation.

3. The licensee is authorized to report the results of more than one parameter (such as total THMs) as an aggregate result in order to comply with reporting requirements provided that that licensee conducts a separate test for each parameter using a method otherwise authorized by this licence, and the means by which the aggregate is calculated is documented and kept available for inspection by the Ministry.

4. The licensee shall not filter drinking water samples prior to analyses unless dictated by non-routine analytical contingencies.

4.1 The licensee shall collect and handle drinking water samples in accordance with the Ministry's Protocol.

5. Licensed laboratories shall report all adverse water quality results as per the drinking water legislation without any regard to calculated uncertainty estimations.

6. Due to short holding time and the requirement for immediate analyses of residual chlorine, the data from the determination of residual chlorine cannot be used for the purposes of the SDWA, unless holding times are met.

Note to the Licensee Regarding Reviewable Decisions

All or part of this licence may be reviewable in accordance with the provisions of Part X of the SDWA. *In accordance with Section 129(1) of the SDWA, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal.* ***Section 129(2) sets out a procedure upon which the 15 days may be extended by the Tribunal.*** *Section 129(3) of the SDWA provides that the Notice requiring the hearing shall state:*

1. The aspect of the decision, including the portion of the permit, licence, approval, order or notice of administrative penalty in respect of which the hearing is required; and
2. The grounds for review to be relied on by the person at the hearing.

Except with leave of the Tribunal, a person requiring a hearing in relation to a reviewable decision is not entitled to,

(a) a review of an aspect of the decision other than that stated in the notice requiring the hearing; or

(b) a review of the decision other than on the grounds stated in the notice

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The Licence number;
4. The date of the Licence;
5. The name of the Director;

The Notice should be signed and dated by the appellant. This Notice must be served upon:

The Secretary* Environmental Review Tribunal 2300 Yonge St., 12th Floor P.O. Box 2382 Toronto, Ontario M4P 1E4	AND	The Director *Part VII, Safe Drinking Water Act, 2002* Safe Drinking Water Branch Ministry of Environment & Climate Change 125 Resources Road Toronto, Ontario M9P 3V6

** If the Director believes that a reviewable decision that he or she is about to make in respect of a drinking-water testing licence, if stayed by an appeal, would endanger, or likely endanger, public health, the Director shall include in the decision the reasons for his or her belief and shall also serve a copy of the decision on the Chief Medical Officer of Health. In the case of a reviewable decision in respect of a drinking-water testing licence, if the Chief Medical Officer of Health advises the Tribunal, the licensee and the Director that in his or her opinion the staying of the decision would endanger, or likely endanger, public health, the Tribunal may not stay the operation of a reviewable decision.*

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

Schedule "A"
Application and Supporting Documentation

The following documents are incorporated into and constitute part of this licence:

1. Application received by the Director on 07/23/08, 06/01/09, 06/12/09, 08/26/09, 11/03/11, 03/12/12 05/23/12, 05/29/12, 11/05/12, 01/09/13, 07/30/13, 01/19/15, 08/14/15, 09/03/15, 10/20/15, 11/17/15, 01/04/16, 01/28/16 and 07/26/16.

Appendix D

Laboratory Analytical Methods

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Misc.-Field Tests			
Air volume	HYGIENE METHOD	0	
Waste-Sample Preparation			
Final pH	EPA 1311	0.10	pH units
Initial pH	EPA 1311	0.10	pH units
Water-Physical Tests			
Color, Apparent	APHA 2120	1.0	C.U.
Conductivity	APHA 2510 B	3.0	umhos/ cm
Hardness (as CaCO3)	APHA 2340 B	10	mg/L
pH	APHA 4500 H-Electrode	0.10	pH units
Total Dissolved Solids	APHA 2540C	20	mg/L
Total Suspended Solids	APHA 2540 D-Gravimetric	2.0	mg/L
Turbidity	APHA 2130 B	0.10	NTU
Soil-Physical Tests			
% Moisture	Gravimetric: Oven Dried	0.10	%
Soil-Particle Size			
% Clay (<2um)	Forestry Canada (1991) p. 46-53	0.10	%
% Sand (2.0mm - 0.05mm)	Forestry Canada (1991) p. 46-53	0.10	%
% Silt (0.05mm - 2um)	Forestry Canada (1991) p. 46-53	0.10	%
Texture	Forestry Canada (1991) p. 46-53		
Filter-Particulates			
Particulates Analysis	SEE SUBLET LAB'S REPORT		
Dustfall-Particulates			
Fixed Insoluble Dustfall	BCMOE DUSTFALLS	0.10	mg/ dm2.day
Total Insoluble Dustfall	BCMOE DUSTFALLS	0.10	mg/ dm2.day
Volatile Insoluble Dustfall	BCMOE DUSTFALLS	0.10	mg/ dm2.day
Air-Asbestos/Quartz/Other Fibres			
Cristobalite	NIOSH 7500		
Soil-Leachable Anions & Nutrients			
Nitrate-N	EPA 300.0	1.0	ug/g
Nitrite-N	EPA 300.0	1.0	ug/g
Total Kjeldahl Nitrogen	APHA 4500-N	200	mg/kg
Water-Anions and Nutrients			
Alkalinity, Bicarbonate (as CaCO3)	EPA 310.2	10	mg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Alkalinity, Carbonate (as CaCO3)	EPA 310.2	10	mg/L
Alkalinity, Hydroxide (as CaCO3)	EPA 310.2	10	mg/L
Alkalinity, Total (as CaCO3)	EPA 310.2	10	mg/L
Ammonia, Total (as N)	EPA 350.1	0.050	mg/L
Bromide (Br)	EPA 300.0 (IC)	0.10	mg/L
Chloride	EPA 300.0 (IC)	2.0	mg/L
Chloride (Cl)	EPA 300.0 (IC)	2.0	mg/L
Fluoride	EPA 300.0 (IC)	0.10	mg/L
Nitrate and Nitrite as N	APHA 4110 B	0.10	mg/L
Nitrate-N (NO3-N)	EPA 300.0 (IC)	0.10	mg/L
Nitrite-N	EPA 300.1 (Modified)	0.0010	mg/L
Sulphate	EPA 300.0 (IC)	2.0	mg/L
Sulphate (SO4)	EPA 300.0 (IC)	2.0	mg/L
Total Kjeldahl Nitrogen	APHA 4500-N	0.15	mg/L
Total Phosphorus	APHA 4500-P B E	0.0030	mg/L
Soil-Anions and Nutrients			
Nitrate and Nitrite as N	APHA 4110 B	1.0	ug/g
Water-Cyanides			
Cyanide, Free	ASTM 7237	0.0050	mg/L
Water-Organic / Inorganic Carbon			
Dissolved Organic Carbon	APHA 5310 B-INSTRUMENTAL	1.0	mg/L
Total Organic Carbon	APHA 5310B	1.0	mg/L
Soil-Organic / Inorganic Carbon			
Fraction Organic Carbon	CARTER 21.2	0.0010	g/g
Total Organic Carbon	CARTER 21.2	0.10	%
Water-Bacteriological Tests			
E. Coli	SM 9222D	0	CFU/100 mL
Fecal Coliforms	SM 9222D	0	CFU/100 mL
Total Coliforms	SM 9222B	0	CFU/100 mL
Soil-Metals			
Aluminum (Al)	EPA 200.2/6020A	50	ug/g
Arsenic (As)	EPA 200.2/6020A	0.2	ug/g
Arsenic (As)	EPA 200.2/6020A	1	ug/g
Barium (Ba)	EPA 200.2/6020A	1	ug/g
Cadmium (Cd)	EPA 200.2/6020A	0.5	ug/g
Calcium (Ca)	EPA 200.2/6020A	100	ug/g

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Chromium (Cr)	EPA 200.2/6020A	1	ug/g
Copper (Cu)	EPA 200.2/6020A	1	ug/g
Iron (Fe)	EPA 200.2/6020A	50	ug/g
Lead (Pb)	EPA 200.2/6020A	1	ug/g
Magnesium (Mg)	EPA 200.2/6020A	20	ug/g
Manganese (Mn)	EPA 200.2/6020A	1	ug/g
Mercury (Hg)	SW846 3050B/7471	0.010	ug/g
Sodium (Na)	EPA 200.2/6020A	100	ug/g
Uranium (U)	EPA 200.2/6020A	1	ug/g
Zinc (Zn)	EPA 200.2/6020A	5	ug/g
Dustfall-Metals			
Aluminum (Al)-Total	EPA 6020A	0.0030	mg/dm2.day
Antimony (Sb)-Total	EPA 6020A	0.00010	mg/dm2.day
Arsenic (As)-Total	EPA 6020A	0.00010	mg/dm2.day
Barium (Ba)-Total	EPA 6020A	0.000050	mg/dm2.day
Beryllium (Be)-Total	EPA 6020A	0.00050	mg/dm2.day
Bismuth (Bi)-Total	EPA 6020A	0.00050	mg/dm2.day
Boron (B)-Total	EPA 6020A	0.010	mg/dm2.day
Cadmium (Cd)-Total	EPA 6020A	0.000050	mg/dm2.day
Calcium (Ca)-Total	EPA 6020A	0.020	mg/dm2.day
Chromium (Cr)-Total	EPA 6020A	0.00050	mg/dm2.day
Cobalt (Co)-Total	EPA 6020A	0.00010	mg/dm2.day
Copper (Cu)-Total	EPA 6020A	0.00050	mg/dm2.day
Interval	EPA 245.7	1	days
Interval	EPA 6020A	1	days
Lead (Pb)-Total	EPA 6020A	0.000050	mg/dm2.day
Lithium (Li)-Total	EPA 6020A	0.0050	mg/dm2.day
Magnesium (Mg)-Total	EPA 6020A	0.0050	mg/dm2.day
Manganese (Mn)-Total	EPA 6020A	0.000050	mg/dm2.day
Mercury (Hg)-Total	EPA 245.7	0.000050	mg/dm2.day

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Molybdenum (Mo)-Total	EPA 6020A	0.000050	mg/ dm2.day
Nickel (Ni)-Total	EPA 6020A	0.00050	mg/ dm2.day
Potassium (K)-Total	EPA 6020A	0.050	mg/ dm2.day
Selenium (Se)-Total	EPA 6020A	0.0010	mg/ dm2.day
Silver (Ag)-Total	EPA 6020A	0.000010	mg/ dm2.day
Sodium (Na)-Total	EPA 6020A	0.050	mg/ dm2.day
Strontium (Sr)-Total	EPA 6020A	0.00010	mg/ dm2.day
Thallium (Tl)-Total	EPA 6020A	0.00010	mg/ dm2.day
Tin (Sn)-Total	EPA 6020A	0.00010	mg/ dm2.day
Uranium (U)-Total	EPA 6020A	0.000010	mg/ dm2.day
Vanadium (V)-Total	EPA 6020A	0.0010	mg/ dm2.day
Zinc (Zn)-Total	EPA 6020A	0.0030	mg/ dm2.day

Water-Total Metals

Aluminum (Al)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.003	mg/L
Aluminum (Al)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.01	mg/L
Aluminum (Al)-Total	EPA 200.8	0.01	mg/L
Antimony (Sb)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Arsenic (As)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Arsenic (As)-Total	EPA 200.8	0.001	mg/L
Barium (Ba)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.00005	mg/L
Barium (Ba)-Total	EPA 200.8	0.002	mg/L
Beryllium (Be)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Bismuth (Bi)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0005	mg/L
Boron (B)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.01	mg/L
Cadmium (Cd)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.00001	mg/L
Cadmium (Cd)-Total	EPA 200.8	0.00009	mg/L
Calcium (Ca)-Total	EPA 200.8	0.5	mg/L
Calcium (Ca)-Total	EPA SW-846 3005A/6010B	0.05	mg/L
Chromium (Cr)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Chromium (Cr)-Total	EPA 200.8	0.0005	mg/L
Cobalt (Co)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Copper (Cu)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0005	mg/L
Copper (Cu)-Total	EPA 200.8	0.001	mg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Iron (Fe)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.01	mg/L
Iron (Fe)-Total	EPA 200.8	0.05	mg/L
Lead (Pb)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.00005	mg/L
Lead (Pb)-Total	EPA 200.8	0.0005	mg/L
Lithium (Li)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0005	mg/L
Magnesium (Mg)-Total	EPA 200.8	0.5	mg/L
Magnesium (Mg)-Total	EPA SW-846 3005A/6010B	0.1	mg/L
Manganese (Mn)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.00005	mg/L
Manganese (Mn)-Total	EPA 200.8	0.001	mg/L
Mercury (Hg)-Total	EPA SW846 7470A	0.000010	mg/L
Molybdenum (Mo)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.00005	mg/L
Nickel (Ni)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0005	mg/L
Phosphorus (P)-Total	EPA SW-846 3005A/6010B	0.3	mg/L
Potassium (K)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.05	mg/L
Selenium (Se)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Silicon (Si)-Total	EPA SW-846 3005A/6010B	0.05	mg/L
Silver (Ag)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.00001	mg/L
Sodium (Na)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.05	mg/L
Sodium (Na)-Total	EPA 200.8	0.5	mg/L
Strontium (Sr)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0002	mg/L
Thallium (Tl)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.00001	mg/L
Tin (Sn)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Titanium (Ti)-Total	EPA SW-846 3005A/6010B	0.01	mg/L
Uranium (U)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.00001	mg/L
Uranium (U)-Total	EPA 200.8	0.001	mg/L
Vanadium (V)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.001	mg/L
Zinc (Zn)-Total	APHA 3030 B&E / EPA SW-846 6020A	0.003	mg/L
Zinc (Zn)-Total	EPA 200.8	0.003	mg/L
Water-Dissolved Metals			
Aluminum (Al)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.001	mg/L
Antimony (Sb)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Arsenic (As)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Barium (Ba)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.00005	mg/L
Beryllium (Be)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Bismuth (Bi)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0005	mg/L
Boron (B)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.01	mg/L
Cadmium (Cd)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.00001	mg/L
Calcium (Ca)-Dissolved	EPA 200.8	0.5	mg/L
Chromium (Cr)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Cobalt (Co)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Copper (Cu)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0002	mg/L
Dissolved Metals Filtration Location	EPA 200.8		
Iron (Fe)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.01	mg/L
Lead (Pb)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.00005	mg/L
Lithium (Li)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0005	mg/L
Magnesium (Mg)-Dissolved	EPA 200.8	0.5	mg/L
Manganese (Mn)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.00005	mg/L
Molybdenum (Mo)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.00005	mg/L
Nickel (Ni)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0005	mg/L
Potassium (K)-Dissolved	EPA SW-846 3005A/6020A	0.05	mg/L
Selenium (Se)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Silver (Ag)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.00001	mg/L
Sodium (Na)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.05	mg/L
Strontium (Sr)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0002	mg/L
Thallium (Tl)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.00001	mg/L
Tin (Sn)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.0001	mg/L
Titanium (Ti)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.01	mg/L
Uranium (U)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.00001	mg/L
Vanadium (V)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.001	mg/L
Zinc (Zn)-Dissolved	APHA 3030 B&E / EPA SW-846 6020A	0.001	mg/L
Waste-TCLP Metals			
Arsenic (As)	EPA 200.8	0.001	mg/L
Barium (Ba)	EPA 200.8	0.01	mg/L
Cadmium (Cd)	EPA 200.8	0.0001	mg/L
Chromium (Cr)	EPA 200.8	0.001	mg/L
Lead (Pb)	EPA 200.8	0.001	mg/L
Mercury (Hg)	SW846 7470A	0.00010	mg/L
Water-Aggregate Organics			
BOD	APHA 5210 B	2.0	mg/L
COD	APHA 5220 D	10	mg/L
Oil and Grease, Total	APHA 5520 B	2.0	mg/L
Mineral Oil and Grease	APHA 5520 B	1.0	mg/L
Phenols (4AAP)	EPA 9066	0.0010	mg/L
Soil-Aggregate Organics			
Oil and Grease, Total	APHA 5520 B	500	mg/kg
Water-Volatile Organic Compounds			
1,4-Difluorobenzene	SW846 8260 (HEADSPACE)	1	

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
4-Bromofluorobenzene	SW846 8260 (HEADSPACE)	1	
Benzene	SW846 8260 (HEADSPACE)	0.5	ug/L
Ethyl Benzene	SW846 8260 (HEADSPACE)	0.5	ug/L
Toluene	SW846 8260 (HEADSPACE)	0.5	ug/L
Water-Hydrocarbons			
2-Bromobenzotrifluoride	MOE DECPH-E3421/CCME TIER 1	1	
3,4-Dichlorotoluene	E3421/CCME (HS)	1	
Chrom. to baseline at nC50	MOE DECPH-E3421/CCME TIER 1		
F2-Naphth	CCME CWS-PHC DEC-2000 - PUB# 1310-L	100	ug/L
F3-PAH	CCME CWS-PHC DEC-2000 - PUB# 1310-L	250	ug/L
F2 (C10-C16)	MOE DECPH-E3421/CCME TIER 1	100	ug/L
F3 (C16-C34)	MOE DECPH-E3421/CCME TIER 1	250	ug/L
F4 (C34-C50)	MOE DECPH-E3421/CCME TIER 1	250	ug/L
Total Hydrocarbons (C6-C50)	CCME CWS-PHC DEC-2000 - PUB# 1310-L	250	ug/L
F1 (C6-C10)	E3421/CCME (HS)	100	ug/L
F1-BTEX	CCME CWS-PHC DEC-2000 - PUB# 1310-L	100	ug/L
Soil-Hydrocarbons			
2-Bromobenzotrifluoride	MOE DECPH-E3398/CCME TIER 1	1	
3,4-Dichlorotoluene	E3398/CCME TIER 1-HS	1	
Chrom. to baseline at nC50	MOE DECPH-E3398/CCME TIER 1		
F2-Naphth	CCME CWS-PHC DEC-2000 - PUB# 1310-S	10	ug/g
F3-PAH	CCME CWS-PHC DEC-2000 - PUB# 1310-S	50	ug/g
F2 (C10-C16)	MOE DECPH-E3398/CCME TIER 1	10	ug/g
F3 (C16-C34)	MOE DECPH-E3398/CCME TIER 1	50	ug/g
F4 (C34-C50)	MOE DECPH-E3398/CCME TIER 1	50	ug/g
Total Hydrocarbons (C6-C50)	CCME CWS-PHC DEC-2000 - PUB# 1310-S	50	ug/g
F1 (C6-C10)	E3398/CCME TIER 1-HS	5.0	ug/g
F1-BTEX	CCME CWS-PHC DEC-2000 - PUB# 1310-S	10	ug/g
Water-Organic Parameters			
Chlorophyll a	EPA 445.0 ACET	0.10	ug/L
Phaeophytin a	EPA 445.0 ACET	0.10	ug/L
Misc.-Miscellaneous			
Special Request	SEE SUBLET LAB RESULTS		

Methodology

Product	Matrix	Product Description	Analytical Method Reference
AIR VOLUME-ED	Misc.	Air volume (L)	HYGIENE METHOD

NOTE: When air concentrations of analytes are reported, they are based on air sampling information (air volume, sampling time, sampling flow rate) supplied by the client.

ALK-SPEC-WT	Water	Speciated Alkalinity	EPA 310.2
ALK-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2
ANIONS3-WT	Water	Cl, F, SO4	EPA 300.0 (IC)
BOD-WT	Water	BOD	APHA 5210 B

Diluted and seeded samples are filled in an airtight bottle and incubated at a specified temperature for 5 days.

BR-WT	Water	Bromide	EPA 300.0 (IC)
BTX-HS-WT	Soil	BTEX by Headspace	SW846 8260 (HEADSPACE)

BTX is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/MS.

BTX-HS-WT	Water	BTEX by Headspace	SW846 8260 (HEADSPACE)

BTX is determined by analyzing by headspace-GC/MS.

C-DIS-ORG-WT	Water	Dissolved Organic Carbon	APHA 5310 B-INSTRUMENTAL

Sample is filtered through a 0.45um filter, sample is then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

CHL/A-ACET-FLUORO-WP	Water	Chlorophyll a by fluorometry	EPA 445.0 ACET

This analysis is done using procedures modified from EPA method 445.0. Chlorophyll a is determined by a 90 % acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-WT	Water	Chloride	EPA 300.0 (IC)
CN-FREE-CFA-WT	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.

COD-BF	Water	Chemical Oxygen Demand	APHA 5220 D

The dichromate ion oxidizes COD material when the sample is digested and after digestion the sample is then analyzed on a spectrophotometer.

COD-WT	Water	Chemical Oxygen Demand	APHA 5220 D

The dichromate ion oxidizes COD material when the sample is digested and after digestion the sample is then analyzed on a spectrophotometer.

Methodology

Product	Matrix	Product Description	Analytical Method Reference
COLOUR-WT	Water	Colour	APHA 2120

Apparent colour is determined by analysis of the decanted sample using the platinum-cobalt colourimetric method.

DUSTFALLS-INS.DM2-VA	Dustfall	Dustfalls Insoluble (mg/dm2.day)	BCMOE DUSTFALLS

Dustfall analysis is carried out in accordance with procedures published by the B.C. Ministry of Environment Laboratory.

EC-BF	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

EC-MF-WT	Water	E. coli	SM 9222D

A 100mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at @44.5±0.2°C for 24±2h. Method ID: WT-TM-1200

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

ETL-HARDNESS-CALC-WT	Water	Hardness (as CaCO3)	APHA 2340 B
ETL-N2N3-WT	Water	Calculate from NO2 + NO3	APHA 4110 B
F-WT	Water	Fluoride	EPA 300.0 (IC)
F1-F4-CALC-WT	Soil	CCME Total Hydrocarbons	CCME CWS-PHC DEC-2000 - PUB# 1310-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k) fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

Methodology

Product	Matrix	Product Description	Analytical Method Reference
F1-F4-CALC-WT	Water	CCME Total Hydrocarbons	CCME CWS-PHC DEC-2000 - PUB# 1310-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k) fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-WT	Soil	F1 (O.Reg.153/04)	E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

F1-HS-WT	Water	F1 (O.Reg.153/04)	E3421/CCME (HS)

Fraction F1 is determined by analyzing by headspace-GC/FID.

F2-F4-WT	Soil	F2-F4 (O.Reg.153/04)	MOE DECPH-E3398/CCME TIER 1

A sub-sample of the solid sample is extracted with a solvent mixture. Following extraction, the sample extract is treated in situ with Silica Gel analyzed by GC/FID.

The F2 fraction is determined by integrating the area in the chromatogram from the apex of nC10 to the apex nC16 and quantitating using external calibration using a standard mix containing nC10, nC16 and nC34. Similarly, the F3 fraction extends from the apex of nC16 to the apex nC34 and the F4 fraction covers the area from the apex nC34 to the apex nC50. If the chromatogram does not return to the baseline by the time nC50 elutes, a gravimetric determination of the F4 is performed.

Methodology

Product	Matrix	Product Description	Analytical Method Reference
F2-F4-WT	Water	F2-F4 (O.Reg.153/04)	MOE DECPH-E3421/CCME TIER 1

The petroleum hydrocarbons are extracted from the aqueous samples using solvent partition. The extracts are treated with silica gel to remove polar contaminants. The final concentrated extract is analyzed by gas chromatography (GC) using flame ionization detection (FID) and a 100% polydimethylsiloxane column.

The F2 fraction is determined by integrating the area in the chromatogram from the apex of nC10 to the apex nC16 and quantitating using external calibration using a standard mix containing nC10, nC16 and nC34. Similarly, the F3 fraction extends from the apex of nC16 to the apex nC34 and the F4 fraction covers the area from the apex nC34 to the apex nC50. If the chromatogram does not return to the baseline by the time nC50 elutes, a gravimetric determination of the F4 is performed.

FILTER-NC-WT	Water	Lab Filtered and Preserved (as required)	

HG-DUST(DM2-CVAFS-VA	Dustfall	Total Mercury in Dustfalls by CVAFS	EPA 245.7

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). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

HG-R511-WT	Soil	Mercury-O.Reg 153/04 (July 2011)	SW846 3050B/7471

Solid sample is digested with a heated, strong, mixed acid solution to convert all forms of mercury to divalent mercury. The divalent mercury is then reduced to elemental mercury, sparged from solution and analyzed by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-T-L-CVAA-WT	Water	Total Mercury in Water by CVAAS (Low)	EPA SW846 7470A

Liquid sample is digested with a heated, strong, mixed acid solution to convert all forms of mercury to divalent mercury. The divalent mercury is then reduced to elemental mercury, sparged from solution and analyzed by CVAAS.

HG-TCLP-WT	Waste	Mercury (CVAA) for O.Reg 347	SW846 7470A
LEACH-TCLP-WT	Waste	Leachate Procedure for Reg 347	EPA 1311
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

MET-D-MS-WT	Water	Dissolved Metals in Water by ICPMS	EPA 200.8

The metal constituents of a non-acidified sample that pass through a membrane filter prior to ICP/MS analysis.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-DIS-MS-VA	Water	Dissolved Metals by ICPMS	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

Methodology

Product	Matrix	Product Description	Analytical Method Reference
MET-DUST(DM2)-MS-VA	Dustfall	Total Metals in Dustfalls by ICPMS	EPA 6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

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

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

MET-T-MS-WT	Water	Total Metals in Water by ICPMS	EPA 200.8

This analysis involves preliminary sample treatment by hotblock acid digestion (APHA 3030E). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TCLP-WT	Waste	O.Reg 347 TCLP Leachable Metals	EPA 200.8
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-UG/G-CCMS-WT	Soil	Metal Scan Collision Cell ICPMS	EPA 200.2/6020A

Sample is vigorously digested with nitric and hydrochloric acid. Analysis is conducted by ICP/MS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

MOISTURE-WT	Soil	% Moisture	Gravimetric: Oven Dried
NH3-WT	Water	Ammonia, Total as N	EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO2-L-IC-WP	Water	Nitrite as N by Ion Chromatography	EPA 300.1 (Modified)

Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.

NO2-WT	Soil		EPA 300.0
NO3-WT	Soil	Nitrate in Soil	EPA 300.0
NO3-WT	Water	Nitrate-N	EPA 300.0 (IC)

A filtered water sample (drinking waters-unfiltered) is analyzed by ion chromatography.

Methodology

Product	Matrix	Product Description	Analytical Method Reference
OGG-SPEC-CALC-WT	Water	Speciated Oil and Grease A/V Calculation	CALCULATION

Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

OGG-SPEC-WT	Water	Speciated Oil and Grease-Gravimetric	APHA 5520 B

Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

OGG-TOT-WT	Soil	Oil and Grease, Total	APHA 5520 B

Sample is extracted with an acetone:hexane mixture followed, extract is then evaporated and residue is weighed to determine total oil and grease.

OGG-TOT-WT	Water	Oil and Grease, Total	APHA 5520 B

Sample is extracted with hexane, extract is then evaporated and the residue is weighed to determine total oil and grease.

P-TOTAL-LOW-WT	Water	Phosphorus, Total, Low Level	APHA 4500-P B E

This analysis is carried by out an discrete colorimetric auto-analyzer using procedures adapted from APHA Method 4500-P "Phosphorus".

PARTICULATE-0.10-SLT	Filter	Respirable Dust N0600	SEE SUBLET LAB'S REPORT
PH-BF	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

PHENOLS-4AAP-WT	Water	Phenol (4AAP)	EPA 9066

An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.

PHEOA-ACET-FLUORO-WP	Water	Pheophytin a by fluorometry	EPA 445.0 ACET

This analysis is done using procedures modified from EPA method 445.0. Pheopigments present in the sample are determined collectively as Pheophytin a by a 90% (v/v) acetone extraction followed with analysis by fluorometry using the acidification procedure.

PREP-DUSTFALL-VA	Dustfall	Dustfall Sample Preparation	

Methodology

Product	Matrix	Product Description	Analytical Method Reference
PSA-3-SK	Soil	Particle size - Pipette removal OM & CO3	Forestry Canada (1991) p. 46-53

Dry, < 2 mm soil is treated hydrochloric acid top remove carbonates, then hydrogen peroxide to remove organic matter. The remaining soil is treated with sodium hexametaphosphate to ensure complete dispersion of primary soil particles. The homogenized suspension is allowed to settle in accordance with Stoke's Law so that only clay particles remain in suspension.To determine the clay fraction, an aliquot of the clay suspension is removed, then dried and weighed. The sand fraction is determined by wet sieving the remaining suspension, then drying and weighing the sand retained on the sieve. The silt fraction is determined by calculation where % Silt = 100 - (%Sand+%Clay)

Reference:
Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

SAMPLE-DISPOSAL-WT	Misc.	Sample Handling and Disposal Fee	
SHIPPING-WT	Misc.	Shipping Charge	
SO4-WT	Water	Sulphate	EPA 300.0 (IC)
SOLIDS-TDS-BF	Water	Total Dissolved Solids	APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105±5°C overnight and then 180±10°C for 1hr.

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105±5°C overnight and then 180±10°C for 1hr.

SOLIDS-TSS-BF	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 105±5°C for a minimum of four hours or until a constant weight is achieved.

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 105±5°C for a minimum of four hours or until a constant weight is achieved.

SPECIAL REQUEST-SLT	Misc.	Special Request Datachem Salt Lake	SEE SUBLET LAB RESULTS
TC-MF-WT	Water	Total Coliforms	SM 9222B

A 100mL volume of sample is filtered through a membrane, the membrane is placed on mENDO LES agar and incubated at 35±0.5°C for 24±2h. Method ID: WT-TM-1200

TKN-WT	Soil	Total Kjeldahl Nitrogen	APHA 4500-N

A homogenized soil sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-N

Sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.

Methodology

Product	Matrix	Product Description	Analytical Method Reference
TOC-WT	Soil	TOC & FOC in Solids	CARTER 21.2
TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

Product	Matrix	Product Description	Analytical Method Reference
TURBIDITY-BF	Water	Turbidity	APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

Product	Matrix	Product Description	Analytical Method Reference
TURBIDITY-WT	Water	Turbidity	APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

Product	Matrix	Product Description	Analytical Method Reference
XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

Product	Matrix	Product Description	Analytical Method Reference
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

Appendix E

Analytical Laboratory QA/QC Procedures

ALS Quality Management System Summary

ALS is a global diversified testing services organization with a presence on every continent, offering a broad range of services to leading global companies.

The following report summarizes standard practices routinely employed by the ALS Environmental Division in Canada. Our practices exceed accreditation requirements and have been built to meet the needs of our customers and to give them confidence in the reliability of our test data.

Additional information is available on request from the Quality Department. Customers are invited to audit or tour ALS facilities at their convenience.

Services to Customers

ALS cooperates closely with its customers to ensure their testing needs are understood, and allows them reasonable access to relevant work areas of the laboratories to audit the management system or to witness test work undertaken on their behalf.

All client issues are logged into our tracking system to ensure each issue is addressed completely and appropriately. Local and national oversight and initiatives ensure that identified improvements are incorporated in the Canadian laboratories so that customers receive the same level of service regardless of which location performs the testing.

Documentation and Document Control

Test methods and support procedures are documented in detail to ensure consistency of application, repeatability of test results and traceability of analyses.

Test method requirements include but are not limited to sample handling, sample storage, minimizing interference, sample preparation, reagent and standard specifications, equipment, supplies, calibration requirements, instrumental measurement procedures, quality control requirements, data quality objectives and corrective actions, calculations, reporting requirements, reference information, hazards and their preventive measures.

Administrative support procedures are also documented where needed to ensure quality system procedures and customer services are provided in a controlled, approved manner consistent with ALS policies and client needs.

All procedures are authorized prior to use by the signing authority, ensuring adequate technical and quality oversight.

Distribution of documents is controlled to ensure only the most recent version is available for use. Authorized documents are reviewed periodically by the signing authority to ensure they continue to meet ALS requirements and customer needs.

Test methods and support procedures are available for client viewing on-site.

Internal Audits

Internal audits are scheduled and performed by qualified Quality and Technical staff for all routine analytical procedures and Quality System elements. Such audits ensure that procedures are implemented as intended, that test methods are scientifically defensible and technically sound, and that policies, procedures and records continue to meet the Quality System objectives.

Quality staff may periodically initiate unscheduled audits in response to proficiency testing program results, client feedback, requests from managers or any other circumstance that warrants investigation.

Quality Control (QC)

ALS has established QC procedures for monitoring the validity of tests performed by its laboratories. Individual test methods specify quality control requirements, frequency of use, and Data Quality Objectives (DQOs).

The type of quality control elements used for process monitoring is dependent on the test performed, but typically includes (as appropriate): Calibration Verification Standards, Continuing Calibration Verifications, Instrument Blanks, Method Blanks, Laboratory Control Samples, Reference Materials, Matrix Spikes, Surrogate Spikes, and Internal Standards.

DQOs are established for each QC sample, based on a combination of reference method objectives, customer requirements and historical test method performance. Where applicable, prescriptive elements of reference methods take precedence over internal DQOs.

Test results for selected QC samples are available on test reports. Please contact your Account Manager for more information.

Control Charts

Control charts are used to provide a graphical representation of QC results and test method performance over time. Control charts graphically display DQOs as well as the statistically derived mean and ± 2 and 3 standard deviations ("sigma") around the mean, calculated from recent historical QC results. ALS applies advanced trend monitoring algorithms to identify outliers and non-random data distributions (trends) that may indicate undesirable changes in test method performance. The trend monitoring process has been automated within our LIMS. Upon data entry, each QC result is checked against programmed limits and trends. If a trend is identified, a notification is e-mailed to the analyst and their supervisor, so that it can be investigated and corrected.

Continuous Improvement

ALS is committed to continuously improving its processes and services. The Quality System feeds into a continuous cycle of review, implementation, and monitoring so that improvements are actively sought and adopted where needed.

Data Validation

ALS analytical data proceeds through several reviews prior to the release of final reports. The ALS data validation process includes test result validation, inter-parameter validation and report validation. Test result validation involves an independent peer review of raw and calculated test results. Inter-parameter validation occurs when all department specific parameters for a sample are completed, and involves an overall review of test results within each sample for consistency among any related test parameters. Report validation occurs when all the requested test results for a work order are completed, and involves a review of the final report before it is sent to the customer.

ALS maintains laboratory records in a traceable manner for five years.

Method Validation

Customers rely on ALS to select test methods that are appropriate to meet their needs. Wherever possible, ALS references the latest versions of published standard methods developed by organizations such as American Public Health Association, United States Environmental Protection Agency, NIOSH, Environment Canada, and other international, regional or regulatory organizations, or equipment manufacturers.

Method validations are conducted to confirm that our test methods are fit for their intended use. The validations are as extensive as necessary to meet the needs of the given application. The extent depends on the source of the method. Test methods are revalidated periodically to ensure continued suitability and fitness for purpose.

Method Detection Limits and Limits of Reporting

ALS Limits of Reporting (LORs) are established using rigorous experimental and statistical procedures that begin with the determination of the Method Detection Limit (MDL) at 99% confidence. The MDL takes into account several factors, like long term Method Blanks, low level Sample Duplicates, and low level Spiked Samples. When detected at or above the MDL, ALS test results are considered to be qualitatively accurate, and a parameter can be reported with 99% confidence as being present in the sample.

$$\mathbf{MDL = (s_0 \times t_{n-1}) + |MBlk|}$$

Where:
- s_0 = the standard deviation derived from the analysis of blank or low level samples, whichever gives a higher standard deviation,
- t_{n-1} = the Student's t-distribution with n-1 degrees of freedom for the one-sided 99% confidence interval.
- |MBlk|= the absolute value of the mean method blank.

ALS takes a conservative approach to detection limits. Our goal is to minimize false positives, because we recognize that any false positive results can be damaging for our clients. Where possible, we establish LORs at levels well-above the statistical MDL, and ideally at the LOQ_5. This improves the accuracy and precision of results near the detection limit, and reduces the chance of false positives due to sample-specific issues. At or above the LOQ_5, test results are considered to be quantitatively accurate. A reported parameter at the LOQ_5 is considered to be within 40% of the true value 95% of the time.

$$\mathbf{LOQ_5 = 5s_0 + |MBlk|}$$

Where:
- s_0 = the standard deviation used in the MDL calculation,
- |MBlk| = the absolute value of the mean method blank.

The D. L. column on ALS analytical reports contains the LOR. The LOR may be the MDL as calculated above, or a higher value. ALS does not report LORs that are less than the calculated MDL.

Measurement Uncertainty (MU)

ALS procedures for calculating measurement uncertainty are based on accepted practices of identifying components contributing to uncertainty, compiling data that represents or includes these components, evaluating the data using appropriate statistical calculations, and reporting in a manner that prevents misunderstanding of the result. The Type A method of calculating measurement uncertainty is followed, however additional factors are considered to ensure the best and most complete information is derived from our evaluation of test method performance.

The ALS model describes the dependency of uncertainty on three factors. The first is a constant contribution to uncertainty attributable to s_0, the standard deviation of the method for concentrations that approach zero. The second is a constant relative uncertainty associated with higher parameter concentrations. The third is a constant contribution to uncertainty attributable to the mean long-term method blank value where it is significant. The following is the ALS equation for measurement uncertainty, using an expansion factor of k=2:

Expanded 95% Uncertainty as a Function of Concentration

$$U(c) = 2 * [\sqrt{ \{ s_0^2 + (\Theta c)^2 \} }] + |MBlk_{LT}|$$

Where:
- **U(c)** = The expanded uncertainty at concentration c. The range c ± U(c) represents approximately the 95% confidence interval (two standard deviations).
- **c** = Measured concentration of parameter in the sample.
- $\mathbf{s_0}$ = A constant contribution to standard uncertainty represented by the standard deviation at zero concentration, which is related to the method detection limit.
- **ϴ** = Combined relative standard uncertainty, excluding MDL and Method Blank contributions. Theta has no units.
- $|\mathbf{MBlk}_{LT}|$ = Absolute value of the mean long-term Method Blank value, where significant (i.e. if > 1/5 s_0). [Note that the Method Blank term is not expanded because it represents a constant bias, not a variance.]

Uncertainty values obtained from this procedure must be regarded as estimates. Primarily, this is because all environmental samples are different, especially with regard to matrix effects and heterogeneity. It is our intent with this procedure to arrive at an estimate of a 95% confidence level uncertainty value that can be assumed to apply to 95% (or more) of the samples that a laboratory receives for a given test. It follows that for samples where undetected matrix effects or interferences occur, or for samples that are atypically heterogeneous, uncertainty estimates may be low.

Another aspect of reporting MU is the reporting of test method bias. Bias occurs in a small number of test methods that cannot recover 100% of a parameter from a sample. In these cases ALS reports bias along with the MU to aid with the interpretation of the test result.

Participation in Interlaboratory Proficiency Testing (PT) Programs

ALS locations participate in an extensive variety of proficiency testing programs. Where available, formal programs operated by outside agencies are used. When not available, ALS utilizes less formal proficiency testing studies. Root cause analysis is initiated and corrective action plans are developed when PT program results indicate a decline in test method performance.

Staff Training

Formal training procedures are in place to ensure all staff are trained in ALS polices and analytical procedures prior to performing analyses. A staff orientation program communicates ALS polices to newly hired staff. Task specific training is performed, and analyst proficiency is demonstrated and documented before staff are authorized to work independently. On-going analyst proficiency is monitored using proficiency testing programs. Records are maintained in training logs issued to staff upon hiring.

As well, ALS Canada promotes continuing education and learning by offering advanced courses covering technical and quality functions.

Employee Agreements

ALS protects its customers' confidential information and proprietary rights. We require all employees to review and sign a Code of Conduct policy that communicates the ALS confidentiality policy. It is ALS practice to never disclose information about a client's analysis to a third party without prior consent of the client, or unless compelled to by law. If we are obligated by law to disclose such information, we will inform the client prior to doing so.

Our employees avoid involvement in activities that would diminish confidence in their competence, impartiality, judgment, or integrity by complying with the ALS Code of Conduct and Data Integrity Policy.

Sample Tracking

Procedures are in place to track samples from receipt at the lab through to final reporting. A data management system (LIMS – Laboratory Information Management System) is used to generate a work order number for each sample submission, and a unique identification number is generated for each sample within the work order. The system is then used to assign specific analyses for the samples, to identify methods to be used, and to assign due dates for the results. The system is used to manage analytical workloads and track the status of all samples in-house. LIMS is a secure system that can only be accessed using login passwords. Controlling the level of access according to staff needs provides additional security.

When requested by the client, legal sample protocols are implemented to ensure chain of custody defensibility in a court of law. Contact the lab for legal sampling and transportation instructions if this service is needed.

Equipment Calibration

Measuring and testing equipment used by ALS laboratories that can have a significant effect on the accuracy or validity of test results is calibrated using established procedures. The procedures ensure traceability through an unbroken chain of calibrations or comparisons to national measurement standards. Where traceability of measurements to SI units is not possible and/or not relevant, traceability is provided by the use of certified reference materials and/or consensus standards.

Management Reviews (MR)

Management conducts a review at least annually to ensure the management system is effective, and continues to be suitable for its operations, and to identify necessary changes or improvements. Senior management is included in the review process for all locations.

ALS Quality Control Protocols

08 May, 2012

Quality control samples are introduced into batches of samples at critical points of sample handling, preparation and analysis to demonstrate the processes are performing as expected. In general, quality control samples are considered either Instrument QC or Method QC.

Instrument QC:

Instrument QC samples demonstrate control for the instrumental portion of a method. Instrument QC requirements must be successfully met before the analysis of Method QC or samples may proceed.

- Verification of initial calibration - criteria varies with each test.
- 2nd source Calibration Verification Standard (CVS) – at minimum, with each initial calibration.
- Continuing Calibration Verification (CCV) – frequency varies by test.
- Instrument Blanks – usage and frequency varies by test.

Method QC:

Method QC samples encompass the entire method and are initiated at the earliest point of the method where appropriate. Refer to the QC Definitions below. One set of Method QC is included for each batch of up to 20 client samples. Each set includes:

- 1 Method Blank.
- 1 Sample Duplicate. *
- 1 Lab Control Sample.
- 1 Reference Material or Matrix Spike. **
- Surrogate Compounds.

* Duplicate analyses are not performed where sub-sampling is not possible – e.g. most tests for organics in water.
** Spikes and Reference Materials are unavailable for Microbiology tests.

Method QC must be successfully analyzed before sample results are approved. Method QC results are normally reported to ALS clients with data reports.

Data Quality Objectives (DQOs):

DQOs are established for each QC sample, based on a combination of reference method objectives, customer requirements and historical test method performance. Where applicable, prescriptive elements of reference methods take precedence over internal DQOs. Current DQOs are available upon request.

Detailed descriptions of how DQOs are evaluated for different types of Quality Control samples are described on the following pages.

Types of Quality Control – Definitions and Evaluation Protocols

Method Blank (MB) - A blank sample prepared to represent the sample matrix as closely as possible and analyzed exactly like the calibration standards, samples, and quality control (QC) samples. Results of Method Blanks provide an estimate of the within batch variability of the blank response and an indication of bias introduced by the analytical procedure.

Except in special cases (as outlined in ALS DQO summary documents) the ALS DQO for Method Blanks is for all results to lie below the Limit of Reporting (LOR).

Laboratory Sample Duplicate (DUP) - A second portion of sample taken from the same container as the sub-sample used for the primary analysis, that is analyzed independently through all steps of the laboratory's sampling and analytical procedures. Duplicate samples are used to assess variance of the total method including sampling and analysis.

Duplicate precision is normally measured as Relative Percent Difference (RPD), where RPD = |(Result2 - Result1) / Mean| * 100. Duplicate samples should normally agree to within the ALS Precision DQO for the test and parameter (expressed as RPD), or within ± 2 x the LOR (for low level results). Refer to the ALS DQOs for Precision for specific limits for any given test.

ALS does not establish DQOs for Field Sample Duplicates. However, it is generally understood and accepted that the variability of Field Sample Duplicates is significantly more than what is observed with Laboratory Sample Duplicates.[1]

Laboratory Control Sample (LCS) - A known matrix spiked with compound(s) representative of the target analytes. An LCS is used to verify the accuracy of the laboratory's performance of the test.

LCS accuracy is calculated as the measured amount divided by the target concentration, and is normally expressed as percent recovery. LCS recoveries should normally lie within the ALS Accuracy DQOs for the test and parameter. For a low level LCS, the result should lie within ± 1 x the LOR of the target concentration. Refer to the ALS Accuracy DQOs for specific limits for any given test.

Reference Material (RM) – A material or substance, one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. An RM is similar to an LCS, but encompasses a representative sample matrix. Similar to an LCS, an RM is used to verify the accuracy of the laboratory's performance of the test, but including the challenges of a complex sample matrix.

RM accuracy is calculated, expressed, and evaluated similarly to LCS accuracy. Refer to ALS Accuracy DQOs for specific limits for any given test.

Matrix Spike (MS) - A sample prepared by adding a known amount of a target analyte to a specified amount of a sample for which an independent estimate of the target analyte concentration is available. Spiked samples are used, for example, to determine the effect of the sample matrix on a method's recovery efficiency.

Matrix Spike results are calculated and expressed as percent recovery, by dividing the measured result (minus any analyte contribution from the unspiked sample) by the target analyte concentration. Matrix Spike results should normally lie within the ALS Accuracy DQOs for Matrix

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[1] Depending on the type of Field Sample Duplicates being evaluated (e.g. Co-located versus Split Sample Duplicates), ALS recommends DQOs for Field Sample Duplicates that are between 1.5 – 2.0 times higher than our Laboratory Sample Duplicate DQOs. Co-located Sample Duplicates generally require higher DQOs than Split Sample Duplicates.

Spikes. Matrix Spike results cannot be calculated or reported in cases where the background concentration of the test parameter in the sample is too high relative to the spike level.

Surrogate Compounds (SURR) – Surrogate Compounds are added to every sample where applicable (organics tests only). They are substances with properties that mimic the analyte of interest, and which are unlikely to be found in environmental samples. They are added at known concentration to samples to establish that the analytical method has been properly performed.

Surrogate results are calculated and expressed as percent recovery, by dividing the measured result against the expected target concentration. Refer to ALS Accuracy DQOs for specific limits for any given test.

Automated Relational Checks

In addition to all our standard Quality Control checks, ALS also employs dozens of "Relational Checks", which are programmed into our Laboratory Information Systems (LIMS) to automatically highlight any situations where the expected relationships between different test parameters are violated, which can often point to errors. Such errors may originate with field sampling, or from laboratory processes, but should always be identified and pro-actively investigated.

Total versus Dissolved Metals ("D > T" Check) – One of the most important and common relational checks we do is a check for situations where Dissolved Metal concentrations significantly exceed Total Metal concentrations. By definition, this situation should not occur. However, there are a few reasons why this can occur:

i) Circumstances where Dissolved Metals slightly exceed Total Metals are expected in a small percentage of samples, simply due to normal random variability. In fact, when all metals in a test sample exist in the dissolved form, we expect that Dissolved Metals measurements will numerically exceed Total Metals measurements exactly half the time (by a small margin), simply due to random chance.

ii) Samples to be analyzed for Dissolved Metals must be filtered, which is normally done in the field. Filtration processes are a common source of low level metals contaminants. Contamination of a sample during filtration is the most common source of significant D > T issues.

iii) Field samples for Dissolved and Total Metals are normally collected independently, so variability of the sampling process is another common cause of D > T issues.

If none of the above causes can explain a situation where Dissolved Metals exceed Total Metals, then another type of error may be indicated, either with the collection of the sample in the field, or with sample containers or preservatives, or with the laboratory testing process.

ALS automatically highlights and investigates all circumstances where a Dissolved Metal result exceeds the Total Metal result by 20% RPD or more, but only if the absolute difference between the two results is greater than the sum of the Limits of Reporting (Detection Limits) of the two results.

The mechanism of this relational check is derived from the ALS Duplicate DQOs for Metals in Water.

All D > T relational checks that violate the rule above are flagged internally, and are investigated by ALS before sample results will be released to our clients. In most cases, results will be re-analyzed to confirm or correct the anomalous relationship. If results are confirmed by re-analysis, the following data qualifier is applied:

DTC: Dissolved concentration exceeds total. Results were confirmed by re-analysis.

Other Important Relational Checks Conducted by ALS

ALS employs dozens of other relational checks to highlight anomalous relationships between test parameters. Some of more common checks include the following:

- *Total Ammonia should not exceed Total Kjeldahl Nitrogen*
- *Weak Acid Dissociable Cyanide should not exceed Total Cyanide*
- *E. coli should not exceed Fecal Coliforms*
- *Nitrate + Nitrite should not exceed Total Nitrogen*
- *Hexavalent Chromium should not exceed Total Chromium*
- *True Colour should not exceed Apparent Colour*
- *Mineral Oil and Grease should not exceed Total Oil and Grease*
- *Reactive Phosphorus should not exceed Total Phosphorus*

ALS Environmental

Quality Control Report Guide

Matrix is the substance type of the QC sample.

Common matrices are water, soil, and tissue.

The **Reference** column contains:

a) Lab sample number (L#) or work group number (WG#) of samples that were used for duplicates or matrix spikes - this information is for internal tracking purposes.

b) Test results for actual samples that were duplicated for QC purposes.

Result from analyzing the QC sample.

% Recovery is calculated for QC samples with known target values (e.g. Spikes or CRMs).

Actual (absolute) test results are reported for the second aliquot of a duplicate pair and method blanks.

A **Qualifier** is used to communicate important information about the QC sample test results.

Sample parameter qualifiers used in the report are defined near the end of the Quality Control Report.

Also refer to the *Sample Parameter Qualifier Definitions* on the next page.

Units of the QC sample test results.

Test results are reported in % recovery for samples with known target values.

Actual (absolute) concentration units are used for reporting duplicate sample and Method Blank test results.

The calculated **Relative % Difference** between duplicate pairs.

RPD is calculated as follows:
|[(Sample Result - Duplicate Result) / [Mean]]| x 100

Duplicate pairs with test results that are < 5 x LOR are reported in sample concentration units (absolute units) and are accompanied by a J qualifier.

The Control **Limit** for the QC sample (ALS Data Quality Objective (DQO)).

QC samples must fall within Control Limits or appropriate action is taken, such as reanalysis where possible, or the data is qualified.

QC samples with known target values have a range for % recovery (eg) 85-115%.

Duplicates have a ± RPD range (e.g. ± 20 RPD). The RPD is reported as an absolute value (e.g. 20 RPD).

Method Blank control limit is the parameter Detection Limit (DL), also known as the Limit of Reporting (LOR).

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-WP	Water							
Batch R2179887								
WG1269694-3 DUP		L997018-4						
Sulfate		60.1	62.0		mg/L	3.1	20	21-APR-11
WG1269674-2 LCS								
Sulfate			100		%		85-115	21-APR-11
WG1269674-1 MB								
Sulfate			<0.50		mg/L		0.5	21-APR-11
WG1269674-4 MS		L997018-4						
Sulfate			N/A	MS-B	%		-	21-APR-11
WG1269674-5 CVS								
Sulfate			103		%		85-115	21-APR-11
WG1269674-6 CRM								
Sulfate			95		%		80-120	21-APR-11

Test Code: Sulfate (SO4), analyzed by Ion Chromatography (IC), in ALS Winnipeg (WP).

DUP: Laboratory Sample Duplicate - a second portion of sample taken from the same container as the sub-sample used for the primary analysis. Assesses variance of the total method including lab sub-sampling and analysis.

The results for this duplicate pair are 60.1 and 62.0 mg/L. The RPD is 3.1 and the control limits are ± 20 RPD.

LCS: Laboratory Control Sample – a known matrix spiked with target analytes. Verifies the accuracy of the performance of the test.

The recovery for this LCS is 100%, with control limits of 85 to 115% recovery.

MB: Method Blank – a blank matrix taken through the entire test method. Monitors variability of the blank response and bias of the test method.

The result for this MB is less than 0.50 mg/L. The control limit for the MB is equal to the LOR.

MS: Matrix Spike – a known amount of target analytes are added to a client sample. Measures the effect of the sample matrix on a method's recovery efficiency.

In this example, the recovery of the MS could not be calculated. The qualifier explains why – refer to the *Sample Parameter Qualifier Definitions*.

CVS: Calibration Verification Standard - a second source reference standard containing known concentrations of target analytes. Confirms the accuracy and stability of the calibration standards.

This CVS has a recovery of 103% and control limits of 85 to 115% recovery.

CRM/IRM: Certified or Internal Reference Material – a homogeneous sample whose analyte values have been well characterized.

This CRM has a 95% recovery and control limits of 80 to 120% recovery.

Quality Control Report Guide

Legend:

Limit ALS Control Limit (Data Quality Objectives)
DUP Duplicate RPD Relative Percent Difference
N/A Not Available
LCS Laboratory Control Sample
SRM Standard Reference Material
MS Matrix Spike
MSD Matrix Spike Duplicate
ADE Average Desorption Efficiency
MB Method Blank
IRM Internal Reference Material
CRM Certified Reference Material
CCV Continuing Calibration Verification
CVS Calibration Verification Standard
LCSD Laboratory Control Sample Duplicate

Legend: explains acronyms that may be used in the QC Report.

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Qualifiers: QC sample qualifiers are listed and explained here.

The three examples are common qualifiers. They explain unusual or special circumstances that pertain to the QC sample results.

Quality Control Report Guide

Parameters and sample numbers that had Hold Time exceedances are listed in this table.

Hold Times are tracked from sampling date and time to the date and time when the sample was processed in the lab.

The recommended Hold Times.

See the Notes* section for sources of recommendations.

Hold time exceedance Qualifiers are explained in the *Legend and Qualifiers Definitions* section below.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Transmittance, UV (254 nm)	1	19-APR-11 14:00	25-APR-11 08:16	48	38	hours	EHTL
pH	1	19-APR-11 14:00	10-MAY-11 09:32	0.25	499	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Explanations for the Qualifiers listed above.

See also the additional Notes below.

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L997206 were received on 21-APR-11 07:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

APPENDIX D

MMER SAMPLING AND REPORTING REQUIREMENTS MEMORANDUM

Memorandum

Date: May 20, 2015

To: Jim Millard (Baffinland Iron Mines Corp.)

c.c.: Oliver Curran (Baffinland Iron Mines Corp.), Cynthia Russel and Pierre Stecko (Minnow Environmental Inc.).

From: Paul LePage (Minnow Environmental Inc.)

RE: Overview of MMER Sampling and Reporting

The Mary River Project is expected to become subject to the Metal Mining Effluent Regulations (MMER) under Canada's *Fisheries Act* in June 2015 upon the release of a cumulative amount of greater than 50 cubic meters (m^3) of effluent per day to the receiving environment. As a result, under the MMER, Baffinland Iron Mines Corporation (Baffinland) will be required to initiate Effluent and Water Quality Monitoring studies.

Minnow Environmental Inc. (Minnow) has prepared this memorandum to provide an overview of the information that must be submitted to Environment Canada once the Mary River Project becomes subject to the MMER. This memorandum has been organized according to the timeline for which the ensuing monitoring information is initially due to Environment Canada to meet Baffinland's MMER obligations.

Information Required Within 60 Days of Initiation of Effluent Discharge

Information that must be submitted to Environment Canada within 60 days following the release of effluent above the trigger level (i.e., 50 m^3/day) includes the following:

- Name and address of the mine owner and operator;
- Name and address of the mine parent company;
- Final discharge point(s) plans, specifications, and general description;
- Final discharge point(s) coordinates, reported in latitude and longitude degrees, minutes and seconds; and,
- Name of water body receiving final effluent discharge(s).

For the Mary River Project, the final discharge points may initially include MS-09 (East Pond) and MS-06 (Ore Stockpile Runoff) locations. The MS-09 pond will collect runoff from the Early Revenue Phase (ERP) waste rock stockpile, whereas the MS-06 pond will collect surface runoff from mine site infrastructure and treated sewage water. Notably, effluent from sewage treatment facilities is not required to be monitored/reported under the MMER, but there may be requirements for monitoring to meet Baffinland's territorial (permitting) obligations. It is also noteworthy that records regarding effluent flow monitoring equipment (e.g., model numbers and year, manufacturer specifications for key equipment/components) and a calibration log must be maintained by the mine, but this information is not required to be routinely reported to Environment Canada.

The information indicated above must be submitted to the Environment Canada MMER Authorization Officer assigned to the Mary River Project, as follows:

Ms. Susanne Forbrich, Regional Director
Environmental Protection Operations Directorate
Prairie and Northern Region
Eastgate Offices
9250 – 49th Street
Edmonton, AB T6B 1K5
Susanne.forbrich@ec.gc.ca
(780) 951 - 8866

Sampling Required Following Initiation of Effluent Discharge

Effluent and water quality monitoring must be initiated upon the mine becoming subject to the MMER, and consists of:

- effluent deleterious substances monitoring;
- effluent acute toxicity testing;
- effluent volume monitoring;
- effluent characterization;
- effluent sublethal toxicity testing; and,
- receiving environment water quality.

Effluent deleterious substance (and pH) monitoring must be conducted weekly, at least 24 hours apart, at the final effluent discharge point during periods of effluent discharge. Analytical parameters measured for deleterious substance monitoring, required laboratory detection limits, and monthly mean limits are provided in Table 1. Baffinland will not be required to monitor effluent cyanide concentrations, as long as this substance is not used as a process reagent within the operations area. In addition, the monitoring frequency for radium-226 may be reduced in the event that concentrations are below 0.037 Bq/L for 10 consecutive sampling events.

Table 1: Effluent monitoring frequency and parameters associated with deleterious substances, acute toxicity and characterization monitoring components under the MMER.

Monitoring Component	Monitoring Frequency	Substance	Method Detection Limit[a]	Mean Monthly Limit
Deleterious Substances	weekly	Arsenic	0.010 mg/L	0.50 mg/L
		Copper	0.010 mg/L	0.30 mg/L
		Lead	0.010 mg/L	0.20 mg/L
		Nickel	0.010 mg/L	0.50 mg/L
		Zinc	0.010 mg/L	0.50 mg/L
		Total Suspended Solids	2.0 mg/L	15.0 mg/L
		Radium-226[b]	0.01 Bq/L	0.37 Bq/L
		pH	-	-
Acute Toxicity	Monthly	Rainbow Trout – Pass/Fail	-	-
		Daphnia magna – Pass-Fail	-	-
Effluent Characterization	four-times per year	Aluminum	0.05 mg/L	-
		Cadmium	0.00001 mg/L	-
		Iron	0.1 mg/L	-
		Mercury[b]	0.001 mg/L	-
		Molybdenum	0.005 mg/L	-
		Ammonia	0.05 mg/L	-
		Nitrate	0.05 mg/L	-
		Hardness	1 mg/L	-
		Alkalinity	2 mg/L	-
		Specific Conductance	-	-
Effluent Sublethal Toxicity	two-times per year	Fathead minnow	-	-
		Ceriodaphnia	-	-
		Duckweed	-	-
		Green alga	-	-

[a] Method detection limits for deleterious substances stipulated under the MMER, whereas those for effluent characterization are recommended by Minnow to allow comparison to relevant guidelines (e.g., Canadian Water Quality Guidelines)

[b] Sampling frequency can be reduced once the mine can demonstrate radium-226 concentrations less than 0.037 Bq/L over 10 consecutive sampling events, and mercury concentrations less than 0.0001 mg/L over 12 consecutive sampling events.

Acute toxicity testing must be conducted monthly, during periods of effluent discharge, to assess the influence of mine effluent on rainbow trout and *Daphnia magna* based on 'Pass/Fail' endpoints. Should samples be shown to be acutely lethal (i.e., ≥50% mortality), sampling frequency must be increased.

Effluent volume must be monitored in cubic meters (m^3), and reported in m^3/day, m^3/month and m^3/year, as appropriate. The effluent volume data will be used to calculate monthly loadings for each of the deleterious substances.

Effluent characterization must be conducted four times each calendar year, not less than one month (30 days) apart, while the mine is depositing effluent. In the event that effluent is discharged for only short periods each calendar year, the monitoring frequency will be reduced. It is recommended that effluent characterization be conducted at the same time as monitoring for deleterious substances and, if possible, receiving environment water quality monitoring. The list of substances required for effluent characterization is included in Table 1.

Effluent sublethal toxicity sampling must initially be conducted two-times annually using the effluent that contributes the greatest loadings of deleterious substances to the receiving environment. For each sampling event, sublethal toxicity tests must be conducted using fathead minnow (*Pimephales promelas*; 7-day survival and growth test), a cladoceran invertebrate (*Ceriodaphnia dubia*; 7-day survival and reproduction test), duckweed (*Lemna minor*; 7-day growth inhibition test), and a green alga (*Psuedokirchneriella subcapitata*; 3-day growth inhibition test) using standard test methods (Environment Canada 2007a,b,c, 2011).

Receiving environment water quality monitoring must be conducted four times each calendar year, not less than one month (30 days) apart, while the mine is depositing effluent. At a minimum, the sampling areas for receiving environment water quality monitoring at the Mary River Project must include an effluent-exposed station situated downstream of the effluent discharge(s) and a reference station located upstream of any mine effluent-related influences. Monitoring requirements for the receiving environment monitoring include field measurements of water temperature, dissolved oxygen, pH and specific conductance, as well as sampling for the substances required for deleterious substance and effluent characterization monitoring (see Table 1).

In terms of initiation of effluent and receiving environment water quality sampling, the following schedule is indicated in the MMER:

Deleterious Substances:	Within one week of the mine becoming subject to MMER.
Effluent Acute Toxicity:	Within one month of the mine becoming subject to MMER.
Effluent Volume:	Within one week of the mine becoming subject to MMER.

Effluent Characterization:	Within six months of the mine becoming subject to MMER.
Effluent Sublethal Toxicity:	Within six months of the mine becoming subject to MMER.
Receiving Water Monitoring:	Within six months of the mine becoming subject to MMER.

For practicality, effluent volume should be monitored daily. In addition, given that effluent is likely to be discharged over a relatively short period of ice-free conditions from approximately June to September at the Mary River Project, the effluent characterization, effluent sublethal toxicity and receiving environment water quality monitoring must all be completed within six months of the Mary River Project becoming subject to the MMER. Thus, Baffinland must be prepared to organize and conduct this sampling in the summer 2015 open-water period.

Reporting Schedule and Content

Effluent monitoring reports are due to the Environment Canada Authorization Officer for all tests and monitoring conducted during each calendar quarter not later than 45 days after the end of the quarter, and annually not later than March 31st of the following calendar year. The quarterly reports will include all information related to effluent deleterious substances and pH (concentration and monthly mean concentration data), the number of days effluent was discharged and the volume of effluent discharged (monthly), mass loadings estimates from effluent for the deleterious substances, effluent acute toxicity data, effluent characterization data, effluent sublethal toxicity data and receiving environment water quality monitoring data. These reports will generally be provided electronically, with the analytical data also required to be entered into the Regulatory Information Submission System (RISS) database. A hypothetical schedule for sampling and reporting, based on an initial effluent discharge date of 30 June 2015, is provided as Table 2.

For the annual effluent and water quality monitoring report, key information that should be provided to the Authorization Officer includes:

a) The dates on which each sample was collected for effluent characterization, sublethal toxicity testing and water quality monitoring:

- four dates for effluent characterization (4 times per calendar year and not less than 1 month apart), while the mine is depositing effluent;
- four dates for water quality monitoring (4 times per calendar year and not less than 1 month apart), while the mine is depositing effluent;
- dates for sublethal toxicity testing (2 times each calendar year for 3 years and once each year after the third year, with the first testing to occur on an effluent sample collected not later than 6 months after the mine becomes subject to the MMER). The sublethal toxicity testing date(s) should match the date(s) for

Table 2: Example sampling and reporting schedule for Baffinland's Mary River Project under a hypothetical effluent discharge date of June 30, 2015.

Component		Sampling Initiation	Sampling Frequency (when discharging)	Year 1 Reporting Period				
				First Quarter Report	Second Quarter Report	Third Quarter Report	Fourth Quarter Report	Annual Report
				July, Aug, Sept 2015	Oct, Nov, Dec 2015	Jan, Feb, Mar 2016	Apr, May, Jun 2016	Jun 30 to Dec 31 2015
Effluent	Deleterious Substances and pH	July 1st - 8th, 2015	every week[a]	13 weeks of data; 3 monthly averages	13 weeks of data; 3 monthly averages	no effluent discharge likely (freeze-up)	no effluent discharge likely (freeze-up)	26 weeks of data; 6 monthly averages
	Acute Toxicity	July 1st - 8th, 2015	every month	3 sampling events	1 sampling event (assume Nov, Dec freeze up)	no effluent discharge likely (freeze-up)	no effluent discharge likely (freeze-up)	4 sampling events
	Effluent Volume (datalogger?)	July 1st - 8th, 2015	daily	continuous data 3 monthly averages	continuous data for Oct monthly averages	no effluent discharge likely (freeze-up)	no effluent discharge likely (freeze-up)	3 months of continuous data; 4 monthly averages
	Effluent Characterization Sampling	July 2015	four times annually[b]	3 sampling events[b]	1 sampling event (assume Nov, Dec freeze up)	no effluent discharge likely (freeze-up)	no effluent discharge likely (freeze-up)	4 sampling events[b]
	Sub-lethal toxicity	July 2015	twice annually[b]	2 sampling events	none required	no effluent discharge likely (freeze-up)	no effluent discharge likely (freeze-up)	2 sampling events
Receiving Environment	Downstream (effluent-exposed) Station	July 2015	four times annually[b]	3 sampling events[b]	1 sampling event (assume Nov, Dec freeze up)	no effluent discharge likely (freeze-up)	no effluent discharge likely (freeze-up)	4 sampling events[b]
	Upstream (reference) Station	July 2015	four times annually[b]	3 sampling events[b]	1 sampling event (assume Nov, Dec freeze up)	no effluent discharge likely (freeze-up)	no effluent discharge likely (freeze-up)	4 sampling events[b]
MMER Reporting	Reporting Date	-	-	due by Nov. 14, 2015	due by Feb. 14, 2016	due by May 15, 2016	due by July 15, 2016	due by Mar 31, 2016

[a] Weekly monitoring samples must be collected a minimum of 24 hours apart

[b] Sampling events must be spaced at least one month (30 days) apart from one another, and thus fewer than four sampling events may occur in instances in which effluent is discharged over short periods.

effluent characterization, as the sublethal toxicity sample must be an aliquot of the effluent characterization sample; and,

- if the required number of tests were not conducted, indicate the reason why (i.e., the number of days that the effluent was being discharged or the habitat conditions that prevented the collection of effluent characterization and/or water quality monitoring samples).

b) The locations of the final discharge points from which samples were collected for effluent characterization, noting that effluent characterization is conducted at all identified final discharge points (FDPs).

c) The location of the final discharge point from which samples were collected for sublethal toxicity testing and the data on which the selection of the final discharge point was based:

- Indicate from which FDP the effluent was collected for the sublethal toxicity testing and why that FDP was chosen for mines with more than one FDP (e.g., effluent that discharges into a sensitive receiving environment, has the greatest mass loading).

d) The latitude and longitude of sampling areas for receiving environment water quality monitoring, in degrees, minutes and seconds, and a description that is sufficient to identify the location of the sampling areas (possibly supplemented with maps).

e) The results of effluent characterization, sublethal toxicity testing and water quality monitoring:

- Include the results from all analyses completed on effluent (chemical and physical parameters), sublethal toxicity testing and receiving environment water quality monitoring.
- Include results from all required parameters, as well as any optional site-specific parameters that were measured.
- For sublethal toxicity testing, the laboratory reports should be included as an appendix in the annual report.

f) The methodologies used to conduct effluent characterization and water quality monitoring, and the related method detection limits:

- Some sampling methods are outlined in the Guidance Document for the Sampling and Analysis of Metal Mining Effluent: Final Report available at http://dsp-psd.pwgsc.gc.ca/Collection/En49-24-1-39E.pdf.

- Indicate the methodology used (e.g., inductively coupled plasma combined with mass spectrometry [ICP-MS], graphite furnace atomic absorption spectrometry [GFAAS]) for effluent characterization and water quality monitoring.
- Indicate the method detection limits for the methodology used—for MMER deleterious substances, the method detection limits identified in Table 1 should be met. Note that the Canadian Council of Ministers of the Environment's Canadian Environmental Quality Guidelines (e.g., Water Quality Guidelines for the Protection of Aquatic Life) or additional territorial/site-specific water quality guidelines should also be considered for comparisons of the receiving environment water quality monitoring.

g) A description of quality assurance and quality control measures that were implemented and the data related to the implementation of those measures:

Conclusions

I trust the information provided in this memorandum provides you with sufficient overview of the MMER sampling and reporting that Baffinland will be required to fulfil to meet its MMER obligations. Once organized, Minnow would be happy to review your monitoring schedules to verify that MMER compliance will be met. Should you require further details or wish to discuss any aspect of this information, please do not hesitate to contact me at your convenience.

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References

Environment Canada. 2007a. Biological Test Method: Test of Reproduction and Survival Using the Cladoceran *Ceriodaphnia dubia*. Environmental Technology Centre, Ottawa, Ontario. Environmental Protection Series. Report EPS 1/RM/21. Second Edition. February 2007.

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Environment Canada. 2007c. Biological Test Method: Test for Measuring the Inhibition of Growth Using the Freshwater Macrophyte *Lemna minor*. Environmental Technology Centre, Ottawa, Ontario. Environmental Protection Series. Report 1/RM/37. Second Edition. January 2007.

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APPENDIX E

MS-08 SUPPLEMENTAL SUMMARY

November 21, 2017

Curtis Didham
Enforcement Officer
Environment and Climate Change Canada
933 Mivvik Street
Iqaluit, Nunavut
X0A 0H0

Dear Mr. Didham,

Re: Investigation under subsection 36(3) of the Fisheries Act in regards to an effluent seepage and controlled discharges from the Waste Rock Stockpile Sedimentation Pond (WRSSP) located at Baffinland's Mary River Project (the Project).

Please find below a summary response prepared by Baffinland Iron Mines Corporation (Baffinland) in response to the investigation under the Fisheries Act and Metal Mining Effluent Regulations (MMER) initiated by Environment and Climate Change Canada (ECCC) on September 13, 2017.

Project Development

Baffinland proposed to develop the Project in a phased approach, and began construction for the Early Revenue Phase (ERP) in 2013, followed by the initial mining of Deposit 1 in September 2014. Prior to the development of Deposit 1, Baffinland had retained AMEC in 2012 to conduct water quality modelling of runoff and seepage originating from the Deposit 1 waste rock stockpile. The report concluded that, with the exception of total suspended solids (TSS), the water quality of runoff and seepage would meet the MMER discharge requirements. To address the estimated solids loading from the runoff and seepage and facilitate the monitoring of discharges, sedimentation ponds downstream of the waste rock stockpile(s) were proposed. In 2014, Baffinland retained AMEC to investigate the metal leaching and acid rock drainage (ML/ARD) potential of waste rock generated from ERP operations on Deposit 1. Results from AMEC's investigation were presented in a technical memo titled "Mary River Deposit 1, 5-Year Pit ML/ARD Characterization". AMEC had determined that approximately 85% of waste rock samples had neutralization potential ratios (NPR) greater than 2 pH and were classified as non-potentially acid generating and were unlikely to generate acidic drainage. Approximately 10% of the samples had NPR values of less than 1 pH, and 5% of the samples were classified as having uncertain acid generating potential (1<NPR<2). Humidity cell testing for historical samples of the Waste Rock Stockpile has stayed relatively consistent previous to 2017, indicating stable conditions in the majority of cells

Construction of the current WRSSP commenced in September 2015 and became operational in May 2016. A Construction Summary Report (CSR) produced by Hatch Ltd. (Hatch) for the current sedimentation pond, which was included in the 2016 Qikiqtani Inuit Association (QIA) and Nunavut Water Board (NWB) Annual

Report for Operations, was signed off by Baffinland in January 2017 and provided to regulators and stakeholders on March 31, 2017.

Under Part D, Item 18, of Baffinland's Type "A" Water License 2AMMRY1325 Amendment No. 1 (Water License), two annual geotechnical inspections are performed on water and waste retention structures. Barry H. Martin Consulting Engineer and Architect conducted two inspections in 2017. The Aug 1-10th bi-annual inspection did not identify integrity or containment issues concerning the WRSSP. Additionally, inspections of the facility from ECCC and Indigenous and Northern Affairs Canada (INAC) in 2016 and spring/early summer 2017 also did not identify seepage from the WRSSP or identify water quality concerns associated with the system. Internal compliance inspections are completed bi-monthly during the open water season on this facility and daily monitoring is completed during discharge which focuses on monitoring water quality in accordance with Baffinland's Water License and Schedule 4 of the MMER, as well as overall WRSSP conditions and operations. There were no issues of compliance with water quality limits in 2016 or in the first half of 2017.

The following summarizes the four incidents that occurred in August and September and remediation measures undertaken.

Spill Report 17-289

A heavy rain event was experienced over a period of several days in late July increasing the runoff into the pond and led to the requirement to de-water and maintain suitable pond freeboard. The pH results leading up to August 1st, which were measured by both YSI meter field readings and the ALS laboratory analyses, were consistently greater than 6.40. In early August low pH water was discharged to the environment on August 1st and 3rd. On August 1st, water chemistry and toxicity testing occurred. Results received indicated the pH of the water was below 6.0 which resulted in a toxicity failure for both Daphnia Magna and Rainbow Trout. No discharge to the environment occurred after receiving official ALS laboratory results.

August 10th - 24th:

- pH adjustment treatment of the WRSSP was planned with Wood Group PLC (formally AMEC Foster Wheeler) to determine the most effective treatment of the WRSSP with resources on site. On August 22-24th, batch treatment of the WRSSP was completed using sodium carbonate to effectively raise the pH from approximately 4 to 7.
- Golder Associates Ltd. (Golder) was consulted to commence work on increasing the storage capacity of the WRSSP.

Spill Report 17-312

On August 23, 2017 during an inspection of the WRSSP with ECCC and INAC, seepage was observed originating from the central toe of the WRSSP in approximately four discrete but closely clustered locations. Water quality samples were taken from the seepages occurring at the toe of the WRSSP in concert with ECCC and INAC on August 23rd and 24th during their on-site inspection and external analytical results indicated that, aside from nickel and TSS, water quality was compliant under the MMER and Water License.

August 25th:

- Construction of an emergency containment ditch downstream of the seepage.

September 1st:

- Hatch was consulted to explore options to stop the seepage from the toe of the WRSSP and identify potential remedial activities to the facility.
- Hatch recommended the placement of a till blanket upstream of the WRSSP liner key-in to allow for proper re-grading in an effort to reduce pooling on the inlet, as well as constructing two sumps to tie into the emergency containment ditch downstream of the WRSSP seepage.

September 2nd:

- Baffinland submitted a notification to regulators detailing the plan to mitigate the ongoing seepage at the WRSSP.

September 7th - 17th

- Construction of the till blanket and sumps were completed to the design specifications provided by Hatch from September 7th to 17th.

On September 26th, during an inspection of the WRSSP and down gradient seepage area, discoloured water was observed outside of the emergency containment ditch under ice and snow. Water quality sampling was conducted, which included acute toxicity testing. Analytical results showed nickel and TSS above applicable guidelines, though the acute toxicity test passed.

October 4th - 24th:

- Golder and Le Groupe Desfor (LGD) consulted to assess the situation and provide expert advice on locating the source and identifying potential remedial solutions.
- LGD Director of Civil Works concluded that the origin of the seepage could not be determined at that time under the existing conditions.
- Principal Geochemist from Golder conducted a detailed hydrological assessment and concluded that the pond design appears appropriate for its intended use.

October 19th:

- Story Environmental was contacted to provide recommendations for the utilization and implementation of using rhodamine dye to determine whether the WRSSP was the potential source of the seepage.
- Monitoring of the seepage for the presence of rhodamine occurred using a YSI meter with a rhodamine sensor. Rhodamine was detected in seepage grab samples indicating that the WRSSP liner's integrity may have been compromised. Current conditions limit the ability to confirm this to be true and further investigations into the matter are required when conditions allow.

October 21st – November 06:

- Construction of a new berm was completed around the outside perimeter of the emergency containment ditch to increase the ditch's containment capacity.
- Water was pumped from the containment ditch back to the WRSSP in order to effectively place ¾ inch rock at the base of the ditch to arrest further seepage.

Baffinland

Spill Report 17-328 and 17-361

On August 27th, visual observations of the turbidity of the WRSSP prompted the discharge to be shut down. Samples later confirmed that the TSS exceeded the Water License and MMER guidelines for an approximate 14-hour period. Discharge resumed again on August 28th after the pond had settled and TSS criteria was found to be below guidelines.

August 24th – 28th

- An Environment Effects Monitoring (EEM) study was performed by Minnow Environmental (Minnow). No exceedances were observed or recorded under applicable guidelines in discharge exposed Tributary F or Mary River except for aluminum. The aluminum is not exposure-related as aluminum was found to be present in the reference sites and is related to known historical turbidity-related colloidal effects in Mary River. The discharge from the WRSSP travels approximately 2.2 km from the Final Discharge Point (FDP) to where Tributary F becomes a defined channel which is non-fish bearing. The confluence with Mary River is located approximately 3 kilometers in distance from that location.

Discharging to the environment continued from August 30th to September 6th and water samples analyzed using the on-site ALS laboratory equipment run by Baffinland personnel were found to be compliant up to September 6th under the MMER and Water License discharge criteria for pH. In addition to the on-site laboratory results, samples were also shipped offsite to ALS Waterloo. The pH results received from the ALS laboratory in Waterloo from September 1st to 6th were below the MMER and Water License criteria. In consultation with the ALS Environmental Technical Director, it was determined that the initial pH measurements from the on-site laboratory taken by Baffinland Staff (within one to four hours of sampling) should be the most reliable and defensible pH measurements representing the conditions of the samples at time of sampling, rather than test results measured by ALS Waterloo which represent the pH of the sample after several days of potential acid rock drainage related redox reactions. The discharge to the environment was stopped on September 6th.

September 1st:

- Aquatic Effects Monitoring Plan (AEMP) data for stations at the confluence of the tributary, (Tributary F) that receives WRSSP effluent and the nearest fish bearing waters, were examined and did not show readily detectable influence from the discharge, exhibiting pH of approximately 8.

Additional Mitigation Measures

Additional mitigation measures were taken to address deficiencies identified with internal environmental systems, protocols and procedures:

- An Emergency Response Plan has been revised for the WRSSP in accordance with MMER requirements outlined in Section 30.
- A Working Near Water Containment Facilities Procedure has been drafted to provide a set of operational standards to ensure work is conducted in a safe and environmentally-compliant manner.

- The Site Environment team reporting structure was changed to include a Site Environmental Manager that will provide leadership and oversight to all site activities.

Additional mitigation measures that are in progress or planned are:

- Initiate a geochemical review of the waste rock dump layout and materials to develop a better understanding of low pH conditions observed on site and, if necessary, develop supplemental mitigation measures to reduce or eliminate production of acidic water from entering the WRSP.
- Review on-site equipment and consider whether additional equipment could more efficiently treat and discharge water from the WRSSP.
- Revise Waste Rock Management Plan to incorporate discharge and ARD mitigation measures
- Resource additional certified ALS Technician(s) and testing equipment during the summer season
- Evaluate and source appropriate coagulants if treatment required.
- Long Term - Design and implement fit for purpose AMD containment and treatment technology for prevention, source control and remediation.

Overall no impacts were observed in the receiving water bodies as shown through Baffinland's EEM and AEMP studies. Engineered mitigation measures to address water quality, seepage and pond capacity issues are currently being reviewed. Through the rhodamine testing early indications are that the source of the seepage is related to the integrity of the WRSSP liner, although further investigations are required to confirm these findings and upon confirmation we will immediately act upon.

Regards,

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APPENDIX F

MMER EMERGENCY RESPONSE PLAN

Baffinland Iron Mines Corporation

METAL MINING EFFLUENT REGULATIONS EMERGENCY RESPONSE PLAN

BAF-PH1-830-P16-0047 r0

Rev 1

Prepared By: Ben Widdowson
Department: Environment
Title: Environmental Coordinator
Date: October 28, 2017

Signature: Benjamin Widdowson

Approved By: Gerald Rogers
Department: Operations
Title: General Manager
Date: January 30, 2017

Signature:

DOCUMENT REVISION RECORD

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TABLE OF CONTENTS

1 PURPOSE 5

2 SCOPE 5

2.1 CROSS-REFERENCE OF MMER REGULATIONS, 30 (1) TO 30(2), TO THIS EMERGENCY PLAN 8

3 RESPONSIBILITIES 9

3.1 GENERAL MANAGER 9

3.2 MINE OPERATIONS 9

3.2.1 MINE OPERATIONS MANAGER 9

3.2.1.1 MINE OPERATIONS SUPERVISOR 9

3.2.1.2 MINE OPERATIONS OPERATORS 9

3.3 CRUSHER OPERATIONS 10

3.3.1 CRUSHER OPERATIONS MANAGER 10

3.3.1.1 CRUSHER OPERATIONS SUPERVISOR 10

3.3.1.2 CRUSHER OPERATIONS OPERATORS 10

3.4 ENVIRONMENT 10

4 DEFINITIONS 11

4.1 SPILL 11

4.2 SPILL PREVENTION 11

5 LEVELS OF EMERGENCY SPILL RESPONSE 12

6 PROTOCOL 13

6.1 EMERGENCY SPILL RESPONSE PROCEDURES 13

6.1.1 SPILLS ON LAND 13

6.1.2 BERM INTEGRITY FAILURE 13

6.1.3 EMERGENCY SPILLWAY 13

6.1.4 SEEPAGE 14

6.1.5 SPILLS INTO CONTAINMENT FACILITY 14

6.2 ENSURING NO ACCIDENTAL DISCHARGE OF NON-COMPLIANT WATER 16

6.2.1 PROCEDURE FOR DISCHARGING CONTAINMENT PONDS 16

6.2.2 ENSURING NO DISCHARGE OF NON-COMPLIANT WATER 16

6.3 TRAINING FOR SPILL RESPONSE 18
6.3.1 DRILLS AND EXERCISES 18
6.3.1.1 TABLE TOP EXERCISES 18
6.3.1.2 FUNCTIONAL DRILLS 18
6.3.1.3 FULL-SCALE EXERCISES 19

7 REFERENCES AND RECORDS 20

APPENDICIES ....
APPENDIX A ....
SITE LAYOUTS AND WATER LICENCE/MMER MONITORING LOCATIONS ....
APPENDIX B ....
MINE SITE DRAINAGE PLAN ....
APPENDIX C ....
METAL MINING EFFLUENT REGULATIONS ....
APPENDIX D ....
EMERGENCY RESPONSE TRUCK INVENTORY ....
APPENDIX E ....
MINE SITE SPILL KIT INVENTORY AND LOCATIONS ....
APPENDIX F ....
NT-NU SPILL REPORT FORM ....

LIST OF TABLES

TABLE 2-1 MMER NOTIFICATION OF A RELEASE LIST 6
TABLE 5-1 MMER EMERGENCY CONTACTS IN CASE OF SPILLS FROM CONTAINMENT BERMS 15
TABLE 5-3 - BIM STANDARDS FOR EFFLUENT QUALITY DISCHARGE LIMITS FOR MS-06 AND MS-08 17

LIST OF FIGURES

FIGURE 5-1 EMERGENCY SPILL RESPONSE LEVELS 12

1 PURPOSE

In accordance with the Metal Mining Effluent Regulations (MMER), Baffinland Iron Mines Corporation (Baffinland) has prepared an Emergency Response Plan in accordance with Part 3 Section 30.

Revisions to this plan shall be completed based on future modifications to the work scope, emergency and spill response procedures, and the associated approvals. Updates to this Plan shall be completed in accordance with: the terms and conditions of Metal Mining Effluent Regulations, Baffinland's water licenses, QIA Commercial Lease (Q13C301; issued September 6, 2013), the amended Project Certificate No. 005 [issued May 28, 2014 by the Nunavut Impact Review Board (NIRB)] and any subsequent requirements that may be issued.

The Waste Rock Stockpile is located approximately one kilometre east of the Deposit 1 mine (Appendix A), and is the storage location for the mine area's waste rock, overburden, and non-commercially relevant grade ore. Runoff from the Waste Rock Stockpile is collected downstream in the Waste Rock Stockpile Pond (WRSP).

The Crusher Ore Stockpile is located approximately four kilometres from the Waste Rock Stockpile. The Crusher Ore Stockpile Pond (CSP), which collects runoff from the area associated with Crusher Ore Stockpile, is located east of the Crusher Ore Stockpile. Both the WRSP and CSP are subject to Metal Mining Effluent Regulations (MMER; Appendix C).

2 SCOPE

Baffinland's Emergency Response Plan (BAF-PH10840-P16-0002 r2) identifies potential environmental, health, and safety emergencies that could arise during the construction and operation phases of the Mary River Project. The ERP establishes the framework for responding to these situations, and applies to all facets of the Mary River Project. It defines requisite organizational roles and responsibilities for project personnel, internal and external contact information, training, resources, and reporting requirements. All Baffinland employees and project contractors are required to comply with the ERP.

This emergency spill response plan provides a guide for preventing and controlling the release of water outside of the normal course of events for the WRSP and CSP operations. This Plan has been prepared in accordance with MMER (Fisheries Act. 2002-2017), and is to be used in conjunction with Baffinland's Emergency Response Plan (BAF-PH1-830-P16-0007) and the Spill Contingency Plan (BAF-PH1-830-P16-0036).

In the event of a spill from the WRSP or CSP, this Plan is to be used in conjunction with Baffinland's Emergency Response Plan and Spill Contingency Plan. Copies of this Plan can be obtained from:

Baffinland Iron Mines Corporation
2275 Upper Middle Road East, Suite 300
Oakville, ON L6H 0C3
Tel: (416) 364-8820
Fax: (416) 364-0193

TABLE 2-1 MMER NOTIFICATION OF A RELEASE LIST

Department of Environment - Environmental Protection Division PO Box 1000 Station 200 Iqaluit, Nunavut X0A 0H0 Tel : (877) 212-6638, (867) 975-6000 Fax : (867) 975-6099	**Environment Climate Change Canada** Enforcement Officer 933 Mivvik Street, Suite 301-Qiliaut Building P.O. Box 1870 Iqaluit, Nunavut X0A 0H0 Tel:(867)-975-4644 Cell: (867)-222-1925 Fax: (867)-975-4594
Qikiqtani Inuit Association Igluvut Building, 2nd Floor PO Box 1340 Iqaluit, Nunavut X0A 0H0 Tel : (867) 975-8400, 1-800-667-2742 Fax : (867) 979-3238	**Indigenous and Northern Affairs Canada** Field Operations Division PO Box 2200 Iqaluit, Nunavut X0A 0H0 Tel : (867) 975-4295 (Field Operations Manager) Cell: (867) 222-8458 Fax : (867) 975-6445
Indigenous and Northern Affairs Canada – Water Resources Division Building 918, PO BOX 100 Iqaluit, Nunavut X0A 0H0 Tel : (867) 975-4517 (Water Resources Manager) Fax (867) 975-4560	**Mittimatalik Hunters and Trappers Organization** PO Box 189 Pond Inlet, Nunavut X0A 0S0 Tel : (867) 899-8856 Fax : (867) 899-8095
Nunavut Impact Review Board 29 Mitik Street PO Box 1360 Cambridge Bay, Nunavut X0B 0C0 Tel : 1-866-233-3033 Fax : (867) 983-2594, (867) 983-2574	**Nunavut Water Board** PO Box 119 Gjoa Haven, Nunavut X0B 1J) Tel : (867) 360-6338 Fax : (867) 360-6369
Hamlet of Pond Inlet PO Box 180 Pond Inlet, Nunavut X0A 0S0 Tel : (867) 899-8934, (867) 899-8935 Fax : (867) 899-8940	**Department of Fisheries and Oceans** Central and Arctic Region 520 Exmouth Street Sarnia, Ontario N7T 8B1 Tel : (519) 383-1813, 1-866-290-3731 Fax : (519) 464-5128

Baffinland requires all site personnel to be trained on the specific spill response initiation and reporting procedures. . Reference Table 5.1: Internal Contacts in the Emergency Response Plan (BAF-PH1-840-P16-0002) for key internal contact information if a spill is discovered. All site personnel must comply with the following procedure upon initiation of a spill response involving a regulated substance:

1. Immediately warn other personnel working near the spill area.
2. Evacuate the area if the health and safety of personnel is threatened.
3. In the absence of danger, and before the spill response team arrives at the scene, take any safe and reasonable measure to stop, contain, and identify the nature of the spill.
4. Notify the Environmental and Health and Safety department and department who owns the facility, who will initiate further spill response operations.

Upon initiation of spill response, as directed by the Head of Health Safety and Environment or designate, the following procedure shall be completed by the spill response team:

Source Control – If safe to do so, reduce or stop the flow of product. This may be accomplished with simple actions such as: turning off a pump; closing a valve; sealing a punctured liner with readily available materials; raising a leaking or discharging hose to stop flow; or transferring product from a leaking container (if required activate Baffinland's Emergency Response Plan).

Contain and Control the Free Product – If safe to do so, prevent or minimize the spread of the spilled product. Accumulate/concentrate spilled product in an area to facilitate recovery. Barriers positioned down-gradient of the spill will slow or stop flow of liquid. Barriers can consist of absorbent booms and pads, dykes, berms, fences, and/or trenches (dug in the ground or in snow/ice).

Protection – Evaluate the risk of the impacted area to the surrounding environment. Protect sensitive ecosystems and/or natural resources that are at risk by isolating the area and/or diverting the spilled material to a less sensitive area. Protection/isolation may be achieved through the use of the above mentioned barriers.

Spill Clean-up – Recover and contain as much product as possible.

Report the Spill – Record information about the spill such as: date and time of occurrence; location and approximate size; type and amount of discharge product; photographic records; actions already taken to stop and contain the spill; ambient conditions; and any perceived threat to humans or the environment. Reports shall be completed as per Baffinland's Incident Investigation Form (BAF-PH1-810-FOR-0005).

2.1 CROSS-REFERENCE OF MMER REGULATIONS, 30 (1) TO 30(2), TO THIS EMERGENCY PLAN

MMER Reference	Description	Emergency Response Plan Reference
30(1)	The owner or operator of a mine shall prepare an emergency response plan that describes the measures to be taken in respect of a deleterious substance within the meaning of subsection 34(1) of the Act to prevent any deposit out of the normal course of events of such a substance or to mitigate the effects of such a deposit.	Entirety of Document
30 (2)(a)	The identification of any deposit out of the normal course of events that can reasonably be expected to occur at the mine and that can reasonably be expected to result in damage or danger to fish habitat or fish or the use by man of fish, and the identification of the damage or danger;	Pages 12 to 16
30 (2)(b)	a description of the measures to be used to prevent, prepare for and respond to a deposit identified under paragraph (a);	Pages 12 to 17
30 (2)(c)	a list of the individuals who are to implement the plan in the event of a deposit out of the normal course of events, and a description of their roles and responsibilities;	Pages 9 to 10
30 (2)(d)	the identification of the emergency response training required for each of the individuals listed under paragraph (c);	Pages 17 to 20
30 (2)(e)	a list of the emergency response equipment included as part of the plan, and the equipment's location; and	Appendix D
30 (2)(f)	alerting and notification procedures including the measures to be taken to notify members of the public who may be adversely affected by a deposit identified under paragraph (a).	Table 2-1

3 RESPONSIBILITIES

In the event of a major spill associated with the WRSP or CSP it will be necessary for multiple departments to work in conjunction with each other. The following outlines the specific responsibilities of those departments.

3.1 GENERAL MANAGER

The General Manager (GM) is responsible for ensuring that each departmental Manager/Superintendent understands the contents of the plan and follows its requirements. The GM is responsible for ensuring that departments contact the appropriate external authorities as per this plan and the Baffinland Emergency Response Plan (BAF-PH1-840-P16-0002).

3.2 MINE OPERATIONS

3.2.1 MINE OPERATIONS MANAGER

The Mine Operations Manager or designate is responsible for implementing the Plan within their department and area of operation. He/she must ensure that their personnel understand the contents of this Plan and follow its requirements. He/she is responsible for implementing an inspection program to ensure that the Plan is being fully implemented and to apply corrective actions in the event of identified non-compliances, non-conformances, and/or issues of concern.

3.2.1.1 MINE OPERATIONS SUPERVISOR

The Mine Operations Supervisor is responsible for the following:

- The safety and health of all persons while managing and directing activities associated with the working around the WRSP.
- Ensuring all workers and operators are trained and understand this Plan.
- Assist in approved discharging activities.
- Inspections of the Waste Rock Stockpile area and WRSP for movement, settlement, or liner damage.
- Inspection of the drainage ditches.

3.2.1.2 MINE OPERATIONS OPERATORS

The Mine Operations operators have the following responsibilities:

- Report all spills to his/her supervisor.
- Understand and follow detailed instructions when assisting with discharging and working around the WRSP.
- Ensuring the WRSP access road is kept clear of snow during winter months.

3.3 CRUSHER OPERATIONS

3.3.1 CRUSHER OPERATIONS MANAGER

The Crusher Operations Manager or designate is responsible for implementing the Plan within their department and area of operation. He/she must ensure that their personnel understand the contents of the plan and follow its requirements. He/she is responsible for implementing an inspection program to ensure that the Plan is being fully implemented and to apply corrective actions in the event of identified non-compliances, non-conformances, and/or issues of concern.

3.3.1.1 CRUSHER OPERATIONS SUPERVISOR

The crusher operator Supervisor is responsible for the following:

- The safety and health of all persons while managing and directing activities associated with the working around the CSP.
- Ensuring all workers and operators are trained and understand this plan.
- Assist in approved discharging activities.
- Inspections of the Crusher Ore Stockpile area and CSP for movement, settlement, or liner damage.

3.3.1.2 CRUSHER OPERATIONS OPERATORS

The crusher operators have the following responsibilities:

- Report all spills to his/her supervisor.
- Understand and follow detailed instructions when assisting with discharging and working around the CSP.
- Ensuring the CSP access road is kept clear of snow during winter months.

3.4 ENVIRONMENT

The Environmental Department will be responsible for:

- Reviewing and understanding all the applicable plans and procedures.
- Inspections of the CSP, WRSP, and surrounding tundra, for signs of seepage, movement, settlement, or damage to the liner.
- Monitoring and sampling of Final Discharge Point (FDP) during discharge of CSP and WRSP.
- All required reporting to regulators regarding WRSP and CSP water quality, discharging, and spills (MMER, 2017).
- Respond to spills that are associated with the CSP and WRSP in conjunction with the Mine Rescue Team and the owner of the facility.

- Advise on how best to evaluate, contain and remediate and/or recover a spill if one should occur associated with the CSP and WRSP.

4 DEFINITIONS

4.1 SPILL

A spill is defined as the uncontrolled release of a deleterious substance from its containment into a receiving environment. A deleterious substance is defined as any acutely lethal effluent or any substance that does not meet the criteria in Table 5-3. Under MMER (2017), Section 34(1) describes the discharge limits for substance that must be prevented from depositing in the receiving environment. Such releases are potentially hazardous to humans, vegetation, water resources, and aquatic and terrestrial wildlife, both directly and through food web interaction. The severity of impact varies depending on several factors, including: the type and quantity of spilled material; the location of the spill; and the time of year. MMER discharge limits are used as the standards for risk potential of WRSP and CSP releases to the environment. As a result, additional levels of spill response have been developed for spills that exceed these limits. Other products with the potential for release include hydrocarbon fuels, anti-freeze, or lubricants from machinery.

4.2 SPILL PREVENTION

Spill prevention is an effective means of maintaining the safety of site personnel and the environment. Spills are less likely to occur when adhering to the criteria listed below. Inspections of the WRSP, and CSP are conducted by the Mine Operations, Crusher Operations, and the Environmental Department, when it is safe to do so. The conditions of the surrounding environment and current understood risk will determine the frequency of inspections, such as: freshet melt; heavy rain events; increasing reservoir levels (with limited freeboard space); and/or changing water quality conditions

5 LEVELS OF EMERGENCY SPILL RESPONSE

To effectively manage emergency responses, Baffinland has adopted a tiered emergency classification scheme. Each level of emergency, based on its severity, require varying degrees of response, effort, and support. Each level has distinct effects on normal business operations, as well requirements for investigation and reporting. The ERP details each level of emergency; levels of classification specific to spill response are as follows:

Level 1 (Low) – Minor accidental release of a deleterious substance with:

- No threat to public safety; and/or
- Negligible environmental impact to receiving environment.

Level 2 (Medium) – Major accidental release of a deleterious substance with:

- Some threat to public safety; and/or
- Potential Moderate environmental impact to receiving environment

Level 3 (High) – Uncontrolled hazard which:

- Jeopardizes project personnel safety: and/or
- Potential significant environmental impacts to receiving environment

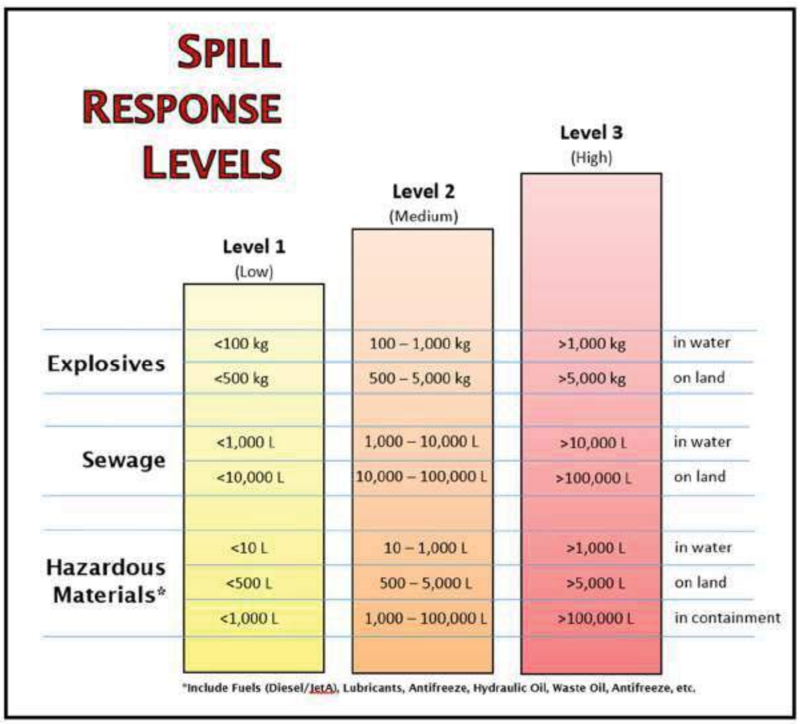


FIGURE 5-1 EMERGENCY SPILL RESPONSE LEVELS

6 PROTOCOL

6.1 EMERGENCY SPILL RESPONSE PROCEDURES

6.1.1 SPILLS ON LAND

Response to spills on land will be conducted in accordance with the procedures detailed in the Emergency Response Plan. During freshet and/or in the event of higher than usual rainfall the risk of a overflow of the emergency spillway is increased. In this event, the integrity of the pond and liner must be monitored more vigilantly, at a frequency determined by the Head of Health Safety and Environment. If the integrity of the dams are compromised the area must be evacuated by all personnel, until a plan is formulated and directive to re-enter the area is provided by the supervisors.

The main control techniques for spills on land are the use of barriers such as dykes, trenches, and booms, and fences. Such barriers slow the progression of the spill and also serve as containment to facilitate spill recovery. They should be placed down gradient from the source of the spill, and as close as possible to the source. Depending on the volume spilled, the site of the spill, as well as available material, a dyke may be built with soil, booms, lumber, snow, etc. Construct dykes in such a way as to accumulate a thick layer of free product in a single area (V shaped or U-shaped). Trenches are useful in the presence of permeable soil and when the spilled product is potentially migrating below the ground surface to facilitate spill recovery and/ or containment.

6.1.2 BERM INTEGRITY FAILURE

Runoff collected in the WRSP/CSP can be released into the receiving environment if the integrity of the pond's berm structure(s) is compromised. Factors that can compromise berm integrity include: construction activities; rainfall; berm design; frost heaving; and poor management. If signs of berm failure are noticed during an inspection, both Operations and Environment and Health and Safety must be contacted immediately.

In the event of failure of a WRSP/CSP berm, a Code 1 should be called immediately dependent upon extent. The Mine Rescue Team will deploy the emergency spill truck and personnel to help set up pumps, manage water, and help stop/prevent further uncontrolled release of water into the receiving environment. Operations will provide personnel and equipment necessary to seal or hold the breach. Departmental Managers and Superintendents of Operations and Environment will provide direction following such an occurrence.

6.1.3 EMERGENCY SPILLWAY

In the event that runoff inflows to the WRSP and CSP exceed the rate that can be intentionally discharged, for a prolonged period of time, pond water levels may reach an elevation that results in water being released to the receiving environment via the pond's engineered emergency spillway. In such event, the first mitigation measure that will be implemented to prevent such occurrence will involve performing an emergency controlled discharge. The plan to conduct an emergency controlled discharge will be formulated by the Operations and Environmental Managers/Superintendents. If the controlled emergency discharge does not lower the level of water contained in the pond(s), the emergency spillway will be used, as designed, to release volumes of water that exceeds the capacity of the pond and prevent the failure of the pond's berm structures. In such an occurrence, close monitoring of the pond and spillway is required to assess any erosional degradation of the pond and surrounding tundra. Monitoring to be conducted in the event that the emergency spillway is used will include inspecting pond infrastructure and adjacent tundra area for cracks, slumping, movement and/or sinkholes. As the level of control is significantly less utilising the emergency spillway, a controlled emergency discharge is the first and preferred measure to be undertaken. If signs of instability or erosional degradation are noticed during a spillway discharge, the Mine Operations, Crushing and Environmental Superintendents should be notified immediately.

In the event of a controlled emergency or spillway discharge, a full suite sample set (BIM-MMER-WT) and acute toxicity sample will be collected to determine the quality of the water being discharged to the receiving environment. Volumes of water released during such an event will be measured using a flowmeter or suitable estimation method (i.e. flowrate extrapolation) and recorded.

6.1.4 SEEPAGE

The potential exists that excessive precipitation and runoff at Waste Rock Stockpile or Crusher Ore Stockpile areas could saturate the underlying substrate and result in the release of seepage outside of the containment areas via active-layer groundwater flow. Close monitoring of the areas surrounding the Waste Rock Stockpile and Crusher Ore Stockpile will be conducted weekly during the open water season. Inspections will look to identify newly formed wet areas, flowing water, and/or areas of pooling. If suspected seepage is observed, the Operations and Environmental Superintendents will be notified immediately. If seepage is confirmed, all reasonable and safe emergency containment methods must be implemented to capture the seepage and/or minimize the extent of seepage migration. For example, an emergency containment ditch and sumps may be utilized to capture observed seepage.

6.1.5 SPILLS INTO CONTAINMENT FACILITY

If hazardous materials (i.e. hydrocarbons, etc.) are released into the WRSP or CSP, spill response should be initiated as outlined in Section 2 of this Plan. To determine the best method for spill cleanup/recovery, the Environmental Superintendent or his/her designate should be consulted. Responses to a spill in a pond can include various containment and recovery techniques, including skimming and booming, in concert with water treatment. Mechanical recovery equipment (i.e., skimmers and oil/water separators) will be utilized, as required.

TABLE 6-1 MMER EMERGENCY CONTACTS IN CASE OF SPILLS FROM CONTAINMENT BERMS

Name	Location	Phone Number	Purpose
Environmental Superintendent and Head of Health, Safety and Environment	Mary River Mine site	416-364-8820 x6016	All spills, leaks and releases of hazardous materials will be reported to the Environment Department immediately and documented by submitting the necessary documentation within 4 hours of the spill.
Environment Climate Change Canada	933 Mivvik Street, Suite 301-Qiliaut Building P.O. Box 1870 Iqaluit, Nunavut X0A 0H0	Tel: (867)-975-4644 Cell: (867)-222-1925 Fax: (867)-975-4594	Any release of a deleterious substance or acute toxicity failure will trigger notification.
Indigenous and Northern Affairs Canada	Resource Management Officer, P.O. Box 100, Iqaluit, NU X0A 0H0	1-867-975-4550	Spills greater than 100 liters require notification to the regulators within 24 hours of the spill.
NT-NU 24-hr Spill Report Line	Iqaluit, NU	1-867-920-8130	Spills greater than 100 liters or deposit of a deleterious substance as outlined in MMER Section 34 require notification to the spill line and documentation submitted within 24 hours of the spill.

6.2 ENSURING NO ACCIDENTAL DISCHARGE OF NON-COMPLIANT WATER

6.2.1 PROCEDURE FOR DISCHARGING CONTAINMENT PONDS

All personnel must adhere to the following procedure when planning to discharge a containment pond. If personnel are unsure of a task at any time, the work must cease, and the worker must contact their supervisor.

1. Obtain pre-discharge samples from pond if discharge is not immediately required to avoid overtopping.
2. If pre-discharge sample results are compliant, notify regulators of planned discharge.
3. Obtain approval from an Environmental Superintendent or Manager to begin discharging.
4. Prior to pumping, record totalizer values on the flow meter, as well as the time of pump start-up, in the appropriate log book.

Note: Baffinland is required to report the total volume of effluent discharged monthly from containment ponds as per the Water License and MMER.

5. Effluent sampling frequency must adhere to MMER and Water Licence Criteria utilizing accredited laboratory analysis, with accompanying field parameters, while discharging.
    a. If regulated under the MMER, samples must be taken from the FDP.
6. Containment pond must be inspected daily while discharging.
7. Ensure an appropriate field log is completed daily while discharging.
8. After sample collection, the following actions must be completed as soon as possible: Photographs of discharge activities and scans of field notes must be documented and the discharge log updated. Samples are to be stored in lab refrigerator, or in a cooler with ice.

6.2.2 ENSURING NO DISCHARGE OF NON-COMPLIANT WATER

Water discharged to the receiving environment from containment ponds must be adhere to the MMER and Baffinland's Water License discharge limits (Tables 5-3). Historically, the WRSP has contained low pH (acidic) water as result of impacted runoff from the Waste Rock Stockpile. In cases where water contained in the WRSP or CSP is determined to be non-compliant with applicable discharge limits, water contained in the pond(s) must be treated as per Baffinland's Waste Rock Management Plan to ensure compliance with the applicable discharge limits.

If non-compliant water is accidently discharged to the receiving environment Operations and Environment will work collaboratively to mitigate, evaluate and document possible effects. It is the responsibility of both the supervisor and the worker to discontinue discharging the ponds, and to notify their supervisor immediately, for any of the following reasons. A re-evaluation of the water quality is required prior to further discharge.

Reasons to discontinue discharging:

1. If external lab results for MS-06 (CSP) or MS-08 (WRSP) effluent are received that exceed the maximum concentrations listed in the 'BIM Internal Limits' column in Table 5-3. These limits are a threshold of conservatism to ensure regulated discharge limits are not exceeded (Table 5-3).

TABLE 5-2 - BIM STANDARDS FOR EFFLUENT QUALITY DISCHARGE LIMITS FOR MS-06 AND MS-08

Parameter	Maximum Authorized Monthly Mean Concentration, as per MMER	Maximum Concentration In A Grab Sample, as per BIM Internal Limits
Total Arsenic	0.50 mg/L	0.40 mg/L
Total Copper	0.30 mg/L	0.24 mg/L
Total Lead	0.20 mg/L	0.16 mg/L
Total Nickel	0.50 mg/L	0.40 mg/L
Total Zinc	0.50 mg/L	0.40 mg/L
TSS	15.0 mg/L	12.0 mg/L
Cyanide	1.00 mg/L	
Radium 226	0.37 Bq/L	
Toxicity	Not acutely toxic (<50% mortality)	
pH	Between 6.0 and 9.5	Between 6.5 and 8.5
Toxicity	Not acutely toxic (<50% mortality)	

2. If field pH measurements (i.e. YSI) fall outside the range/limits outlined in the 'BIM Internal Limits' column of Tables 5-3. These field readings are real-time measurements that characterize the water quality of effluent being discharged at that instance. As such, if measured field parameters fall outside of the 'BIM Internal Limits' outlined in Table 5-3, the discharge of effluent to the receiving environment must cease and the worker's supervisor notified
3. Pumping must stop for at least 12 hours following heavy precipitation or wind events to allow for the pond water to stabilize, settle and be re-sampled, unless advised otherwise by the Environmental Superintendent.

If accidental release of non-compliant water does occur, pumping of effluent to the receiving environment must seize immediately and the Head of Health, Safety and Environment and Environmental Superintendent must to be notified immediately. In the event of a release of non-compliant water to the receiving environment, all notes, photographs, pumping/discharge times, and water quality data must be compiled for the investigation and the scene of the incident shut down until further instruction.

6.3 TRAINING FOR SPILL RESPONSE

Emergency spill responses often occur in conjunction with other emergency responses (i.e. an overturned fuel tanker on the Tote Road); to facilitate an efficient response to an emergency, Project personnel trained to respond to health and safety emergencies shall also be trained in spill response. Baffinland's MRT Lead, with support from the Environmental Superintendents, will identify training and resource requirements for personnel involved with emergency spill responses. Emergency spill response training required by this Plan shall be reviewed in conjunction with Baffinland's ERP. Emergency and spill response training shall be updated throughout the lifecycle of Project to ensure the following requirements are fulfilled:

- The requirements of NWT/Nunavut Mines Health and Safety Regulations are met or exceeded.
- Emergency responders can competently operate the equipment employed for spills and other emergencies.
- Emergency responders will undertake practices, drills, and full scale exercises, for responding to emergencies that are plausible on site.

6.3.1 DRILLS AND EXERCISES

While drills and exercises can be used for training purposes, their primary function for this Plan is to provide the means of testing the adequacy of the Plan's provisions and the level of readiness of response personnel. The Emergency Response Trainer and Environmental Superintendents are responsible for coordinating the development of and assisting in conducting drills and exercises. The following section outlines the types of drills and exercises that can be practiced:

6.3.1.1 TABLE TOP EXERCISES

Table top exercises involve presenting a simulated emergency situation to key emergency response personnel in informal settings to elicit constructive discussions as the participants examine and resolve problems based on this Plan. These exercises shall be performed during MRT training sessions conducted throughout the year.

6.3.1.2 FUNCTIONAL DRILLS

Functional drills are practical exercises designed to evaluate the capability of personnel to perform a specific function (i.e. communications, first aid, and spill response). Functional drills are required to be performed annually. Deficiencies and competencies identified during functional drills are documented, and used as effective development tools in the preparation of response procedures required for full-scale exercises.

6.3.1.3 FULL-SCALE EXERCISES

Full scale exercises are intended to evaluate the operational capability of Baffinland's emergency response and preparedness. Full-scale exercises are required to be conducted annually with sufficient notice to allow for the preparation of effective emergency response procedures and to identify and correct deficiencies in advance. Examples of mock full scale exercises at Baffinland include: non-compliant water discharge, berm breach, controlled discharge and/or seepage observed.

7 REFERENCES AND RECORDS

Baffinland, (2014). EPP: BAF-PH1-840-P16-0002 Emergency Response Plan. Baffinland Iron Mines: Revised March 31, 2017

Baffinland, (2017). BAF-PH1-830-P16-0036 Spill Contingency Plan. Baffinland Iron Mines. Revised March 30, 2017.

Baffinland, (2014). EPP: BAF-PH1-830-P16-0008 Environmental Protection Plan. Baffinland Iron Mines: Revised July 15, 2014

Baffinland, (2016) BAF-PH1-320-PRO-0055 r0 - Working on Ice Procedure

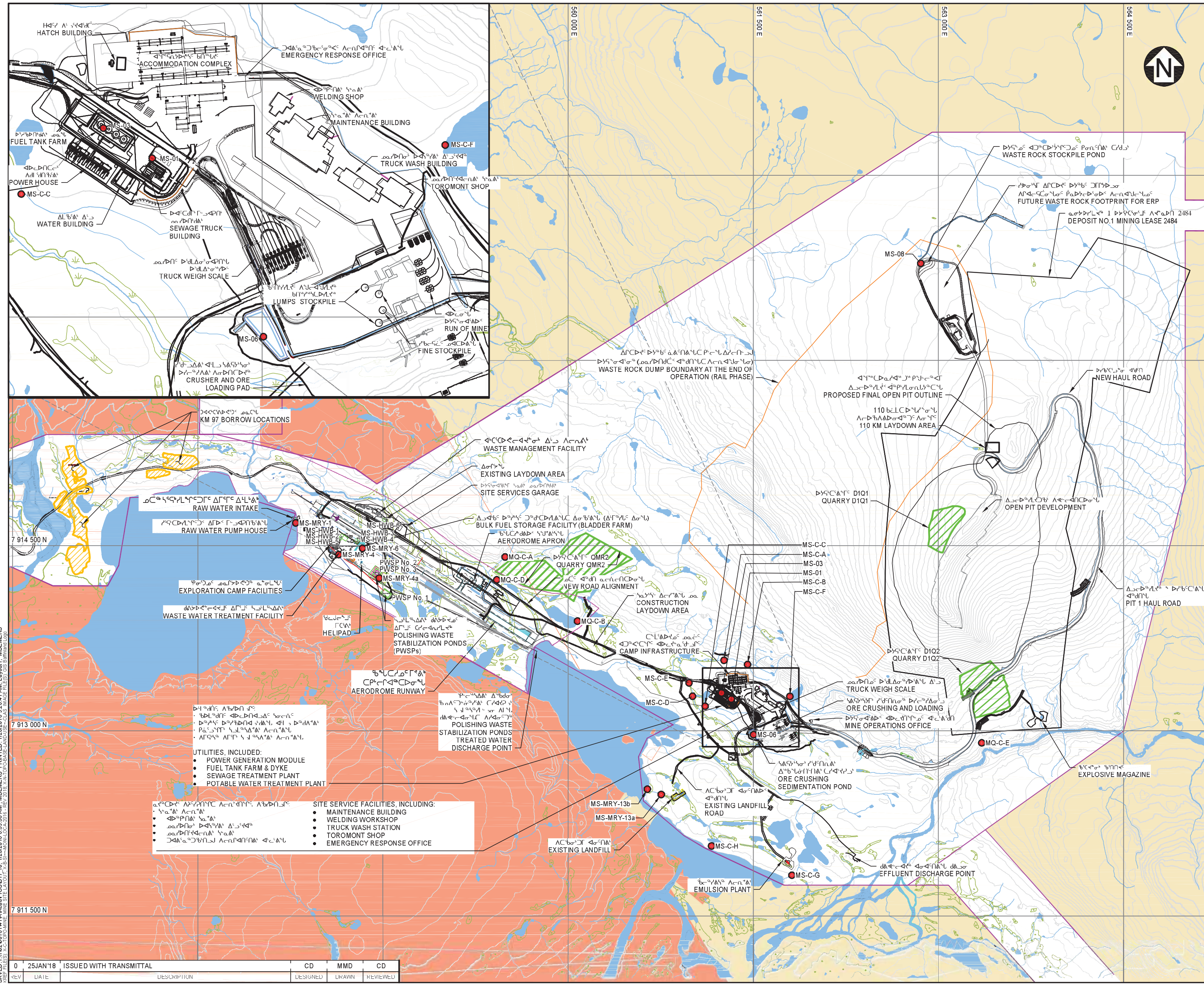
Nunavut Water Board (2013): Water License NO: 2AM–MRY1325 Type “A”, and 8BC-MRY1314 & 2BE-MRY1421 Type “B”. Revised July 21, 2015

Metal Mining Effluent Regulations (2017).

APPENDICIES

APPENDIX A

SITE LAYOUTS AND WATER LICENCE/MMER MONITORING LOCATIONS



LEGEND:

- INUIT OWNED LAND - SURFACE ONLY EXCLUDING MINERALS
- INUIT OWNED LAND - SURFACE AND SUBSURFACE INCLUDING MINERALS
- WATER
- BORROW AREAS (2013 UNDER Q10C3001)
- QUARRY AREA (EXISTING UNDER Q13C301)
- WASTE STORAGE AREA
- RIVER/STREAM/DRAINAGE
- ROAD
- QIA SURFACE COMMERCIAL LEASE BOUNDARY
- WATER LICENCE WATER QUALITY MONITORING LOCATION

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 17N.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PLAN BASED ON INFORMATION PROVIDED BY HATCH, DATED (JAN 13, 2015).
4. CONTOUR INTERVAL IS 10 METRES.
5. ALL SAMPLE ID'S SHOWN IN BRACKETS REPRESENT THE TYPE B WATER LICENCE(S) MONITORING POINTS. ALL OTHERS ARE MONITORING POINTS AS PER THE TYPE A WATER LICENCE (2AM-MRY1325).

SCALE A 300 150 0 500 1000 1500 m

Baffinland

MARY RIVER PROJECT

MINE SITE LAYOUT AND MMER/WATER LICENCE MONITORING LOCATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB102-181/41	NB18-00065

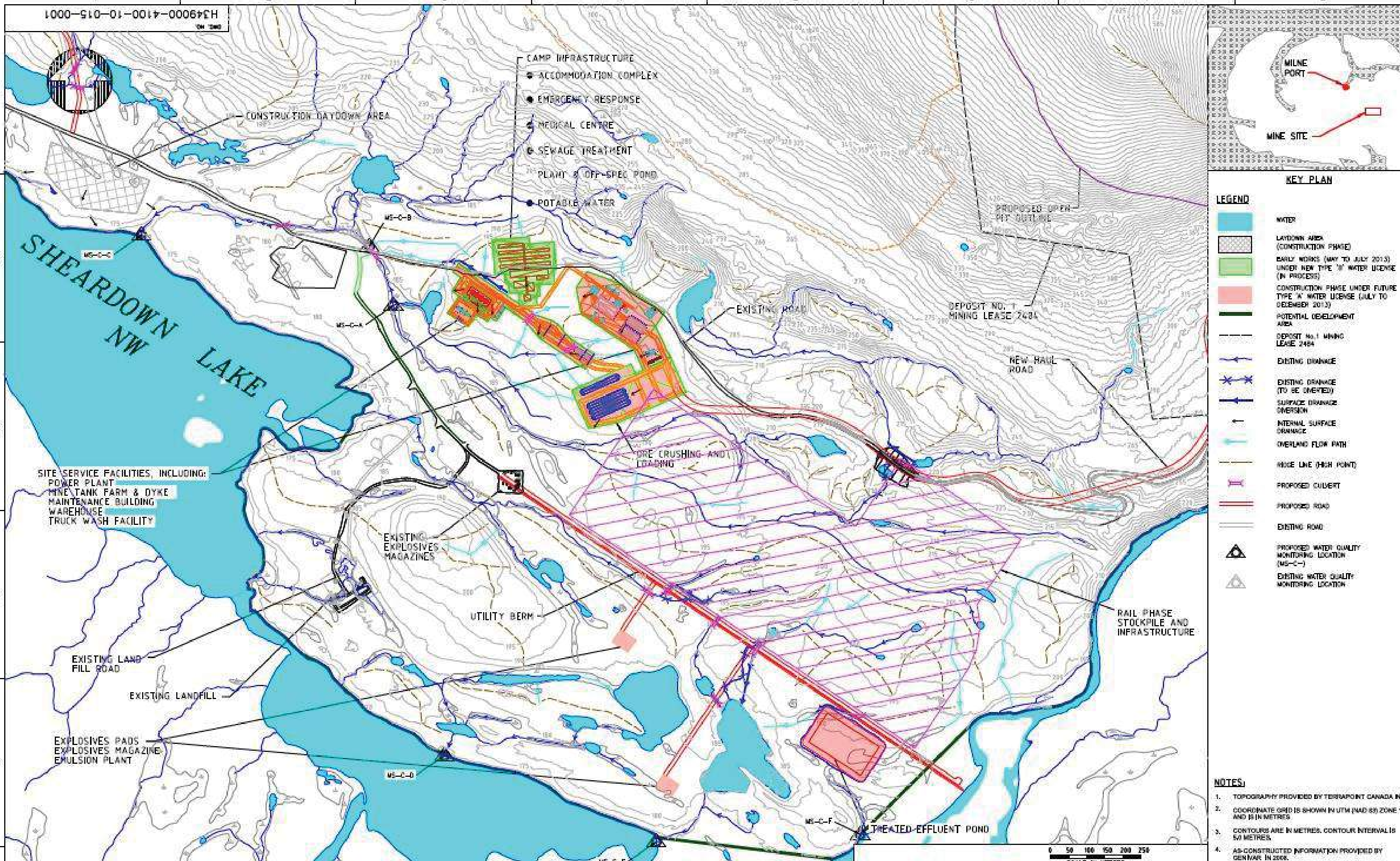
FIGURE 1.5 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	25JAN'18	ISSUED WITH TRANSMITTAL	CD	MMD	CD

SAVED: I:\1\02\00181\41\A\Acad\FIGS\B17_r0, 1/26/2018 8:59:58 AM, MDEMERS, PRINTED: 1/26/2018 9:26:41 AM, Layout1, MDEMERS

APPENDIX B

MINE SITE DRAINAGE PLAN



NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD 83) ZONE 17 AND IS IN METRES
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 5.0 METRES.
4. AS-CONSTRUCTED INFORMATION PROVIDED BY GENIVAR IN 2008.

DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS	

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NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
REVISIONS					

REV.	ISSUE FOR	AUTH. BY	DATE
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PROJ. GEN. COORD. T. THEIRTELL DATE 2013-03-28	PROJ. ENGR. J. CLELAND DATE 2013-03-28
PROJ. MGR. S. PERRY DATE 2013-03-28	

Baffinland

MARY RIVER PROJECT

MINE SITE
SITE LAYOUT
DRAINAGE PLAN

SCALE	DWG. NO.	REV.
1:5000 OR AS NOTED	H349000-4100-10-015-0001	A

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APPENDIX C
METAL MINING EFFLUENT REGULATIONS

CANADA

CONSOLIDATION

CODIFICATION

Metal Mining Effluent Regulations

Règlement sur les effluents des mines de métaux

SOR/2002-222

DORS/2002-222

Current to January 31, 2017

Last amended on June 22, 2016

À jour au 31 janvier 2017

Dernière modification le 22 juin 2016

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http://lois-laws.justice.gc.ca

OFFICIAL STATUS OF CONSOLIDATIONS

Subsections 31(1) and (3) of the *Legislation Revision and Consolidation Act*, in force on June 1, 2009, provide as follows:

Published consolidation is evidence

31 (1) Every copy of a consolidated statute or consolidated regulation published by the Minister under this Act in either print or electronic form is evidence of that statute or regulation and of its contents and every copy purporting to be published by the Minister is deemed to be so published, unless the contrary is shown.

...

Inconsistencies in regulations

(3) In the event of an inconsistency between a consolidated regulation published by the Minister under this Act and the original regulation or a subsequent amendment as registered by the Clerk of the Privy Council under the *Statutory Instruments Act*, the original regulation or amendment prevails to the extent of the inconsistency.

NOTE

This consolidation is current to January 31, 2017. The last amendments came into force on June 22, 2016. Any amendments that were not in force as of January 31, 2017 are set out at the end of this document under the heading "Amendments Not in Force".

CARACTÈRE OFFICIEL DES CODIFICATIONS

Les paragraphes 31(1) et (3) de la *Loi sur la révision et la codification des textes législatifs*, en vigueur le 1er juin 2009, prévoient ce qui suit :

Codifications comme élément de preuve

31 (1) Tout exemplaire d'une loi codifiée ou d'un règlement codifié, publié par le ministre en vertu de la présente loi sur support papier ou sur support électronique, fait foi de cette loi ou de ce règlement et de son contenu. Tout exemplaire donné comme publié par le ministre est réputé avoir été ainsi publié, sauf preuve contraire.

[...]

Incompatibilité — règlements

(3) Les dispositions du règlement d'origine avec ses modifications subséquentes enregistrées par le greffier du Conseil privé en vertu de la *Loi sur les textes réglementaires* l'emportent sur les dispositions incompatibles du règlement codifié publié par le ministre en vertu de la présente loi.

NOTE

Cette codification est à jour au 31 janvier 2017. Les dernières modifications sont entrées en vigueur le 22 juin 2016. Toutes modifications qui n'étaient pas en vigueur au 31 janvier 2017 sont énoncées à la fin de ce document sous le titre « Modifications non en vigueur ».

TABLE OF PROVISIONS

Metal Mining Effluent Regulations

1 **PART 1**

General

1 Interpretation

2 Application

3 Deleterious Substances

4 Authority to Deposit

5 Authority to Deposit in Tailings Impoundment Areas

6 **PART 2**

Conditions Governing Authority to Deposit

6 **DIVISION 1**

General

6 Prohibition on Diluting Effluent

7 Environmental Effects Monitoring

8 Identifying Information

9 Final Discharge Points

11 Monitoring Equipment Information

12 **DIVISION 2**

Effluent Monitoring Conditions

12 Deleterious Substance and pH Testing

14 Acute Lethality Testing

15 Increased Frequency of Acute Lethality Testing

TABLE ANALYTIQUE

Règlement sur les effluents des mines de métaux

1 **PARTIE I**

Dispositions générales

1 Définitions et interprétation

2 Champ d’application

3 Substances nocives

4 Rejet autorisé

5 Autorisation de rejeter dans un dépôt de résidus miniers

6 **PARTIE 2**

Conditions régissant l’autorisation de rejeter

6 **SECTION 1**

Dispositions générales

6 Interdiction de diluer

7 Études de suivi des effets sur l’environnement

8 Renseignements d’identification

9 Points de rejet final

11 Renseignements sur l’équipement de surveillance

12 **SECTION 2**

Conditions portant sur le suivi de l’effluent

12 Essais concernant le pH et les substances nocives

14 Essai de détermination de la létalité aiguë

15 Fréquence accrue des essais de détermination de la létalité aiguë

16 Reduced Frequency of Acute Lethality Testing
17 Daphnia magna Monitoring Tests
18 Obligation to Record All Test Results
19 Volume of Effluent
19.1 Calculation of Monthly Mean Concentration and Loading
21 Reporting Monitoring Results
25 Relief
26 DIVISION 3
Notice, Records and Other Documents
26 End of Commercial Operation Notice
27 Records, Books of Account or Other Documents
27.1 DIVISION 4
Tailings Impoundment Areas
27.1 Compensation Plan
28 Deposits from Tailings Impoundment Areas
29 PART 3
Deposits out of the Normal Course of Events
29 Prescribed Persons
30 Emergency Response Plan
31 Reporting
32 PART 4
Recognized Closed Mines
32 Requirements
33 Identifying Information
34 PART 5
Transitional Authorizations

16 Fréquence réduite des essais de détermination de la létalité aiguë
17 Essai de suivi avec bioessais sur la Daphnia magna
18 Enregistrement des renseignements
19 Volume d’effluent
19.1 Calcul de la concentration moyenne mensuelle et de la charge
21 Rapports sur les résultats de suivi
25 Dispense
26 SECTION 3
Avis, registres et autres documents
26 Avis de la fin de l’exploitation commerciale
27 Registres, livres comptables ou autres documents
27.1 SECTION 4
Dépôts de résidus miniers
27.1 Plan compensatoire
28 Rejets à partir de dépôts de résidus miniers
29 PARTIE 3
Rejets irréguliers
29 Autorités désignées
30 Plan d’intervention d’urgence
31 Rapport
32 PARTIE 4
Mines fermées reconnues
32 Exigences
33 Renseignements d’identification
34 PARTIE 5
Autorisations transitoires

34 Application for Transitional Authorization

35 Issuance of Transitional Authorization

36 Transitional Authorization Obligations

37 Transitional Authorization Reporting

38 Revocation of Transitional Authorizations

39 Expiry of Transitional Authorizations

40 **PART 6**

Repeals and Coming into Force

40 Repeals

42 Coming into Force

SCHEDULE 1

SCHEDULE 2

SCHEDULE 3

SCHEDULE 4

SCHEDULE 5

Environmental Effects Monitoring Studies

SCHEDULE 6

Annual Report Summarizing Effluent Monitoring Results

SCHEDULE 6.1

SCHEDULE 7

SCHEDULE 8

34 Demande d’autorisation transitoire

35 Délivrance des autorisations transitoires

36 Exigences relatives aux autorisations transitoires

37 Rapport

38 Révocation d’une autorisation transitoire

39 Expiration de l’autorisation transitoire

40 **PARTIE 6**

Abrogations et entrée en vigueur

40 Abrogations

42 Entrée en vigueur

ANNEXE 1

ANNEXE 2

ANNEXE 3

ANNEXE 4

ANNEXE 5

Études de suivi des effets sur l’environnement

ANNEXE 6

Rapport annuel résumant les résultats du suivi de l’effluent

ANNEXE 6.1

ANNEXE 7

ANNEXE 8

Registration
SOR/2002-222 June 6, 2002

FISHERIES ACT

Metal Mining Effluent Regulations

P.C. 2002-987 June 6, 2002

Her Excellency the Governor General in Council, on the recommendation of the Minister of Fisheries and Oceans, pursuant to subsections 34(2), 36(5) and 38(9) of the *Fisheries Act*, hereby makes the annexed *Metal Mining Effluent Regulations*.

Enregistrement
DORS/2002-222 Le 6 juin 2002

LOI SUR LES PÊCHES

Règlement sur les effluents des mines de métaux

C.P. 2002-987 Le 6 juin 2002

Sur recommandation du ministre des Pêches et des Océans et en vertu des paragraphes 34(2), 36(5) et 38(9) de la *Loi sur les pêches*, Son Excellence la Gouverneure générale en conseil prend le *Règlement sur les effluents des mines de métaux*, ci-après.

PART 1

General

Interpretation

1 (1) The following definitions apply in these Regulations.

Act means the *Fisheries Act*. (*Loi*)

acute lethality test means the test to determine the acute lethality of effluent to rainbow trout as set out in Reference Method EPS 1/RM/13. (*essai de détermination de la létalité aiguë*)

acutely lethal effluent means an effluent at 100% concentration that kills more than 50% of the rainbow trout subjected to it over a 96-hour period when tested in accordance with the acute lethality test. (*effluent à létalité aiguë*)

authorization officer means the holder of the title that is set out in column 2 of Schedule 1 for a province that is set out in column 1 where a mine or recognized closed mine is located. (*agent d'autorisation*)

commercial operation, in respect of a mine, means an average rate of production equal to or greater than 10% of the design-rated capacity of the mine over a period of 90 consecutive days. (*exploitation commerciale*)

composite sample means

(a) a quantity of effluent consisting of not less than three equal volumes or three volumes proportionate to flow that have been collected at approximately equal time intervals over a sampling period of not less than seven hours and not more than 24 hours; or

(b) a quantity of effluent collected continuously at a constant rate or at a rate proportionate to the rate of flow of the effluent over a sampling period of not less than seven hours and not more than 24 hours. (*échantillon composite*)

Daphnia magna monitoring test means the test to determine the acute lethality of effluent to *Daphnia magna*

PARTIE I

Dispositions générales

Définitions et interprétation

1 (1) Les définitions qui suivent s'appliquent au présent règlement.

agent d'autorisation Le titulaire du poste indiqué à la colonne 2 de l'annexe 1, à l'égard d'une province mentionnée à la colonne 1 où est située une mine ou une mine fermée reconnue. (*authorization officer*)

autorisation transitoire Autorisation provisoire délivrée par l'agent d'autorisation en application de l'article 35. (*transitional authorization*)

chantier Toutes les terres et tous les ouvrages qui sont ou ont été utilisés dans le cadre d'activités d'extraction ou de préparation du minerai ou d'hydrométallurgie, notamment :

a) les mines à ciel ouvert, les mines souterraines, les aires de lixiviation en tas, les aires d'extraction par solution, les bâtiments, les aires de stockage du minerai et les tas de stériles;

b) les dépôts de résidus miniers, les lagunes et les bassins de traitement;

c) les zones déboisées ou perturbées adjacentes aux terres et ouvrages qui ne sont pas visées aux alinéas a) ou b). (*operations area*)

concentration moyenne mensuelle La valeur moyenne des concentrations mesurées dans les échantillons composites ou instantanés prélevés de chaque point de rejet final chaque mois où il y a rejet de substances nocives. (*monthly mean concentration*)

dépôt de résidus miniers [Abrogée, DORS/2006-239, art. 1]

eau de drainage superficiel Les eaux de ruissellement de surface contaminées par des substances nocives du fait qu'elles coulent sur un chantier ou en proviennent. (*surface drainage*) as set out in Reference Method EPS 1/RM/14. (*essai de suivi avec bioessais sur la Daphnia magna*)

deleterious substance means a substance prescribed under section 3 except as otherwise prescribed by these Regulations. (*substance nocive*)

effluent means an effluent — hydrometallurgical facility effluent, milling facility effluent, mine water effluent, tailings impoundment area effluent, treatment pond effluent, seepage and surface drainage, treatment facility effluent other than effluent from a sewage treatment facility — that contains a deleterious substance. (*effluent*)

final discharge point, in respect of an effluent, means an identifiable discharge point of a mine beyond which the operator of the mine no longer exercises control over the quality of the effluent. (*point de rejet final*)

grab sample means a quantity of undiluted effluent collected at a time prescribed by these Regulations. (*échantillon instantané*)

hydrometallurgical facility effluent means effluent from the acidic leaching, solution concentration and recovery of metals by means of aqueous chemical methods, tailings slurries, and all other effluents deposited from a hydrometallurgical facility. (*effluent d'installations d'hydrométallurgie*)

hydrometallurgy means the production of a metal by means of aqueous chemical methods for acidic leaching, solution concentration and recovery of metals from metal-bearing minerals other than metal-bearing minerals that have been thermally pre-treated or blended with metal-bearing minerals that have been thermally pretreated. (*hydrométallurgie*)

milling means any of the following activities for the purpose of producing a metal or metal concentrate:

(a) crushing or grinding ore; or

(b) processing uranium ore or uranium enriched solution. (*préparation du minerai*)

milling facility effluent means tailing slurries, heap leaching effluent, solution mining effluent and all other effluent deposited from a milling facility. (*effluent d'installations de préparation du minerai*)

mine means hydrometallurgical, milling, or mining facilities that are designed or used to produce a metal, a metal concentrate or an ore from which a metal or metal concentrate may be produced or any facilities, including smelters, pelletizing plants, sintering plants, refineries

échantillon composite

a) Soit le volume d'effluent composé d'au moins trois parties égales ou de trois parties proportionnelles au débit, prélevées à intervalles sensiblement égaux, pendant une période d'échantillonnage d'au moins sept heures et d'au plus vingt-quatre heures;

b) soit le volume d'effluent prélevé de façon continue à un débit constant ou à un débit proportionnel à celui de l'effluent, pendant une période d'échantillonnage d'au moins sept heures et d'au plus vingt-quatre heures. (*composite sample*)

échantillon instantané Volume d'effluent non dilué prélevé à un moment prévu par le présent règlement. (*grab sample*)

effluent Effluent — eaux d'exfiltration, eaux de drainage superficiel, effluent de bassins de traitement, effluent d'eau de mine, effluent de dépôts de résidus miniers, effluent d'installations de préparation du minerai, effluent d'installations d'hydrométallurgie, effluent d'installations de traitement à l'exclusion de l'effluent d'installations de traitement d'eaux résiduaires — qui contient une substance nocive. (*effluent*)

effluent à létalité aiguë Effluent en une concentration de 100 % qui, au cours de l'essai de détermination de la létalité aiguë, tue plus de 50 % des truites arc-en-ciel qui y sont soumises durant une période de quatre-vingt-seize heures. (*acutely lethal effluent*)

effluent d'eau de mine Dans le cadre d'activités minières, l'eau pompée d'ouvrages souterrains, de compartiments d'extraction par solution ou de mines à ciel ouvert ou l'eau s'écoulant de ceux-ci. (*mine water effluent*)

effluent d'installations de préparation du minerai Boues de stériles, effluent des lixiviats de terrils, effluent de l'extraction par solution et tout autre effluent rejeté à partir d'une installation de préparation du minerai. (*milling facility effluent*)

effluent d'installations d'hydrométallurgie Effluent rejeté à partir d'une installation d'hydrométallurgie, notamment effluent de lixiviation acide, de concentration de solution et de récupération de métal par procédés chimiques aqueux et boues de résidus miniers. (*hydrometallurgical facility effluent*)

essai de détermination de la létalité aiguë L'essai visant à déterminer la létalité aiguë d'effluents chez la truite arc-en-ciel selon la méthode de référence SPE 1/RM/13. (*acute lethality test*) and acid plants, where any effluent from the facility is combined with the effluent from hydrometallurgy, milling or mining. (*mine*)

mine under development means a mine where the construction of an open pit or underground mine has started. (*mine en développement*)

mine water effluent means, in respect of mining activities, water that is pumped from or flows out of any underground works, solution chambers or open pits. (*effluent d'eau de mine*)

monthly mean concentration means the average value of the concentrations measured in all composite or grab samples collected from each final discharge point during each month when a deleterious substance is deposited. (*concentration moyenne mensuelle*)

new mine means a mine that begins commercial operation on or after June 6, 2002. (*nouvelle mine*)

operations area means all the land and works that are used or have been used in conjunction with a hydrometallurgical, milling or mining activity, including

(a) open pits, underground mines, heap leaching areas, solution mines, buildings, ore storage areas and waste rock dumps;

(b) tailings impoundment areas, lagoons and treatment ponds; and

(c) cleared or disturbed areas that are adjacent to the land and works that are not included in paragraph (a) or (b). (*chantier*)

operator means the person who operates, has control or custody of or is in charge of a mine or recognized closed mine. (*exploitant*)

placer mining means a mining operation that extracts minerals or metals from stream sediments by gravity or magnetic separation. (*exploitation des placers*)

recognized closed mine means a mine referred to in section 32 for which the owner or operator has satisfied the requirements of subsection 32(1). (*mine fermée reconnue*)

Reference Method EPS 1/RM/13 means *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout* (Reference Method EPS 1/RM/13), July 1990, published by the Department of the Environment, as amended in December

essai de suivi avec bioessais sur la Daphnia magna L'essai visant à déterminer la létalité aiguë d'effluents chez la *Daphnia magna* selon la méthode de référence SPE 1/RM/14. (*Daphnia magna monitoring test*)

exploitant Personne qui exploite une mine ou une mine fermée reconnue, qui en a le contrôle ou la garde, ou qui en est responsable. (*operator*)

exploitation commerciale Le taux de production moyen d'une mine qui, au cours d'une période de quatre-vingt-dix jours consécutifs, est égal ou supérieur à 10 % de la capacité nominale de la mine. (*commercial operation*)

exploitation des placers Exploitation minière où le minerai ou les métaux sont extraits de sédiments de cours d'eau par gravité ou par séparation magnétique. (*placer mining*)

hydrométallurgie La production d'un métal par des procédés chimiques aqueux de lixiviation acide, concentration de solution et récupération de métal à partir de minéraux métallifères n'ayant pas subi de prétraitement thermique ou n'ayant pas été mélangés à des minéraux métallifères qui ont subi un prétraitement thermique. (*hydrometallurgy*)

Loi La *Loi sur les pêches*. (*Act*)

méthode de référence SPE 1/RM/13 La publication intitulée *Méthode d'essai biologique : méthode de référence pour la détermination de la létalité aiguë d'effluents chez la truite arc-en-ciel* (Méthode de référence SPE 1/RM/13), publiée en juillet 1990 par le ministère de l'Environnement, dans sa version modifiée en décembre 2000 et avec ses modifications successives. (*Reference Method EPS 1/RM/13*)

méthode de référence SPE 1/RM/14 La publication intitulée *Méthode d'essai biologique : méthode de référence pour la détermination de la létalité aiguë d'effluents chez Daphnia magna* (Méthode de référence SPE 1/RM/14), publiée en juillet 1990 par le ministère de l'Environnement, dans sa version modifiée en décembre 2000 et avec ses modifications successives. (*Reference Method EPS 1/RM/14*)

mine Installations d'extraction minière, installations de préparation du minerai ou installations d'hydrométallurgie qui sont conçues ou utilisées pour produire un métal, un concentré de métal ou un minerai à partir duquel un métal ou un concentré de métal peut être produit, ou toute installation, telles les fonderies, usines de bouletage, usines de frittage, affineries et usines d'acide, dont

2000, and as may be further amended from time to time. (*méthode de référence SPE 1/RM/13*)

Reference Method EPS 1/RM/14 means *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna* (Reference Method EPS 1/RM/14), July 1990, published by the Department of the Environment, as amended in December 2000, and as may be further amended from time to time. (*méthode de référence SPE 1/RM/14*)

reopened mine means a mine that resumes commercial operation on or after June 6, 2002. (*mine remise en exploitation*)

surface drainage means all surface run-off contaminated by a deleterious substance as a result of flowing over, through or out of an operations area. (*eau de drainage superficiel*)

tailings impoundment area [Repealed, SOR/2006-239, s. 1]

total suspended solids means all solid matter that is retained on a 1.5 micron pore filter paper when the effluent is tested in compliance with the analytical requirements set out in Schedule 3. (*total des solides en suspension*)

transitional authorization means a temporary authorization issued by an authorization officer in accordance with section 35. (*autorisation transitoire*)

(2) Where the word “mine” is used in sections 2 to 39, it includes a mine, a mine under development, a new mine and a reopened mine but does not refer to a recognized closed mine.

SOR/2006-239, s. 1; SOR/2009-156, s. 1; SOR/2012-22, s. 1.

l’effluent est combiné aux effluents provenant de l’extraction minière ou de la préparation du minerai ou de l’hydrométallurgie. (*mine*)

mine en développement Mine où a débuté la construction d’une mine à ciel ouvert ou d’une mine souterraine. (*mine under development*)

mine fermée reconnue Mine visée à l’article 32 dont le propriétaire ou l’exploitant a satisfait aux exigences du paragraphe 32(1). (*recognized closed mine*)

mine remise en exploitation Mine dont l’exploitation commerciale reprend le 6 juin 2002 ou après cette date. (*reopened mine*)

nouvelle mine Mine dont l’exploitation commerciale commence le 6 juin 2002 ou après cette date. (*new mine*)

point de rejet final Le point de rejet de l’effluent d’une mine qui est repérable et au-delà duquel l’exploitant de la mine n’agit plus quant à la qualité de l’effluent. (*final discharge point*)

préparation du minerai Les activités ci-après effectuées en vue de la production d’un métal ou d’un concentré de métal :

a) le concassage et le broyage d’un minerai;

b) le traitement du minerai d’uranium et de solutions uranifères. (*milling*)

rejet Est assimilée au rejet l’immersion au sens du paragraphe 34(1) de la Loi. (*French version only*)

substance nocive Toute substance désignée aux termes de l’article 3, sauf disposition contraire du présent règlement. (*deleterious substance*)

total des solides en suspension Toutes les matières solides retenues sur un papier filtre aux pores de 1,5 micron lorsque l’effluent est soumis à un essai qui satisfait aux exigences analytiques prévues à l’annexe 3. (*total suspended solids*)

(2) Dans les articles 2 à 39, sont assimilés à une mine une mine en développement, une nouvelle mine et une mine remise en exploitation, mais non une mine fermée reconnue.

DORS/2006-239, art. 1; DORS/2009-156, art. 1; DORS/2012-22, art. 1.

Application

2 (1) These Regulations apply in respect of mines and recognized closed mines that

(a) at any time after June 6, 2002, exceed an effluent flow rate of 50 m^3 per day, based on effluent deposited from all the final discharge points of the mine; and

(b) deposit a deleterious substance in any water or place referred to in subsection 36(3) of the Act.

(2) Despite subsection (1), these Regulations do not apply in respect of mines that stopped commercial operation before June 6, 2002, unless they are reopened after the registration of these Regulations, or in respect of placer mining operations.

SOR/2012-22, s. 2.

Deleterious Substances

3 For the purpose of these Regulations, the substances set out in column 1 of Schedule 4 and any acutely lethal effluent are prescribed as deleterious substances.

Authority to Deposit

4 (1) Subject to subsection (2), the owner or operator of a mine may deposit, or permit the deposit of, an effluent that contains a deleterious substance in any water or place referred to in subsection 36(3) of the Act if a transitional authorization permits the deposit or if

(a) the concentration of the deleterious substance in the effluent does not exceed the authorized limits set out in Schedule 4;

(b) the pH of the effluent is equal to or greater than 6.0 but is not greater than 9.5; and

(c) the deleterious substance is not an acutely lethal effluent.

(2) The authority in subsection (1) is conditional

(a) in the case of a transitional authorization that permits the deposit, on the owner or operator complying with section 36; and

(b) in the other case, on the owner or operator complying with sections 6 to 27.

Champ d'application

2 (1) Le présent règlement s'applique aux mines et aux mines fermées reconnues qui présentent les caractéristiques suivantes :

a) après le 6 juin 2002, elles ont, à un moment quelconque, un débit d'effluent supérieur à 50 m^3 par jour, déterminé d'après les rejets d'effluent à partir de tous leurs points de rejet final;

b) elles rejettent une substance nocive dans les eaux ou les lieux visés au paragraphe 36(3) de la Loi.

(2) Malgré le paragraphe (1), le présent règlement ne s'applique ni aux exploitations des placers ni aux mines dont l'exploitation commerciale a pris fin avant le 6 juin 2002 à moins qu'elles ne soient remises en exploitation après cette date.

DORS/2012-22, art. 2.

Substances nocives

3 Pour l'application du présent règlement, sont des substances nocives l'effluent à létalité aiguë et toute substance mentionnée à la colonne 1 de l'annexe 4.

Rejet autorisé

4 (1) Sous réserve du paragraphe (2), le propriétaire ou l'exploitant d'une mine peut rejeter — ou permettre que soit rejeté — un effluent contenant des substances nocives dans les eaux ou les lieux visés au paragraphe 36(3) de la Loi si une autorisation transitoire le permet ou si les conditions suivantes sont réunies :

a) la concentration des substances nocives dans l'effluent ne dépasse pas les limites permises prévues à l'annexe 4;

b) le pH de l'effluent est égal ou supérieur à 6,0 mais ne dépasse pas 9,5;

c) la substance nocive n'est pas un effluent à létalité aiguë.

(2) Le propriétaire ou l'exploitant ne peut se prévaloir du droit que lui confère le paragraphe (1) que s'il satisfait aux exigences prévues :

a) à l'article 36, dans le cas où une autorisation transitoire permet le rejet;

b) aux articles 6 à 27, dans l'autre cas.

Authority to Deposit in Tailings Impoundment Areas

5 (1) Despite section 4, the owner or operator of a mine may deposit or permit the deposit of waste rock or an effluent that contains any concentration of a deleterious substance and that is of any pH into a tailings impoundment area that is either

(a) a water or place set out in Schedule 2; or

(b) a disposal area that is confined by anthropogenic or natural structures or by both, other than a disposal area that is, or is part of, a natural water body that is frequented by fish.

(2) The authority in subsection (1) is conditional on the owner or operator complying with sections 7 to 28.

SOR/2006-239, s. 2.

Autorisation de rejeter dans un dépôt de résidus miniers

5 (1) Malgré l'article 4, le propriétaire ou l'exploitant d'une mine peut rejeter — ou permettre que soient rejetés — des stériles ou un effluent, quel que soit le pH de l'effluent ou sa concentration en substances nocives, dans l'un ou l'autre des dépôts de résidus miniers suivants :

a) les eaux et lieux mentionnés à l'annexe 2;

b) toute aire de décharge circonscrite par une formation naturelle ou un ouvrage artificiel, ou les deux, à l'exclusion d'une aire de décharge qui est un plan d'eau naturel où vivent des poissons ou qui en fait partie.

(2) Le propriétaire ou l'exploitant ne peut se prévaloir du droit que lui confère le paragraphe (1) que s'il satisfait aux exigences prévues aux articles 7 à 28.

DORS/2006-239, art. 2.

PART 2

Conditions Governing Authority to Deposit

DIVISION 1

General

Prohibition on Diluting Effluent

6 The owner or operator of a mine shall not combine effluent with water or any other effluent for the purpose of diluting effluent before it is deposited.

Environmental Effects Monitoring

7 (1) The owner or operator of a mine shall conduct environmental effects monitoring studies of the potential effects of effluent on the fish population, on fish tissue and on the benthic invertebrate community in accordance with the requirements and within the periods set out in Schedule 5.

(2) The owner or operator shall record the results of the studies and submit the reports and required information to the authorization officer as set out in Schedule 5.

PARTIE 2

Conditions régissant l'autorisation de rejeter

SECTION 1

Dispositions générales

Interdiction de diluer

6 Il est interdit au propriétaire ou à l'exploitant d'une mine de combiner un effluent avec de l'eau ou avec tout autre effluent dans le but de le diluer avant son rejet.

Études de suivi des effets sur l'environnement

7 (1) Le propriétaire ou l'exploitant d'une mine mène des études de suivi des effets possibles des effluents sur la population de poissons, sur les tissus de poissons et sur la communauté d'invertébrés benthiques selon les exigences et dans les délais prévus à l'annexe 5.

(2) Il consigne dans un registre les résultats des études et présente les rapports et les renseignements exigés à l'agent d'autorisation selon les exigences prévues à l'annexe 5.

(3) The studies shall be performed using documented and validated methods, and their results interpreted and reported on in accordance with generally accepted standards of good scientific practice at the time that the studies are performed.

SOR/2006-239, s. 3.

Identifying Information

8 (1) The owner or operator of a mine shall submit in writing to the authorization officer the information referred to in subsection (2) not later than 60 days after the day on which one or both of the following occur:

(a) the mine becomes subject to these Regulations; and

(b) ownership of the mine is transferred.

(2) The information that shall be submitted is the name and address of

(a) both the owner and the operator of the mine; and

(b) any parent company of the owner and the operator.

(3) The owner or operator shall submit in writing to the authorization officer any change in the information not later than 60 days after the change occurs.

Final Discharge Points

9 The owner or operator of a mine shall identify each final discharge point and submit in writing to the authorization officer, not later than 60 days after the day on which the mine becomes subject to these Regulations, the following information:

(a) plans, specifications and a general description of each final discharge point together with its location by latitude and longitude, in degrees, minutes and seconds;

(b) a description of how each final discharge point is designed and maintained in respect of the deposit of deleterious substances; and

(c) the name of the receiving body of water, if there is a name.

SOR/2006-239, s. 4.

10 (1) The owner or operator of a mine shall submit in writing to the authorization officer the information required by section 9, for

(3) Les études sont réalisées selon des méthodes éprouvées et validées et leurs résultats évalués et présentés conformément aux normes généralement reconnues régissant les bonnes pratiques scientifiques au moment de l'étude.

DORS/2006-239, art. 3.

Renseignements d'identification

8 (1) Le propriétaire ou l'exploitant d'une mine présente par écrit à l'agent d'autorisation les renseignements mentionnés au paragraphe (2) :

a) dans les soixante jours suivant la date à laquelle la mine devient assujettie au présent règlement;

b) dans les soixante jours suivant le transfert de la propriété de la mine.

(2) Les renseignements à présenter sont :

a) les nom et adresse du propriétaire et de l'exploitant;

b) les nom et adresse de toute société mère du propriétaire et de l'exploitant.

(3) Le propriétaire ou l'exploitant présente par écrit à l'agent d'autorisation des précisions sur tout changement des renseignements dans les soixante jours suivant le changement.

Points de rejet final

9 Le propriétaire ou l'exploitant d'une mine détermine chaque point de rejet final et fournit par écrit à l'agent d'autorisation, dans les soixante jours suivant la date à laquelle la mine devient assujettie au présent règlement, les renseignements suivants :

a) les plans, les spécifications et une description générale de chaque point de rejet final, ainsi que la latitude et la longitude de son emplacement, exprimées en degrés, minutes et secondes;

b) la façon dont chacun des points de rejet final est conçu et entretenu en ce qui a trait au rejet de substances nocives;

c) le nom du milieu aquatique récepteur, si ce nom existe.

DORS/2006-239, art. 4.

10 (1) Le propriétaire ou l'exploitant d'une mine présente par écrit à l'agent d'autorisation les renseignements visés à l'article 9 relativement à :

(a) any final discharge point that is identified by an inspector, and that was not identified as required by section 9, within 30 days after the discharge point is identified; and

(b) each new final discharge point, at least 60 days before depositing effluent from that new final discharge point.

(2) The owner or operator shall submit in writing to the authorization officer the information on any proposed change to a final discharge point at least 60 days before the change is to be made.

Monitoring Equipment Information

11 The owner or operator of a mine shall keep records relating to effluent monitoring equipment that contain

(a) a description of the equipment and, if applicable, the manufacturer's specifications and the year and model number of the equipment; and

(b) the results of the calibration tests of the equipment.

DIVISION 2

Effluent Monitoring Conditions

Deleterious Substance and pH Testing

12 (1) Subject to subsection (3), the owner or operator of a mine shall, not less than once per week and at least 24 hours apart, collect from each final discharge point a grab sample or composite sample of effluent and, without delay, record the pH and concentrations of the deleterious substances set out in column 1 of Schedule 4.

(2) Testing conducted under subsection (1) shall comply with the analytical requirements set out in Schedule 3 and shall be done in accordance with generally accepted standards of good scientific practice at the time of the sampling using documented and validated methods.

(3) The owner or operator is not required to collect samples for the purpose of recording the concentrations of

a) tous les points de rejet final que désigne l'inspecteur et qui n'ont pas été déterminés en application de l'article 9, dans les trente jours suivant leur désignation;

b) tout nouveau point de rejet final, au moins soixante jours avant qu'un effluent en soit rejeté.

(2) Il présente par écrit à l'agent d'autorisation des précisions sur toute modification proposée d'un point de rejet final au moins soixante jours avant que la modification soit apportée.

Renseignements sur l'équipement de surveillance

11 Le propriétaire ou l'exploitant d'une mine tient un registre concernant l'équipement de surveillance des effluents et y consigne :

a) la description de l'équipement et, le cas échéant, les spécifications du fabricant ainsi que l'année et le numéro du modèle de l'équipement;

b) les résultats des essais d'étalonnage de l'équipement.

SECTION 2

Conditions portant sur le suivi de l'effluent

Essais concernant le pH et les substances nocives

12 (1) Sous réserve du paragraphe (3), le propriétaire ou l'exploitant d'une mine prélève, au moins une fois par semaine et à au moins vingt-quatre heures d'intervalle, à partir de chaque point de rejet final, un échantillon instantané ou un échantillon composite d'effluent et enregistre sans délai le pH et les concentrations des substances nocives énumérées à la colonne 1 de l'annexe 4.

(2) Les essais effectués en application du paragraphe (1) doivent satisfaire aux exigences analytiques prévues à l'annexe 3 et doivent être effectués conformément aux normes généralement reconnues régissant les bonnes pratiques scientifiques au moment de l'échantillonnage et selon des méthodes éprouvées et validées.

(3) Le propriétaire ou l'exploitant d'une mine n'a pas à prélever d'échantillon afin d'enregistrer la concentration de cyanure figurant à l'article 3 de l'annexe 4, si cette cyanide set out as item 3 of Schedule 4 if that substance is not used as a process reagent within the operations area.

SOR/2006-239, s. 5.

13 (1) Despite section 12 and subject to subsection (3), the owner or operator of a mine may reduce the frequency of testing of effluent collected from a final discharge point for a deleterious substance that is set out in any of items 1 to 6, in column 1, of Schedule 4 to not less than once in each calendar quarter if that substance's monthly mean concentration in the effluent collected from that final discharge point is less than 10% of the value set out in column 2 of that Schedule for the 12 months immediately preceding the most recent test.

(2) Despite section 12 and subject to subsection (3), the owner or operator of a mine, other than an uranium mine, may reduce the frequency of testing for Radium 226 set out as item 8 of Schedule 4 to not less than once in each calendar quarter if that substance's concentration in the effluent is less than 0.037 Bq/L in 10 consecutive tests conducted under section 12.

(3) The owner or operator shall increase the frequency of testing to that prescribed in section 12 for a deleterious substance that is set out in any of items 1 to 6 or 8 of Schedule 4 if the substance's monthly mean concentration is equal to or greater than 10% of the value set out in column 2 of these items.

(4) The owner or operator must notify the authorization officer, in writing, at least 30 days in advance, of a reduction in the frequency of testing.

SOR/2006-239, s. 6.

Acute Lethality Testing

14 (1) Subject to subsection (1.1) and section 15, the owner or operator of a mine shall conduct an acute lethality test, in accordance with the requirements and procedures specified in Reference Method EPS 1/RM/13,

(a) once a month, in accordance with the procedure set out in section 5 or 6 of that document, on a grab sample that was collected from each final discharge point; and

(b) without delay, in accordance with the procedure set out in section 6 of that document, on a sample taken from the place where the deposit occurred if the deposit occurs out of the normal course of events.

substance n'est pas utilisée comme réactif de procédé sur le chantier.

DORS/2006-239, art. 5.

13 (1) Malgré l'article 12 et sous réserve du paragraphe (3), le propriétaire ou l'exploitant d'une mine peut réduire la fréquence des essais de l'effluent prélevé à partir d'un point de rejet final, dans le cas d'une substance nocive figurant à l'un des articles 1 à 6 de l'annexe 4, dans la colonne 1, à au moins une fois par trimestre civil, si la concentration moyenne mensuelle de la substance dans l'effluent prélevé à ce point de rejet final est inférieure à 10 % de la valeur établie à la colonne 2 de cette annexe durant les douze mois précédant le dernier essai.

(2) Malgré l'article 12 et sous réserve du paragraphe (3), le propriétaire ou l'exploitant d'une mine, autre qu'une mine d'uranium, peut réduire la fréquence des essais, dans le cas du radium 226 figurant à l'article 8 de l'annexe 4, à au moins une fois par trimestre civil, si la concentration de la substance dans l'effluent est inférieure à 0,037 Bq/L dans dix essais consécutifs effectués selon l'article 12.

(3) Il porte la fréquence des essais à celle prévue à l'article 12 pour une substance nocive figurant à l'un des articles 1 à 6 ou 8 de l'annexe 4, dans la colonne 1, si la concentration de cette substance est égale ou supérieure à 10 % de la valeur établie à la colonne 2.

(4) Il avise par écrit l'agent d'autorisation de la réduction de la fréquence des essais, au moins trente jours avant celle-ci.

DORS/2006-239, art. 6.

Essai de détermination de la létalité aiguë

14 (1) Sous réserve du paragraphe (1.1) et de l'article 15, le propriétaire ou l'exploitant d'une mine effectue un essai de détermination de la létalité aiguë conformément à la méthode de référence SPE 1/RM/13 :

a) une fois par mois, selon les modes opératoires visés aux sections 5 ou 6 de ce document, sur un échantillon instantané prélevé à partir de chaque point de rejet final;

b) si le rejet est irrégulier, sans délai, selon le mode opératoire visé à la section 6 de ce document sur un échantillon prélevé sur les lieux du rejet.

(1.1) The owner or operator who is required to conduct an acute lethality test under paragraph (1)(b) is not required to conduct that test if they notify without delay an inspector, or a person referred to in section 29, that the deposit is an acutely lethal effluent.

(2) For the purposes of paragraph (1)(a),

(a) the owner or operator shall select and record the sampling date not less than 30 days in advance of collecting the grab sample;

(b) the operator shall collect the sample on the selected day except if, owing to unforeseen circumstances, the operator cannot sample on that day, in which case, they shall do so as soon as possible after that day; and

(c) the operator shall collect the grab samples not less than 15 days apart.

(3) When collecting a grab sample of effluent for the purpose of subsection (1), the owner or operator shall collect a sufficient volume of effluent to enable the owner or operator to comply with paragraph 15(1)(a).

SOR/2006-239, s. 7; SOR/2011-92, s. 4; SOR/2012-22, s. 3.

Increased Frequency of Acute Lethality Testing

15 (1) If a sample of effluent is determined to be acutely lethal when tested under paragraph 14(1)(a), the owner or operator of a mine shall

(a) without delay, conduct the effluent characterization set out in subsection 4(1) of Schedule 5 on the aliquot of each grab sample collected under paragraph 14(1)(a) and record the concentrations of the deleterious substances set out in column 1 of Schedule 4;

(b) collect, from the final discharge point from which the sample was determined to be acutely lethal, a grab sample twice a month and, without delay, conduct an acute lethality test on each grab sample in accordance with the procedure set out in section 6 of Reference Method EPS 1/RM/13 and, if the sample is determined to be acutely lethal, then conduct the effluent characterization set out in subsection 4(1) of Schedule 5 and record the concentrations of the deleterious substances set out in column 1 of Schedule 4; and

(c) collect the grab samples not less than seven days apart.

(1.1) Le propriétaire ou l'exploitant qui est tenu d'effectuer l'essai de détermination de la létalité aiguë en application de l'alinéa (1)b) n'a pas à le faire s'il avise sans délai l'inspecteur ou l'une des autorités désignées à l'article 29 que le rejet est un effluent à létalité aiguë.

(2) Pour l'application de l'alinéa (1)a) :

a) le propriétaire ou l'exploitant choisit et enregistre, au moins trente jours à l'avance, la date de l'échantillonnage;

b) l'exploitant prélève l'échantillon ce jour-là ou, si des circonstances imprévues empêchent le prélèvement de l'échantillon, le plus tôt possible après ce jour;

c) l'exploitant prélève les échantillons instantanés à au moins quinze jours d'intervalle.

(3) Lors du prélèvement des échantillons instantanés en application du paragraphe (1), il prélève un volume d'effluent suffisant pour lui permettre de se conformer à l'alinéa 15(1)a).

DORS/2006-239, art. 7; DORS/2011-92, art. 4; DORS/2012-22, art. 3.

Fréquence accrue des essais de détermination de la létalité aiguë

15 (1) S'il est établi qu'un échantillon d'effluent présente une létalité aiguë selon l'essai prévu à l'alinéa 14(1)a), le propriétaire ou l'exploitant d'une mine :

a) effectue sans délai la caractérisation de l'effluent conformément au paragraphe 4(1) de l'annexe 5 sur une portion aliquote de chaque échantillon instantané prélevé en application de l'alinéa 14(1)a) et enregistre les concentrations des substances nocives énumérées à la colonne 1 de l'annexe 4;

b) deux fois par mois, prélève un échantillon instantané à partir du point de rejet final d'où l'échantillon d'effluent qui présente une létalité aiguë a été prélevé, effectue sans délai sur chacun de ces échantillons un essai de détermination de la létalité aiguë selon le mode opératoire prévu à la section 6 de la méthode de référence SPE 1/RM/13 et, s'il est établi que l'échantillon présente une létalité aiguë selon cet essai, effectue la caractérisation de l'effluent conformément au paragraphe 4(1) de l'annexe 5 et enregistre les concentrations des substances nocives énumérées à la colonne 1 de l'annexe 4;

c) prélève les échantillons instantanés à au moins sept jours d'intervalle.

(2) The owner or operator may resume sampling and testing at the frequency prescribed in section 14 if the effluent is determined not to be acutely lethal in three consecutive tests conducted under paragraph (1)(b).

SOR/2006-239, s. 8.

Reduced Frequency of Acute Lethality Testing

16 (1) The owner or operator of a mine may reduce the frequency of conducting acute lethality tests prescribed in paragraph 14(1)(a) to once in each calendar quarter if the effluent is determined not to be acutely lethal over a period of 12 consecutive months.

(2) For the purpose of determining whether effluent is acutely lethal in the 12-month period referred to in subsection (1), the owner or operator shall use the results of the acute lethality tests conducted under paragraph 14(1)(a).

(3) Despite subsection (2), for the purpose of determining whether effluent is acutely lethal in the 12-month period referred to in subsection (1), the owner or operator may also use acute lethality data collected during twelve consecutive months prior to June 6, 2002, if the owner or operator submits a report to the authorization officer that indicates that the data

- **(a)** meets the quality assurance requirements of Reference Method EPS 1/RM/13;
- **(b)** relates to effluent generated after the start of commercial operation by the mine; and
- **(c)** was collected not more than 36 months before June 6, 2002.

(4) The owner or operator who reduces the frequency of conducting acute lethality testing under subsection (1) shall

- **(a)** select and record the sampling date not less than 30 days in advance of collecting the grab samples; and
- **(b)** collect the grab samples not less than 45 days apart.

(5) If a grab sample is determined to be acutely lethal while the testing is proceeding in accordance with subsection (1), the owner or operator shall increase the frequency and conduct the testing as prescribed in section 15.

SOR/2012-22, s. 4.

(2) Il peut recommencer à effectuer l'échantillonnage et les essais à la fréquence fixée à l'article 14 si l'effluent ne présente pas de létalité aiguë dans trois essais consécutifs effectués selon l'alinéa (1)b).

DORS/2006-239, art. 8.

Fréquence réduite des essais de détermination de la létalité aiguë

16 (1) Le propriétaire ou l'exploitant d'une mine peut réduire à une fois par trimestre civil la fréquence des essais de détermination de la létalité aiguë prévue à l'alinéa 14(1)a) s'il est établi que l'effluent ne présente pas de létalité aiguë pendant douze mois consécutifs.

(2) Pour déterminer la létalité aiguë de l'effluent pendant la période de douze mois prévue au paragraphe (1), le propriétaire ou l'exploitant se fonde sur les résultats obtenus aux termes de l'alinéa 14(1)a).

(3) Malgré le paragraphe (2), pour déterminer la létalité aiguë de l'effluent pendant la période de douze mois prévue au paragraphe (1), le propriétaire ou l'exploitant peut utiliser les données d'essai de détermination de la létalité aiguë recueillies pendant toute période de douze mois consécutifs précédant le 6 juin 2002, s'il présente un rapport à l'agent d'autorisation indiquant ce qui suit :

- **a)** les données satisfont aux exigences de qualité prévues par la méthode de référence SPE 1/RM/13;
- **b)** elles se rapportent à l'effluent émanant de la mine après le début de son exploitation commerciale;
- **c)** elles ont été recueillies au cours des trente-six mois précédant le 6 juin 2002.

(4) Le propriétaire ou l'exploitant qui réduit la fréquence des essais en application du paragraphe (1) prend les mesures suivantes :

- **a)** il choisit et enregistre, au moins trente jours à l'avance, la date de l'échantillonnage;
- **b)** il prélève les échantillons instantanés à au moins quarante-cinq jours d'intervalle.

(5) S'il est établi qu'un échantillon instantané d'effluent présente une létalité aiguë pendant que les essais sont effectués conformément au paragraphe (1), le propriétaire ou l'exploitant porte la fréquence des essais à celle prévue à l'article 15 et effectue les essais conformément à cet article.

DORS/2012-22, art. 4.

Daphnia magna Monitoring Tests

17 (1) The owner or operator of a mine shall conduct *Daphnia magna* monitoring tests in accordance with the procedure set out in section 5 or 6 of Reference Method EPS 1/RM/14 at the same time that the acute lethality tests are conducted under section 14, 15 or 16 of these Regulations.

(2) The owner or operator shall conduct *Daphnia magna* monitoring tests on the aliquots of each effluent sample collected for the acute lethality tests.

Obligation to Record All Test Results

18 The owner or operator of a mine shall record without delay the information specified by section 8.1 of Reference Method EPS 1/RM/13 and by section 8.1 of Reference Method EPS 1/RM/14 for all acute lethality and *Daphnia magna* monitoring tests that are conducted to monitor deposits from final discharge points.

Volume of Effluent

19 (1) The owner or operator of a mine shall record, in cubic metres, the total monthly volume of effluent deposited from each final discharge point for each month during which there was a deposit.

(2) The total monthly volume of effluent deposited shall be either

(a) determined on the basis of the average of the flow rates, expressed in cubic metres per day, measured and calculated as follows:

(i) by measuring the flow rate at the same time as samples are collected under section 12,

(ii) by calculating the average monthly flow rate by adding the flow rate measurements taken during the month and dividing the total by the number of times the flow rate was measured, and

(iii) by multiplying the average monthly flow rate by the number of days during the month that effluent was deposited; or

(b) determined by using a monitoring system that provides a continuous measure of the volume of effluent deposited.

Essai de suivi avec bioessais sur la *Daphnia magna*

17 (1) Le propriétaire ou l'exploitant d'une mine qui fait des essais de détermination de la létalité aiguë en application des articles 14, 15 ou 16 effectue au même moment des essais de suivi avec bioessais sur la *Daphnia magna* selon les modes opératoires prévus aux sections 5 ou 6 de la méthode de référence SPE 1/RM/14.

(2) Il effectue chaque essai de suivi sur des portions aliquotes de chaque échantillon d'effluent prélevé pour les essais de détermination de la létalité aiguë.

Enregistrement des renseignements

18 Le propriétaire ou l'exploitant d'une mine enregistre sans délai les données visées au paragraphe 8.1 de la méthode de référence SPE 1/RM/13 et au paragraphe 8.1 de la méthode de référence SPE 1/RM/14 pour tous les essais de détermination de la létalité aiguë et tous les essais de suivi avec bioessais sur la *Daphnia magna* effectués dans le cadre du suivi des rejets provenant de points de rejet final.

Volume d'effluent

19 (1) Le propriétaire ou l'exploitant d'une mine enregistre, en mètres cubes, le volume mensuel total d'effluent rejeté à partir de chaque point de rejet final, pour chaque mois au cours duquel un effluent a été rejeté.

(2) Le volume mensuel total d'effluent rejeté est :

a) soit fondé sur la moyenne des débits, exprimée en mètres cubes par jour, auquel cas il est déterminé de la façon suivante :

(i) le débit est mesuré au moment où les échantillons sont prélevés en application de l'article 12,

(ii) la moyenne mensuelle des débits est calculée par la division du total des mesures de débit enregistrées au cours du mois par le nombre de mesures prises,

(iii) la moyenne mensuelle des débits est multipliée par le nombre de jours où l'effluent a été rejeté;

b) soit déterminé à l'aide d'un système de surveillance à mesure continue.

(3) The owner or operator shall

(a) measure the flow rate or volume of effluent deposited by using a monitoring system that is accurate to within 15% of measured flow rate or volume; and

(b) calibrate the monitoring system not less than once in each year and record the results.

SOR/2006-239, s. 9; SOR/2012-22, s. 5.

(3) Le propriétaire ou l'exploitant mesure le volume ou le débit d'effluent rejeté en tenant compte des exigences suivantes :

a) il utilise à cette fin un système de surveillance donnant des mesures exactes à 15 % près;

b) il étalonne le système de surveillance au moins une fois par année et enregistre les résultats.

DORS/2006-239, art. 9; DORS/2012-22, art. 5.

Calculation of Monthly Mean Concentration and Loading

19.1 (1) With respect to deleterious substances contained in effluent deposited from each final discharge point, the owner or operator of a mine shall, for each month during which there was a deposit, record the monthly mean concentration

(a) in mg/L for deleterious substances referred to in items 1 to 7, in column 1, of Schedule 4; or

(b) in Bq/L for a deleterious substance referred to in item 8, in column 1, of that Schedule.

(2) If the analytical result from any test conducted under section 12 or 13 is less than the method detection limit used for that test, the test result shall be considered to be equal to one half of the detection limit used for the purpose of calculating the monthly mean concentration.

SOR/2006-239, s. 9.

Calcul de la concentration moyenne mensuelle et de la charge

19.1 (1) À l'égard des substances nocives se trouvant dans l'effluent rejeté à partir de chaque point de rejet final, le propriétaire ou l'exploitant d'une mine enregistre, pour chaque mois au cours duquel un effluent a été rejeté :

a) la concentration moyenne mensuelle en mg/L des substances nocives énumérées aux articles 1 à 7 de l'annexe 4, dans la colonne 1;

b) la concentration moyenne mensuelle en Bq/L de la substance figurant à l'article 8 de la même annexe, dans la colonne 1.

(2) Si le résultat analytique de tout essai effectué en application des articles 12 ou 13 est inférieur à la limite de détection de la méthode utilisée pour l'essai, il est considéré comme égal à la moitié de la limite de détection de la méthode utilisée pour le calcul de la concentration moyenne mensuelle.

DORS/2006-239, art. 9.

20 (1) With respect to deleterious substances contained in effluent deposited from each final discharge point, the owner or operator of a mine shall, for each month and for each calendar quarter during which there was a deposit, record the loading

(a) in kg for deleterious substances referred to in items 1 to 7, in column 1, of Schedule 4; or

(b) in MBq for a deleterious substance referred to in item 8, in column 1, of that Schedule.

(2) The owner or operator shall determine the loading for each month using the following formula:

$$ML = C \times V / 1{,}000$$

where

ML is the loading for a month;

20 (1) À l'égard des substances nocives se trouvant dans l'effluent rejeté à partir de chaque point de rejet final, le propriétaire ou l'exploitant d'une mine enregistre, pour chaque mois et pour chaque trimestre civil au cours duquel un effluent a été rejeté :

a) la charge en kg des substances nocives énumérées aux articles 1 à 7 de l'annexe 4, dans la colonne 1;

b) la charge en MBq de la substance figurant à l'article 8 de la même annexe, dans la colonne 1.

(2) Il détermine la charge pour chaque mois civil selon la formule suivante :

$$CM = C \times V / 1\,000$$

où :

CM représente la charge pour un mois;

C is the monthly mean concentration of the deleterious substance, recorded under section 19.1; and

V is the total monthly volume of effluent deposited from each final discharge point, recorded under section 19.

(3) The owner or operator shall determine the loading for each calendar quarter using the following formula:

$$QL = C \times V / 1{,}000$$

where

QL is the loading for a calendar quarter;

C is the mean of the monthly mean concentrations of the deleterious substance for that calendar quarter, recorded under section 19.1; and

V is the total volume of effluent deposited from each final discharge point during that calendar quarter, based on the sum of the total monthly volumes of effluent deposited from each final discharge point, recorded under section 19.

SOR/2006-239, s. 9.

Reporting Monitoring Results

21 (1) The owner or operator of a mine shall submit to the authorization officer an effluent monitoring report for all tests and monitoring conducted during each calendar quarter not later than 45 days after the end of the quarter.

(2) Subject to subsection (3), the effluent monitoring report shall include

(a) the information specified by section 8.1 of Reference Method EPS 1/RM/13 and by section 8.1 of Reference Method EPS 1/RM/14 as required by section 18;

(b) the concentration and monthly mean concentration of each deleterious substance set out in column 1 of Schedule 4 that is contained in effluent samples collected under subsection 12(1) and the concentrations of such deleterious substances contained in effluent samples collected under subsection 13(1) or (2);

(c) the pH of the effluent samples as required by subsection 12(1);

(d) whether a composite or grab sample collection method was used for each effluent sample as required by subsection 12(1);

(d.1) for each month of the calendar quarter, the number of days that effluent was deposited;

C la concentration moyenne mensuelle de la substance nocive enregistrée en application de l'article 19.1;

V le volume total d'effluent rejeté à partir de chaque point de rejet final au cours du mois et enregistré en application de l'article 19.

(3) Il détermine la charge pour le trimestre civil selon la formule suivante :

$$CT = C \times V / 1\,000$$

où :

CT représente la charge pour un trimestre;

C la moyenne des concentrations moyennes mensuelles de la substance nocive enregistrées au cours du trimestre en application de l'article 19.1;

V le volume total d'effluent rejeté à partir de chaque point de rejet final au cours du trimestre, fondé sur la somme des volumes mensuels d'effluent rejeté à partir de chaque point de rejet final et enregistrés en application de l'article 19.

DORS/2006-239, art. 9.

Rapports sur les résultats de suivi

21 (1) Le propriétaire ou l'exploitant d'une mine présente à l'agent d'autorisation un rapport sur le suivi de l'effluent pour tout essai ou mesure de suivi effectué au cours de chaque trimestre civil, dans les quarante-cinq jours suivant la fin du trimestre.

(2) Sous réserve du paragraphe (3), le rapport comporte ce qui suit :

a) les données visées à la section 8.1 de la méthode de référence SPE 1/RM/13 et à la section 8.1 de la méthode de référence SPE 1/RM/14, qu'exige l'article 18;

b) la concentration et la concentration moyenne mensuelle des substances nocives énumérées à la colonne 1 de l'annexe 4 se trouvant dans les échantillons d'effluent prélevés en application du paragraphe 12(1) de même que la concentration de ces substances nocives dans les échantillons d'effluent prélevés en application des paragraphes 13(1) ou (2);

c) le pH des échantillons, exigé par le paragraphe 12(1);

d) pour chaque échantillon d'effluent prélevé en application du paragraphe 12(1), s'il s'agit d'un échantillon composite ou instantané;

d.1) pour chaque mois du trimestre civil, le nombre de jours où il y a eu rejet d'effluent;

(e) the total volume of effluent deposited during each month of the reporting quarter as recorded under section 19;

(f) the mass loading of the deleterious substances set out in column 1 of Schedule 4 as recorded under section 20; and

(g) the results of the effluent characterization conducted under paragraph 15(1)(a).

(3) If no effluent is deposited in a calendar quarter, the report shall only include a statement to that effect.

SOR/2006-239, s. 10.

22 The owner or operator of a mine shall submit to the authorization officer, not later than March 31 in each year, a report summarizing the effluent monitoring results for the previous calendar year including the information set out in Schedule 6 and in the form set out in that Schedule.

SOR/2006-239, s. 11.

23 Each report referred to in sections 7, 21 and 22 shall be submitted electronically in the format provided by the federal Department of the Environment, but the report shall be submitted in writing if

(a) no such format has been provided; or

(b) it is, owing to circumstances beyond the control of either the owner or the operator, impracticable to submit the report electronically in the format provided.

SOR/2006-239, s. 11.

24 (1) The owner or operator of a mine shall notify an inspector without delay if the results of the effluent monitoring tests conducted under section 12 or 13, paragraph 14(1)(a) or section 15 or 16 indicate that

(a) the limits set out in Schedule 4 are being or have been exceeded;

(b) the pH of the effluent is less than 6.0 or greater than 9.5; or

(c) an effluent is acutely lethal.

(2) The owner or operator shall provide a written report of the test results to the inspector within 30 days after the tests have been completed.

e) le volume total d'effluent rejeté pour chaque mois du trimestre, enregistré en application de l'article 19;

f) la charge des substances nocives énumérées à la colonne 1 de l'annexe 4 enregistrée en application de l'article 20;

g) les résultats des essais de caractérisation de l'effluent effectués conformément à l'alinéa 15(1)a).

(3) Si au cours d'un trimestre civil aucun effluent n'a été rejeté, le rapport ne comporte qu'une mention à cet effet.

DORS/2006-239, art. 10.

22 Le propriétaire ou l'exploitant d'une mine présente à l'agent d'autorisation, au plus tard le 31 mars de chaque année, un rapport résumant les résultats du suivi de l'effluent pour l'année civile précédente et comportant les renseignements prévus à l'annexe 6, en la forme qui y est prévue.

DORS/2006-239, art. 11.

23 Les rapports visés aux articles 7, 21 et 22 sont présentés sous forme électronique selon le modèle fourni par le ministère de l'Environnement du Canada. Ils sont toutefois présentés par écrit dans l'un ou l'autre des cas suivants :

a) aucun modèle n'est fourni;

b) il est pratiquement impossible, pour des raisons indépendantes de la volonté du propriétaire ou de l'exploitant, selon le cas, de les présenter sous forme électronique selon le modèle fourni.

DORS/2006-239, art. 11.

24 (1) Le propriétaire ou l'exploitant d'une mine avise sans délai l'inspecteur si les résultats des essais de suivi de l'effluent effectués en application des articles 12 ou 13, de l'alinéa 14(1)a) ou des articles 15 ou 16 montrent que :

a) les limites prévues à l'annexe 4 sont ou ont été dépassées;

b) le pH de l'effluent est inférieur à 6,0 ou supérieur à 9,5;

c) l'effluent est un effluent à létalité aiguë.

(2) Il présente à l'inspecteur un rapport écrit des résultats des essais dans les trente jours suivant la fin de ceux-ci.

(3) Subsections (1) and (2) do not apply to the owner or operator of a mine with a valid transitional authorization.

SOR/2006-239, s. 12.

(3) Les paragraphes (1) et (2) ne s’appliquent pas au propriétaire ou à l’exploitant d’une mine ayant une autorisation transitoire valide.

DORS/2006-239, art. 12.

Relief

25 (1) Any time period specified for collecting samples of effluent referred to in this Division may be extended if

(a) unforeseen circumstances cause safety concerns or access problems and render the collection of samples of effluent impracticable; and

(b) the owner or operator of a mine notifies an inspector, without delay, of the circumstances and indicates when they expect to be able to collect the samples.

(2) The owner or operator shall collect the samples of effluent without delay when the circumstances permit.

SOR/2006-239, s. 13.

Dispense

25 (1) Les délais prévus dans la présente section à l’égard du prélèvement des échantillons d’effluent peuvent être prorogés si les conditions suivantes sont réunies :

a) des circonstances imprévues provoquent des problèmes de sécurité ou d’accessibilité et rendent le prélèvement d’échantillons d’effluent pratiquement impossible;

b) le propriétaire ou l’exploitant d’une mine a avisé l’inspecteur sans délai des circonstances et lui a indiqué le moment où il croit pouvoir procéder au prélèvement des échantillons.

(2) Le propriétaire ou l’exploitant prélève les échantillons d’effluent sans délai dès que les circonstances le permettent.

DORS/2006-239, art. 13.

DIVISION 3

Notice, Records and Other Documents

End of Commercial Operation Notice

26 (1) The owner or operator of a mine shall notify the authorization officer in writing of the day on which the mine has stopped commercial operation not later than 90 days after the end of commercial operation.

(2) The owner or operator shall notify the authorization officer in writing without delay if the mine returns to commercial operation.

Records, Books of Account or Other Documents

27 Subject to subsection 32(4), the owner or operator of a mine shall keep all records, books of account or other documents required by these Regulations at the mine’s location for a period of not less than five years, beginning on the day they are made.

SECTION 3

Avis, registres et autres documents

Avis de la fin de l’exploitation commerciale

26 (1) Le propriétaire ou l’exploitant d’une mine avise l’agent d’autorisation par écrit de la date où l’exploitation commerciale de la mine a cessé, dans les quatre-vingt-dix jours suivant la cessation.

(2) Il avise l’agent d’autorisation, par écrit et sans délai, de la reprise de l’exploitation commerciale.

Registres, livres comptables ou autres documents

27 Sous réserve du paragraphe 32(4), le propriétaire ou l’exploitant d’une mine conserve tous les registres, livres comptables ou autres documents exigés par le présent règlement à l’emplacement de la mine pendant au moins cinq ans à compter de leur établissement.

DIVISION 4

Tailings Impoundment Areas

Compensation Plan

27.1 (1) The owner or operator of a mine shall submit to the Minister for approval a compensation plan and obtain the Minister's approval of that plan before depositing a deleterious substance into a tailings impoundment area that is added to Schedule 2 after the coming into force of this section.

(2) The purpose of the compensation plan is to offset for the loss of fish habitat resulting from the deposit of a deleterious substance into the tailings impoundment area.

(3) The compensation plan shall contain the following elements:

- **(a)** a description of the location of the tailings impoundment area and the fish habitat affected by the deposit;
- **(b)** a quantitative impact assessment of the deposit on the fish habitat;
- **(c)** a description of the measures to be taken to offset the loss of fish habitat caused by the deposit;
- **(d)** a description of the measures to be taken during the planning and implementation of the compensation plan to mitigate any potential adverse effect on the fish habitat that could result from the plan's implementation;
- **(e)** a description of measures to be taken to monitor the plan's implementation;
- **(f)** a description of the measures to be taken to verify the extent to which the plan's purpose has been achieved;
- **(g)** a description of the time schedule for the plan's implementation, which time schedule shall provide for achievement of the plan's purpose within a reasonable time; and
- **(h)** an estimate of the cost of implementing each element of the plan.

(4) The owner or operator shall submit with the compensation plan an irrevocable letter of credit to cover the plan's implementation costs, which letter of credit shall

SECTION 4

Dépôts de résidus miniers

Plan compensatoire

27.1 (1) Le propriétaire ou l'exploitant d'une mine présente au ministre un plan compensatoire pour approbation et doit obtenir celle-ci avant de rejeter des substances nocives dans tout dépôt de résidus miniers qui est ajouté à l'annexe 2 après l'entrée en vigueur du présent article.

(2) Le plan compensatoire a pour objectif de contrebalancer la perte d'habitat du poisson consécutive au rejet de substances nocives dans le dépôt de résidus miniers.

(3) Le plan compensatoire comporte des dispositions portant sur les éléments suivants :

- **a)** une description de l'emplacement du dépôt de résidus miniers et de l'habitat du poisson atteint par le rejet de substances nocives;
- **b)** l'analyse quantitative de l'incidence du rejet sur l'habitat du poisson;
- **c)** les mesures visant à contrebalancer la perte d'habitat du poisson;
- **d)** les mesures envisagées durant la planification et la mise en œuvre du plan pour atténuer les effets défavorables sur l'habitat du poisson qui pourraient résulter de la mise en œuvre du plan;
- **e)** les mesures de surveillance de la mise en œuvre du plan;
- **f)** les mécanismes visant à établir dans quelle mesure les objectifs du plan ont été atteints;
- **g)** le délai pour la mise en œuvre du plan, lequel délai permet l'atteinte des objectifs prévus dans un délai raisonnable;
- **h)** l'estimation du coût de mise en œuvre de chacun des éléments du plan.

(4) Le propriétaire ou l'exploitant présente, avec le plan compensatoire, une lettre de crédit irrévocable couvrant be payable upon demand on the declining balance of the implementation costs.

(5) The Minister shall approve the compensation plan if it meets the requirements of subsections (2) and (3) and the owner or operator has complied with subsection (4).

(6) The owner or operator shall ensure that the compensation plan approved by the Minister is implemented.

(7) If the measures referred to in paragraph (3)(f) reveal that the compensation plan's purpose is not being achieved, the owner or operator shall inform the Minister and, as soon as possible in the circumstances, identify and implement all necessary remedial measures.

SOR/2006-239, s. 14.

Deposits from Tailings Impoundment Areas

28 (1) The owner or operator of a mine shall deposit effluent from a tailings impoundment area only through a final discharge point that is monitored and reported on in accordance with the requirements of these Regulations.

(2) The owner or operator of a mine shall comply with section 6 and the conditions prescribed in paragraphs 4(1)(a) to (c) for all effluent that exits a tailing impoundment area.

PART 3

Deposits out of the Normal Course of Events

Prescribed Persons

[SOR/2006-239, s. 15(E)]

29 For the purpose of subsection 38(4) of the Act, the person occupying the position set out in column 2 of Schedule 6.1 for the province, set out in column 1, where the mine is located is a prescribed person.

SOR/2006-239, s. 16; SOR/2011-92, s. 5.

Emergency Response Plan

30 (1) The owner or operator of a mine shall prepare an emergency response plan that describes the measures to be taken in respect of a deleterious substance within the meaning of subsection 34(1) of the Act to prevent any

les coûts de mise en œuvre du plan et payable sur demande à l'égard du coût des éléments du plan qui n'ont pas été mis en œuvre.

(5) Le ministre approuve le plan compensatoire si les exigences des paragraphes (2) et (3) ont été remplies et si le propriétaire ou l'exploitant s'est conformé aux exigences du paragraphe (4).

(6) Le propriétaire ou l'exploitant veille à ce que le plan compensatoire soit mis en œuvre.

(7) Si les mécanismes visés à l'alinéa (3)f) révèlent que les objectifs n'ont pas été atteints, le propriétaire ou l'exploitant en informe le ministre et, le plus tôt possible dans les circonstances, détermine et prend les mesures correctives nécessaires à l'atteinte des objectifs.

DORS/2006-239, art. 14.

Rejets à partir de dépôts de résidus miniers

28 (1) Le propriétaire ou l'exploitant d'une mine ne rejette l'effluent provenant d'un dépôt de résidus miniers qu'à un point de rejet final faisant l'objet d'un suivi et de rapports conformément aux exigences du présent règlement.

(2) Il remplit les conditions prévues aux alinéas 4(1)a) à c) et se conforme à l'article 6 lorsqu'il rejette un tel effluent.

PARTIE 3

Rejets irréguliers

Autorités désignées

[DORS/2006-239, art. 15(A)]

29 Pour l'application du paragraphe 38(4) de la Loi, l'autorité désignée est la personne qui occupe le poste mentionné à la colonne 2 de l'annexe 6.1 en regard de la province, mentionnée à la colonne 1, où la mine est située.

DORS/2006-239, art. 16; DORS/2011-92, art. 5.

Plan d'intervention d'urgence

30 (1) Le propriétaire ou l'exploitant d'une mine dresse un plan d'intervention d'urgence qui énonce, à l'égard d'une substance nocive au sens du paragraphe 34(1) de la Loi, les mesures à prendre pour prévenir tout rejet deposit out of the normal course of events of such a substance or to mitigate the effects of such a deposit.

(2) The emergency response plan shall include the following elements:

(a) the identification of any deposit out of the normal course of events that can reasonably be expected to occur at the mine and that can reasonably be expected to result in damage or danger to fish habitat or fish or the use by man of fish, and the identification of the damage or danger;

(b) a description of the measures to be used to prevent, prepare for and respond to a deposit identified under paragraph (a);

(c) a list of the individuals who are to implement the plan in the event of a deposit out of the normal course of events, and a description of their roles and responsibilities;

(d) the identification of the emergency response training required for each of the individuals listed under paragraph (c);

(e) a list of the emergency response equipment included as part of the plan, and the equipment's location; and

(f) alerting and notification procedures including the measures to be taken to notify members of the public who may be adversely affected by a deposit identified under paragraph (a).

(3) The owner or operator shall complete the emergency response plan and have it available for inspection no later than 60 days after the mine becomes subject to this section.

(4) The owner or operator shall update and test the emergency response plan at least once each year to ensure that the plan continues to meet the requirements of subsection (2).

(5) If a mine has not been subject to the requirements of this section for more than one year, a new emergency response plan shall be prepared and completed no later than 60 days after the day on which the mine again becomes subject to this section.

SOR/2006-239, s. 16; SOR/2012-22, s. 6(F).

Reporting

31 (1) Any person required by subsection 38(4) of the Act to report the occurrence of a deposit of a deleterious

irrégulier d'une telle substance ou pour en atténuer les effets.

(2) Le plan d'intervention d'urgence comporte en outre les éléments suivants :

a) la mention de tout rejet irrégulier qui pourrait se produire à la mine et entraîner des dommages ou des risques réels de dommages pour le poisson ou son habitat ou pour l'utilisation par l'homme du poisson, ainsi que l'identification de ces risques ou dommages;

b) le détail des mesures préventives, de préparation et d'intervention à l'égard du rejet irrégulier mentionné au titre de l'alinéa a);

c) la liste des personnes chargées de mettre à exécution le plan en cas de rejet irrégulier ainsi qu'une description de leurs rôles et responsabilités;

d) la mention de la formation en intervention d'urgence exigée des personnes visées à l'alinéa c);

e) la liste de l'équipement d'intervention d'urgence prévu dans le plan et l'emplacement de cet équipement;

f) les procédures d'alerte et de notification, notamment les mesures prévues pour avertir les membres du public auxquels le rejet irrégulier mentionné au titre de l'alinéa a) pourrait causer un préjudice.

(3) Le propriétaire ou l'exploitant termine le plan d'intervention d'urgence, lequel doit être disponible pour inspection, dans les soixante jours suivant la date à laquelle la mine devient assujettie au présent article.

(4) Il tient à jour et met à l'essai le plan d'intervention d'urgence au moins une fois par année afin de veiller à ce que celui-ci satisfasse aux exigences du paragraphe (2).

(5) Si la mine n'a pas été assujettie au présent article pendant plus d'un an, un nouveau plan d'intervention d'urgence est dressé — et doit être terminé — dans les soixante jours suivant la date à laquelle elle le redevient.

DORS/2006-239, art. 16; DORS/2012-22, art. 6(F).

Rapport

31 (1) Toute personne tenue de faire rapport, en application du paragraphe 38(4) de la Loi, du rejet irrégulier substance out of the normal course of events shall, if a deposit has occurred, submit a written report to an inspector or the person referred to in section 29 as soon as possible in the circumstances, but at the latest 30 days after the day on which the deposit occurred.

(2) The written report shall contain

(a) the name, description and concentration of the deleterious substance deposited;

(b) the estimated quantity of the deposit and how the estimate was achieved;

(c) the quantity of any deleterious substance that was deposited at a place other than through a final discharge point and the identification of that place;

(d) the quantity of any deleterious substance that was deposited through a final discharge point and the identification of that discharge point;

(e) the name of the receiving body of water, if there is a name and, if not, the location by latitude and longitude, in degrees, minutes and seconds, where the deleterious substance entered the receiving body of water;

(f) the results of the acute lethality test conducted under paragraph 14(1)(b);

(g) a statement that an acute lethality test was not conducted but that notification was given under subsection 14(1.1), as the case may be; and

(h) the circumstances of the deposit, the measures that were taken to mitigate the effects of the deposit and, if the emergency response plan was implemented, details concerning its implementation.

SOR/2006-239, s. 17; SOR/2011-92, s. 6.

effectif d'une substance nocive présente le rapport par écrit à l'inspecteur ou à l'autorité visée à l'article 29, le plus tôt possible dans les circonstances, mais au plus tard trente jours après la date du rejet.

(2) Le rapport comporte :

a) le nom, la description et la concentration de la substance nocive rejetée;

b) la quantité estimative du rejet ainsi que la méthode d'estimation utilisée;

c) la quantité de toute substance nocive qui a été rejetée à partir d'un lieu autre qu'un point de rejet final, et la mention de ce lieu;

d) la quantité de toute substance nocive qui a été rejetée à partir d'un point de rejet final, et la mention de celui-ci;

e) le nom du milieu aquatique récepteur, si ce nom existe et, si ce nom n'existe pas, la latitude et la longitude, exprimées en degrés, minutes et secondes, du point de pénétration de la substance nocive dans le milieu aquatique;

f) les résultats de l'essai de détermination de la létalité aiguë effectué en application de l'alinéa 14(1)b);

g) une attestation que l'essai de détermination de la létalité aiguë n'a pas été effectué mais qu'un avis a été donné en application du paragraphe 14(1.1), le cas échéant;

h) les circonstances du rejet, les mesures d'atténuation prises et, si le plan d'intervention d'urgence a été mis en œuvre, le détail de son application.

DORS/2006-239, art. 17; DORS/2011-92, art. 6.

PART 4

Recognized Closed Mines

Requirements

32 (1) An owner or operator who intends to close a mine shall

(a) provide written notice of that intention to the authorization officer;

(b) maintain the mine's rate of production at less than 10% of its design rated capacity for a continuous

PARTIE 4

Mines fermées reconnues

Exigences

32 (1) Le propriétaire ou l'exploitant qui souhaite fermer sa mine :

a) en avise l'agent d'autorisation par écrit;

b) maintient la mine, durant une période continue de trois ans commençant à la date de réception de l'avis, period of three years starting on the day that the written notice is received by the authorization officer; and

(c) conduct a biological monitoring study during the three-year period referred to in paragraph (b) in accordance with Division 3 of Part 2 of Schedule 5.

(2) If the owner or operator has complied with all of the requirements set out in paragraphs (1)(a) to (c), the mine becomes a recognized closed mine after the expiry of the three-year period referred to in subsection (1).

(3) The owner or operator shall notify the authorization officer in writing at least 60 days before reopening the recognized closed mine.

(4) The owner or operator referred to in this section shall keep at any place in Canada all records, books of account or other documents required by these Regulations for a period of not less than five years beginning on the day they are made, and shall notify the authorization officer in writing of their location.

SOR/2006-239, s. 18.

Identifying Information

33 (1) The owner or operator of a recognized closed mine shall submit in writing to the authorization officer the information referred to in subsection (2) not later than 60 days after the day on which

(a) the recognized closed mine becomes subject to these Regulations; or

(b) ownership of the recognized closed mine is transferred.

(2) The information that shall be submitted is the name and address of

(a) both the owner and the operator of the recognized closed mine; and

(b) any parent company of the owner or the operator.

(3) The owner or operator shall notify the authorization officer of any change in the information not later than 60 days after the change occurs.

à un taux de production inférieur à 10 % de sa capacité nominale;

c) effectue, durant la période prévue à l'alinéa b), une étude de suivi biologique conformément à la section 3 de la partie 2 de l'annexe 5.

(2) La mine devient une mine fermée reconnue à l'expiration de la période de trois ans prévue au paragraphe (1) si le propriétaire ou l'exploitant s'est conformé aux exigences visées aux alinéas (1)a) à c).

(3) Le propriétaire ou l'exploitant avise par écrit l'agent d'autorisation de la réouverture de la mine fermée reconnue au moins soixante jours avant la réouverture.

(4) Le propriétaire ou l'exploitant visé par le présent article conserve n'importe où au Canada tous les registres, livres comptables ou autres documents exigés par le présent règlement pendant au moins cinq ans à compter de leur établissement et avise l'agent d'autorisation par écrit du lieu où ils se trouvent.

DORS/2006-239, art. 18.

Renseignements d'identification

33 (1) Le propriétaire ou l'exploitant d'une mine fermée reconnue présente par écrit à l'agent d'autorisation les renseignements mentionnés au paragraphe (2) :

a) dans les soixante jours suivant la date à laquelle la mine fermée reconnue devient assujettie au présent règlement;

b) dans les soixante jours suivant le transfert de propriété de la mine fermée reconnue.

(2) Les renseignements à présenter sont :

a) les nom et adresse du propriétaire et de l'exploitant;

b) les nom et adresse de toute société mère du propriétaire ou de l'exploitant.

(3) Le propriétaire ou l'exploitant avise l'agent d'autorisation de tout changement des renseignements dans les soixante jours suivant le changement.

PART 5

Transitional Authorizations

Application for Transitional Authorization

34 (1) The owner or operator of a mine may apply to an authorization officer for a transitional authorization that permits the deposit of

(a) an acutely lethal effluent, unless another law of the jurisdiction where the mine is located requires that the mine produce a non-acutely lethal effluent;

(b) an effluent containing any concentration of a deleterious substance that is set out in any of items 1 to 8 of Schedule 4, unless another law of the jurisdiction where the mine is located requires that the mine produce an effluent containing the deleterious substance in a concentration that is equal to or less than the limits set out in Schedule 4; and

(c) an effluent of any pH, unless another law of the jurisdiction where the mine is located requires that the mine produce an effluent with a pH equal to or greater than 6.0 but not greater than 9.5.

(2) Despite paragraph (1)(a), the owner or operator may apply for a transitional authorization to deposit acutely lethal effluent only if the mine produced such an effluent at any time during the 12-month period preceding the application.

(3) The owner or operator of a mine may apply to an authorization officer for a transitional authorization that permits only the deposit of an effluent containing any concentration of total suspended solids, but may not apply if another law of the jurisdiction where the mine is located requires that the mine produce an effluent containing total suspended solids in a concentration equal to or less than the limits set out in Schedule 4 or if, during the 12-month period preceding the application, the results of two consecutive effluent monitoring tests conducted under sections 12 to 16 indicate that

(a) the concentration in the effluent of any of the deleterious substances referred to in any of items 1 to 6 or 8 of Schedule 4 exceeded the applicable authorized limits set out in that Schedule;

(b) the pH of the effluent was less than 6.0 or greater than 9.5; or

PARTIE 5

Autorisations transitoires

Demande d’autorisation transitoire

34 (1) Le propriétaire ou l’exploitant d’une mine peut présenter à l’agent d’autorisation une demande visant une autorisation transitoire permettant le rejet de l’un ou l’autre des effluents suivants :

a) un effluent à létalité aiguë, sauf si une autre loi de l’autorité législative du territoire où est située la mine exige que celle-ci produise un effluent à létalité non aiguë;

b) un effluent contenant toute substance nocive figurant à l’un des articles 1 à 8 de l’annexe 4, quelle que soit sa concentration, sauf si une autre loi de l’autorité législative du territoire où est située la mine exige que celle-ci produise un effluent contenant la substance en une concentration égale ou inférieure aux limites établies à l’annexe 4;

c) un effluent, quel que soit son pH, sauf si une autre loi de l’autorité législative du territoire où est située la mine exige que celle-ci produise un effluent dont le pH est égal ou supérieur à 6,0 mais ne dépasse pas 9,5.

(2) Malgré l’alinéa (1)a), il ne peut présenter une demande visant une autorisation transitoire permettant le rejet d’un effluent à létalité aiguë que si, à un moment quelconque au cours des douze mois précédant la demande, la mine a rejeté un tel effluent.

(3) Le propriétaire ou l’exploitant d’une mine peut présenter à l’agent d’autorisation une demande visant une autorisation transitoire permettant le rejet d’un effluent contenant toute concentration du total des solides en suspension. Il ne peut toutefois le faire si une autre loi de l’autorité législative du territoire où est située la mine exige que celle-ci produise un effluent contenant le total des solides en suspension en une concentration égale ou inférieure aux limites établies à l’annexe 4 ou si, au cours des douze mois précédant la demande, les résultats de deux essais consécutifs de suivi de l’effluent effectués en application des articles 12 à 16 ont montré que :

a) soit la concentration dans l’effluent de toute substance nocive figurant à l’un des articles 1 à 6 et 8 de l’annexe 4 a dépassé les limites permises prévues à cette annexe;

(c) the effluent was acutely lethal.

(4) The owner or operator referred to in subsection (1) shall submit an application for a transitional authorization not later than three months after June 6, 2002 and shall submit with the application,

(a) the information required by Part 1 of Schedule 7 including, for the 12-month period preceding the application

(i) the monthly mean concentrations of the deleterious substances set out in column 1 of Schedule 4 that are contained in the effluent,

(ii) whether the effluent is acutely lethal, and

(iii) the pH of the effluent;

(b) a description of the facilities and procedures that are necessary to deposit an effluent that complies with paragraphs 4(1)(a) to (c);

(c) a proposed schedule for the construction of the facilities and implementation of the procedures; and

(d) a signed statement of certification as set out in Part 2 of Schedule 7.

(5) The owner or operator referred to in subsection (3) shall submit an application for a transitional authorization not earlier than 24 months and not later than 27 months after June 6, 2002 and shall submit with the application

(a) the information required by Part 1 of Schedule 7 including, for the 12-month period preceding the application,

(i) the monthly mean concentrations of the deleterious substances set out in column 1 of Schedule 4 that are contained in the effluent,

(ii) whether the effluent is acutely lethal, and

(iii) the pH of the effluent;

(b) a description of the facilities and procedures that are necessary to deposit an effluent that complies with the concentrations referred to in item 7 of Schedule 4;

(c) a proposed schedule for the construction of the facilities and implementation of the procedures;

b) soit le pH de l'effluent était inférieur à 6,0 ou supérieur à 9,5;

c) soit l'effluent était un effluent à létalité aiguë.

(4) Le propriétaire ou l'exploitant visé au paragraphe (1) présente la demande d'autorisation transitoire dans les trois mois suivant le 6 juin 2002 et soumet avec sa demande :

a) les renseignements prévus à la partie 1 de l'annexe 7, notamment, à l'égard des douze mois précédant la demande :

(i) la concentration moyenne mensuelle des substances nocives énumérées à la colonne 1 de l'annexe 4 se trouvant dans l'effluent,

(ii) s'il s'agit ou non d'un effluent à létalité aiguë,

(iii) le pH de l'effluent;

b) la liste des installations et pratiques qui sont nécessaires pour que l'effluent rejeté soit conforme aux conditions prévues aux alinéas 4(1)a) à c);

c) un projet de calendrier de construction des installations et de mise en œuvre des pratiques;

d) l'attestation prévue à la partie 2 de l'annexe 7.

(5) Le propriétaire ou l'exploitant visé au paragraphe (3) présente la demande d'autorisation transitoire au plus tôt vingt-quatre mois après le 6 juin 2002 mais au plus tard vingt-sept mois après cette date et soumet avec sa demande :

a) les renseignements prévus à la partie 1 de l'annexe 7, notamment, à l'égard des douze mois précédant la demande :

(i) la concentration moyenne mensuelle des substances nocives énumérées à la colonne 1 de l'annexe 4 se trouvant dans l'effluent,

(ii) s'il s'agit ou non d'un effluent à létalité aiguë,

(iii) le pH de l'effluent;

b) la liste des installations et pratiques qui sont nécessaires pour que l'effluent rejeté soit conforme aux limites permises prévues à l'article 7 de l'annexe 4;

c) un projet de calendrier de construction des installations et de mise en œuvre des pratiques;

d) l'attestation prévue à la partie 2 de l'annexe 7;

(d) a signed statement of certification as set out in Part 2 of Schedule 7; and

(e) a statement of certification signed by the owner, the operator or their duly authorized representative indicating that there is no feasible alternative to the transitional authorization, based on documented engineering evidence.

SOR/2006-239, s. 19(F); SOR/2012-22, s. 7.

e) une attestation signée par le propriétaire, l'exploitant ou leur représentant dûment autorisé précisant qu'il n'existe aucune autre solution sur la base de preuves techniques.

DORS/2006-239, art. 19(F); DORS/2012-22, art. 7.

Issuance of Transitional Authorization

35 (1) An authorization officer shall issue to the owner or operator of a mine a transitional authorization, if

(a) the owner or operator is entitled to make the application under subsections 34(1) to (3) and has complied with subsection 34(4) or (5), as applicable; and

(b) any construction of facilities and the implementation of the procedures described by the owner or operator under paragraph 34(4)(b) or (5)(b), as applicable will result in the deposit of an effluent that complies with the requirements prescribed in paragraphs 4(1)(a) to (c).

(2) The authorization officer shall issue a transitional authorization in the form set out in Schedule 8 and provide in the authorization

(a) for the deposit of acutely lethal effluent, the information required by Part 1 of Schedule 8; and

(b) for the deposit of effluent that contains a deleterious substance set out in column 1 of Schedule 4, the information required by Part 2 of Schedule 8, including the maximum concentration of the deleterious substances and the pH range of the effluent the determination of which are specified in that Schedule.

(3) Authorization officers shall maintain a public record of all transitional authorizations issued for mines located in the province where they perform their functions.

Délivrance des autorisations transitoires

35 (1) L'agent d'autorisation délivre une autorisation transitoire au propriétaire ou à l'exploitant d'une mine aux conditions suivantes :

a) le propriétaire ou l'exploitant a le droit de faire une telle demande aux termes des paragraphes 34(1), (2) et (3) et il s'est conformé aux paragraphes 34(4) ou (5), selon le cas;

b) les installations et les pratiques proposées par le propriétaire ou l'exploitant aux termes des alinéas 34(4)b) ou (5)b) rendront le rejet de l'effluent conforme aux conditions prévues aux alinéas 4(1)a) à c).

(2) L'agent d'autorisation délivre l'autorisation transitoire en la forme prévue à l'annexe 8 et y inscrit :

a) si elle vise le rejet d'un effluent à létalité aiguë, les renseignements prévus à la partie 1 de l'annexe 8;

b) si elle vise le rejet d'un effluent contenant des substances nocives énumérées à la colonne 1 de l'annexe 4, les renseignements prévus à la partie 2 de l'annexe 8, notamment la concentration maximale des substances nocives et la plage du pH de l'effluent déterminées selon cette annexe.

(3) L'agent d'autorisation tient un registre public de toutes les autorisations transitoires délivrées à l'égard des mines situées dans la province où il exerce ses fonctions.

Transitional Authorization Obligations

36 An owner or operator of a mine who has been issued a transitional authorization

Exigences relatives aux autorisations transitoires

36 Le propriétaire ou l'exploitant d'une mine à qui une autorisation transitoire a été délivrée doit satisfaire aux exigences suivantes :

(a) shall comply with sections 6 to 27 and, if the mine is depositing effluent into a tailings impoundment area, subsection 28(1);

(b) shall start the construction of the facilities and implement the procedures referred to in paragraph 34(4)(b) or (5)(b), as applicable, in a timely manner;

(c) shall report to the authorization officer, without delay, any change in the information provided under subsection 34(4) or (5);

(d) shall not deposit effluent that contains a deleterious substance set out in column 1 of Schedule 4 that exceeds the maximum concentration that is specified in the transitional authorization or has a pH that is outside the pH range specified in the transitional authorization; and

(e) shall not deposit effluent that is acutely lethal unless authorized to do so in the transitional authorization.

Transitional Authorization Reporting

37 (1) The owner or operator of a mine with a valid transitional authorization shall notify an inspector without delay if

(a) an effluent that contains a deleterious substance set out in column 1 of Schedule 4 exceeds the concentration or is outside the pH range that is specified in the transitional authorization; or

(b) an acutely lethal effluent is being or has been deposited, unless the deposit of acutely lethal effluent is authorized in the transitional authorization.

(2) The owner or operator shall provide to the inspector a written report of any test results which identified that the effluent contains a deleterious substance or is acutely lethal under subsection (1) within 30 days after the tests have been completed.

Revocation of Transitional Authorizations

38 An authorization officer may revoke a transitional authorization if

(a) the information provided by the owner or operator of a mine to support the application for the transitional authorization is false or incomplete; or

a) il doit se conformer aux articles 6 à 27 et, si la mine rejette ses effluents dans un dépôt de résidus miniers, au paragraphe 28(1);

b) il commence la construction des installations et met en œuvre les pratiques visées aux alinéas 34(4)b) ou (5)b) dans les meilleurs délais;

c) il signale à l’agent d’autorisation, sans délai, toute modification des renseignements soumis en application des paragraphes 34(4) ou (5);

d) il ne rejette pas un effluent contenant des substances nocives énumérées à la colonne 1 de l’annexe 4 en une concentration supérieure à celle indiquée dans l’autorisation transitoire ou un effluent ayant un pH en dehors de la plage de pH indiquée dans l’autorisation transitoire;

e) il ne rejette un effluent à létalité aiguë que si l’autorisation transitoire le permet.

Rapport

37 (1) Le propriétaire ou l’exploitant d’une mine ayant une autorisation transitoire valide informe l’inspecteur sans délai :

a) que la concentration dans l’effluent de toute substance nocive figurant à la colonne 1 de l’annexe 4 est supérieure à celle indiquée dans l’autorisation transitoire ou qu’un effluent a un pH en dehors de la plage de pH indiquée dans l’autorisation transitoire;

b) qu’un effluent à létalité aiguë non couvert par l’autorisation transitoire a été ou est rejeté.

(2) Il présente à l’inspecteur un rapport écrit faisant état du résultat de tout essai ayant servi à détecter les substances nocives ou l’effluent à létalité aiguë visés au paragraphe (1) dans les trente jours suivant la fin de l’essai.

Révocation d’une autorisation transitoire

38 L’agent d’autorisation peut révoquer une autorisation transitoire si :

a) soit les renseignements fournis par le propriétaire ou l’exploitant d’une mine à l’appui de sa demande d’autorisation transitoire sont faux ou incomplets;

(b) the owner or operator has failed to comply with any requirement prescribed in sections 36 and 37.

Expiry of Transitional Authorizations

39 (1) Subject to subsection (2), transitional authorizations expire 30 months after June 6, 2002.

(2) Transitional authorizations referred to in subsection 34(3) that expired on June 6, 2007 are deemed to be reissued as of the day on which this subsection comes into force and they shall expire on December 6, 2008.

SOR/2007-161, s. 1; SOR/2012-22, s. 8.

PART 6

Repeals and Coming into Force

Repeals

40 [Repeal]

41 [Repeal]

Coming into Force

42 (1) Subject to subsection (2), these Regulations come into force on the day on which they are registered.

(2) Sections 3 to 33 and 36 to 39 and 41 come into force six months after the day on which these Regulations are registered.

b) soit le propriétaire ou l’exploitant n’a pas satisfait à l’une ou l’autre des exigences prévues aux articles 36 et 37.

Expiration de l’autorisation transitoire

39 (1) Sous réserve du paragraphe (2), les autorisations transitoires expirent trente mois après le 6 juin 2002.

(2) Les autorisations transitoires visées au paragraphe 34(3) qui ont expiré le 6 juin 2007 sont réputées être délivrées de nouveau à la date d’entrée en vigueur du présent paragraphe et elles expirent le 6 décembre 2008.

DORS/2007-161, art. 1; DORS/2012-22, art. 8.

PARTIE 6

Abrogations et entrée en vigueur

Abrogations

40 [Abrogation]

41 [Abrogation]

Entrée en vigueur

42 (1) Sous réserve du paragraphe (2), le présent règlement entre en vigueur à la date de son enregistrement.

(2) Les articles 3 à 33 et 36 à 39 et 41 entrent en vigueur six mois après l’enregistrement du présent règlement.

SCHEDULE 1

(Subsection 1(1))

Authorization Officers

Item	Column 1 Province	Column 2 Title
1	Ontario	Director, Environmental Protection Operations Directorate — Ontario Environment Canada
2	Quebec	Director, Environmental Protection Operations Directorate — Quebec Environment Canada
3	Nova Scotia	Director, Environmental Protection Operations Directorate — Atlantic Environment Canada
4	New Brunswick	Director, Environmental Protection Operations Directorate — Atlantic Environment Canada
5	Manitoba	Director, Environmental Protection Operations Directorate — Prairie and Northern Environment Canada
6	British Columbia	Director, Environmental Protection Operations Directorate — Pacific and Yukon Environment Canada
7	Prince Edward Island	Director, Environmental Protection Operations Directorate — Atlantic Environment Canada
8	Saskatchewan	Director, Environmental Protection Operations Directorate — Prairie and Northern Environment Canada
9	Alberta	Director, Environmental Protection Operations Directorate — Prairie and Northern Environment Canada
10	Newfoundland and Labrador	Director, Environmental Protection Operations Directorate — Atlantic Environment Canada
11	Yukon Territory	Director, Environmental Protection Operations Directorate — Pacific and Yukon Environment Canada
12	Northwest Territories	Director, Environmental Protection Operations Directorate — Prairie and Northern Environment Canada
13	Nunavut	Director, Environmental Protection Operations Directorate — Prairie and Northern Environment Canada

SOR/2006-239, s. 20; SOR/2012-22, s. 9.

ANNEXE 1

(paragraphe 1(1))

Agents d’autorisation

Article	Colonne 1 Province	Colonne 2 Poste
1	Ontario	Directeur, Direction des activités de protection de l’environnement — Ontario Environnement Canada
2	Québec	Directeur, Direction des activités de protection de l’environnement — Québec Environnement Canada
3	Nouvelle-Écosse	Directeur, Direction des activités de protection de l’environnement — Atlantique Environnement Canada
4	Nouveau- Brunswick	Directeur, Direction des activités de protection de l’environnement — Atlantique Environnement Canada
5	Manitoba	Directeur, Direction des activités de protection de l’environnement — Prairies et Nord Environnement Canada
6	Colombie-Britannique	Directeur, Direction des activités de protection de l’environnement — Pacifique et Yukon Environnement Canada
7	Île-du-Prince-Édouard	Directeur, Direction des activités de protection de l’environnement — Atlantique Environnement Canada
8	Saskatchewan	Directeur, Direction des activités de protection de l’environnement — Prairies et Nord Environnement Canada
9	Alberta	Directeur, Direction des activités de protection de l’environnement — Prairies et Nord Environnement Canada
10	Terre-Neuve-et-Labrador	Directeur, Direction des activités de protection de l’environnement — Atlantique Environnement Canada
11	Yukon	Directeur, Direction des activités de protection de l’environnement — Pacifique et Yukon Environnement Canada
12	Territoires du Nord-Ouest	Directeur, Direction des activités de protection de l’environnement — Prairies et Nord Environnement Canada
13	Nunavut	Directeur, Direction des activités de protection de l’environnement — Prairies et Nord Environnement Canada

DORS/2006-239, art. 20; DORS/2012-22, art. 9.

SCHEDULE 2

(Subsections 5(1) and 27.1(1))

Tailings Impoundment Areas

Item	Column 1 Water or Place	Column 2 Description
1	Anderson Lake, Manitoba	Anderson Lake located at 54°51′ north latitude and 100°0′ west longitude near the town of Snow Lake, Manitoba. More precisely, the area bounded by **(a)** the contour of elevation around Anderson Lake at the 285-m level, and **(b)** the control dam built at the east end of Anderson Lake.
2	Garrow Lake, Nunavut	Garrow Lake located at 75°23′ north latitude and 97°48′ west longitude near the south end of Little Cornwallis Island, Nunavut.
3	South Kemess Creek, British Columbia	That part of South Kemess Creek being within the watershed of that tributary of South Kemess Creek **(a)** extending eastwards and upstream from the centre of a tailings dam constructed at 57°1′ north latitude and 126°41′ west longitude, and **(b)** below the crest of the dam at an elevation of 1515 m.
4	Albino Lake, British Columbia	Albino Lake located at 56°39.4′ north latitude and 130°29.4′ west longitude near the Eskay Creek Mine in British Columbia. More precisely, the area bounded by **(a)** the contour of elevation around Albino Lake at the 1040-m level, and **(b)** the outlet of Albino Lake.
5	Tom MacKay Lake, British Columbia	Tom MacKay Lake located at 56°39′ north latitude and 130°34′ west longitude near the Eskay Creek Mine in British Columbia. More precisely, the area bounded by **(a)** the contour of elevation around Tom MacKay Lake at the 1078-m level, and **(b)** the outlet of Tom MacKay Lake.
6	Trout Pond, Newfoundland and Labrador	Trout Pond located at 48°39′0.81882″ north latitude and 56°29′19.704984″ west longitude in west-central Newfoundland. More precisely, the area bounded by **(a)** the contour of elevation around Trout Pond at the 270 m level, and **(b)** the outlet of Trout Pond.
7	The headwater pond of a tributary to Gill's Pond Brook, Newfoundland and Labrador	The headwater pond of a tributary to Gill's Pond Brook, located at 48°38′29.599584″ north latitude and 56°30′15.560676″ west longitude in west-central Newfoundland. More precisely, the area bounded by **(a)** the contour of elevation around the pond at the 260 m level, and **(b)** the outlet of the pond.

ANNEXE 2

(paragraphes 5(1) et 27.1(1))

Dépôts de résidus miniers

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
1	Lac Anderson, Manitoba	Le lac Anderson, situé par 54°51′ de latitude N. et 100°0′ de longitude O., près de la ville de Snow Lake, au Manitoba. Plus précisément, le lieu délimité par : **a)** la courbe de niveau à 285 m autour du lac Anderson; **b)** le barrage de régulation à l'extrémité est du lac Anderson.
2	Lac Garrow, Nunavut	Le lac Garrow, situé par 75°23′ de latitude N. et 97°48′ de longitude O., près de l'extrémité sud de la petite île Cornwallis, au Nunavut.
3	Ruisseau South Kemess, Colombie-Britannique	La partie du ruisseau South Kemess située dans le bassin hydrographique du tributaire du ruisseau South Kemess : **a)** qui s'étend vers l'est et en amont du centre d'un barrage de retenue des stériles situé par 57°1′ de latitude N. et 126°41′ de longitude O.; **b)** qui se trouve en dessous de la crête du barrage, à une altitude de 1515 m.
4	Lac Albino, Colombie-Britannique	Le lac Albino, situé par 56°39,4′ de latitude N. et 130°29,4′ de longitude O., près de la mine Eskay Creek, en Colombie-Britannique. Plus précisément, la région délimitée par : **a)** la courbe de niveau à 1040 m autour du lac Albino; **b)** la décharge du lac Albino.
5	Lac Tom MacKay, Colombie-Britannique	Le lac Tom MacKay, situé par 56°39′ de latitude N. et 130°34′ de longitude O., près de la mine Eskay Creek, en Colombie-Britannique. Plus précisément, la région délimitée par : **a)** la courbe de niveau à 1078 m autour du lac Tom MacKay; **b)** la décharge du lac Tom Mackay.
6	Trout Pond, Terre-Neuve-et-Labrador	L'étang Trout Pond, situé par 48°39′0,818 82″ de latitude N. et 56°29′19,704 984″ de longitude O., dans la partie centrale ouest de Terre-Neuve et, plus précisément, la région délimitée par : **a)** la courbe de niveau à 270 m autour de l'étang Trout Pond; **b)** la décharge de l'étang Trout Pond.

	Column 1	Column 2
Item	Water or Place	Description
8	The northwest arm of Second Portage Lake, Nunavut	That portion of the northwest arm of Second Portage Lake, located at 65°1′39.29″ north latitude and 96°3′43″ west longitude, approximately 80 km north of the town of Baker Lake, Nunavut. More precisely, the area bounded by **(a)** the contour of elevation around the arm at the 146 m level, and **(b)** the dam built at the southeast end of the arm.
9	Tail Lake, Nunavut	Tail Lake, located at 68°7′25.8″ north latitude and 106°33′31.2″ west longitude, approximately 125 km southwest of the town of Cambridge Bay, Nunavut. More precisely, the area bounded by **(a)** the contour of elevation around Tail Lake at the 33.5 m level, and **(b)** the dams built at the south and north ends of the lake.
10	A portion of Wabush Lake, Newfoundland and Labrador	That portion of Wabush Lake near the towns of Labrador City and Wabush in western Labrador. More precisely, the area bounded by **(a)** the southern limit, extending from 53° north latitude, 66°50′24″ west longitude to 53° north latitude, 66°52′57″ west longitude, and **(b)** the outlet of Wabush Lake, extending from 53°09′4.7″ north latitude, 66°47′3.5″ west longitude to 53°08′57.5″ north latitude, 66°47′2.9″ west longitude.
11	Flora Lake, Newfoundland and Labrador	Flora Lake located at 52°55′ north latitude, 66°49′ west longitude, near the towns of Labrador City and Wabush in western Labrador.
12	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador. More precisely, an area extending from the mouth of the stream (52°52′9.94″ north latitude, 66°47′14.26″ west longitude) for a distance of 75 m upstream from Flora Lake.
13	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador. More precisely, an area extending from the mouth of the stream (52°52′10.70″ north latitude, 66°47′6.49″ west longitude) for a distance of 580 m upstream from Flora Lake.
14	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador. More precisely, an area extending from the mouth of the stream (52°52′57.45″ north latitude, 66°47′25.23″ west longitude) for a distance of 256 m upstream from Flora Lake.

	Colonne 1	Colonne 2
Article	Eaux ou lieux	Description
7	L'étang d'amont d'un tributaire du ruisseau Gill, Terre-Neuve-et-Labrador	L'étang d'amont d'un tributaire du ruisseau Gill, situé par 48°38′29,599 584″ de latitude N. et 56°30′15,560 676″ de longitude O., dans la partie centrale ouest de Terre-Neuve et, plus précisément, la région délimitée par : **a)** la courbe de niveau à 260 m autour de l'étang; **b)** la décharge de l'étang.
8	Le nord-ouest du bras du lac Second Portage, Nunavut	La partie du nord-ouest du bras du lac Second Portage, située par 65°1′39,29″ de latitude N. et 96°3′43″ de longitude O., à environ 80 km au nord de la ville de Baker Lake, au Nunavut et, plus précisément, la région délimitée par : **a)** la courbe de niveau à 146 m autour du bras; **b)** la digue construite à l'extrémité sud-est du bras.
9	Lac Tail, Nunavut	Le lac Tail, situé par 68°7′25,8″ de latitude N. et 106°33′31,2″ de longitude O., à environ 125 km au sud-ouest de la ville de Cambridge Bay, au Nunavut et, plus précisément, la région délimitée par : **a)** la courbe de niveau à 33,5 m autour du lac; **b)** les digues construites aux extrémités sud et nord du lac.
10	Une partie du lac Wabush, Terre-Neuve-et-Labrador	La partie du lac Wabush, située près des villes de Labrador City et de Wabush dans la partie ouest du Labrador, et, plus précisément, la région délimitée par : **a)** la limite sud s'étendant de 53° de latitude N. et 66°50′24″ de longitude O., à 53° de latitude N. et 66°52′57″ de longitude O.; **b)** la décharge du lac Wabush, s'étendant de 53°09′4,7″ de latitude N. et 66°47′3,5″ de longitude O., à 53°08′57,5″ de latitude N. et 66°47′2,9″ de longitude O.
11	Lac Flora, Terre-Neuve-et-Labrador	Le lac Flora, situé par 52°55′ de latitude N. et 66°49′ de longitude O., près des villes de Labrador City et de Wabush dans la partie ouest du Labrador.
12	Une partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador	La partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador, et, plus précisément, la région s'étendant de l'embouchure du ruisseau (52°52′9,94″ de latitude N., 66°47′14,26″ de longitude O.) sur une distance de 75 m en amont du lac Flora.
13	Une partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador	La partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador, et, plus précisément, la région s'étendant de l'embouchure du ruisseau (52°52′10,70″ de latitude N., 66°47′6,49″ de longitude O.) sur une distance de 580 m en amont du lac Flora.

Item	Column 1 Water or Place	Column 2 Description
15	Sandy Pond, Newfoundland and Labrador	Sandy Pond, located at 47°25′33″ north latitude and 53°46′52″ west longitude, on the Avalon Peninsula, approximately 3 km east southeast of the town of Long Harbour-Mount Arlington Heights, Newfoundland and Labrador. More precisely, the area bounded by **(a)** the contour of elevation around Sandy Pond at the 137 m level, and **(b)** the dams built at the north end of Sandy Pond.
16	A portion of King Richard Creek, British Columbia	A portion of King Richard Creek, located approximately 60 km southwest of the town of Mackenzie, British Columbia. More precisely, a 3.3 km portion of the creek extending northwards and upstream from the centre of a dam constructed at 55°06′42″ north latitude and 123°59′29″ west longitude, to the centre of a dam constructed at 55°07′52″ north latitude and 124°00′50″ west longitude.
17	A portion of an unnamed tributary to Alpine Lake, British Columbia	A portion of an unnamed tributary to Alpine Lake, located approximately 60 km southwest of the town of Mackenzie, British Columbia. More precisely, a 900 m portion of the tributary extending southwards and upstream from the centre of a dam constructed at 55°08′19″ north latitude and 124°00′27″ west longitude, to the centre of a dam constructed at 55°07′59″ north latitude and 124°01′00″ west longitude.
18	A portion of an unnamed tributary to Alpine Lake, British Columbia	A portion of an unnamed tributary to Alpine Lake, located approximately 60 km southwest of the town of Mackenzie, British Columbia. More precisely, a 590 m portion of the tributary extending southwards and upstream from the centre of a dam constructed at 55°08′18″ north latitude and 124°00′41″ west longitude, to the centre of a dam constructed at 55°08′09″ north latitude and 124°01′08″ west longitude.
19	Mallard Lake, Saskatchewan	Mallard Lake, located at 56°00′32″ north latitude and 104°16′38″ west longitude, approximately 120 km northeast of the town of La Ronge, Saskatchewan. More precisely, the area bounded by **(a)** the contour of elevation around Mallard Lake at the 490 m level, and **(b)** the dam built at the south end of Mallard Lake.
20	The unnamed headwater pond of an unnamed tributary of East Creek, Ontario	An unnamed headwater pond of an unnamed tributary of East Creek, located at 50°02′17″ north latitude and 79°40′57″ west longitude, approximately 145 km northeast of the town of Cochrane, Ontario.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
14	Une partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador	La partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador, et, plus précisément, la région s'étendant de l'embouchure du ruisseau (52°52′57,45″ de latitude N., 66°47′25,23″ de longitude O.) sur une distance de 256 m en amont du lac Flora.
15	Sandy Pond, Terre-Neuve-et-Labrador	L'étang Sandy Pond, situé par 47°25′33″ de latitude N. et 53°46′52″ de longitude O., dans la péninsule Avalon, à environ 3 km est-sud-est de la ville de Long Harbour-Mount Arlington Heights, Terre-Neuve-et-Labrador, et, plus précisément, la région délimitée par : **a)** la courbe de niveau à 137 m autour de l'étang Sandy Pond; **b)** les digues construites à l'extrémité nord de l'étang Sandy Pond.
16	Une partie du ruisseau King Richard, Colombie-Britannique	La partie du ruisseau King Richard située à environ 60 km au sud-ouest de la ville de Mackenzie en Colombie-Britannique, et, plus précisément, la partie du ruisseau qui s'étend sur 3,3 km vers le nord et en amont du centre du barrage situé par 55°06′42″ de latitude N. et 123°59′29″ de longitude O. jusqu'au centre du barrage situé par 55°07′52″ de latitude N. et 124°00′50″ de longitude O.
17	Une partie d'un affluent sans nom tributaire du lac Alpine, Colombie-Britannique	La partie d'un affluent sans nom tributaire du lac Alpine située à environ 60 km au sud-ouest de la ville de Mackenzie en Colombie-Britannique, et, plus précisément, la partie de l'affluent qui s'étend sur 900 m vers le sud et en amont du centre du barrage situé par 55°08′19″ de latitude N. et 124°00′27″ de longitude O. jusqu'au centre du barrage situé par 55°07′59″ de latitude N. et 124°01′00″ de longitude O.
18	Une partie d'un affluent sans nom tributaire du lac Alpine, Colombie-Britannique	La partie d'un affluent sans nom tributaire du lac Alpine située à environ 60 km au sud-ouest de la ville de Mackenzie en Colombie-Britannique, et, plus précisément, la partie de l'affluent qui s'étend sur 590 m vers le sud et en amont du centre du barrage situé par 55°08′18″ de latitude N. et 124°00′41″ de longitude O. jusqu'au centre du barrage situé par 55°08′09″ de latitude N. et 124°01′08″ de longitude O.
19	Lac Mallard, Saskatchewan	Le lac Mallard, situé par 56°00′32″ de latitude N. et 104°16′38″ de longitude O., à environ 120 km au nord-est de la ville de La Ronge en Saskatchewan et, plus précisément, la région délimitée par : **a)** la courbe de niveau à 490 m autour du lac Mallard; **b)** le barrage construit à l'extrémité sud du lac Mallard.
20	L'étang d'amont sans nom d'un tributaire sans nom du ruisseau East, Ontario	L'étang d'amont sans nom d'un tributaire sans nom du ruisseau East situé par 50°02′17″ de latitude N. et 79°40′57″ de longitude O., à environ 145 km au nord-est de la ville de Cochrane, en Ontario.

	Column 1	Column 2
Item	Water or Place	Description
21	A portion of an unnamed tributary to East Creek, Ontario	A portion of an unnamed tributary to East Creek, Ontario, located approximately 145 km northeast of the town of Cochrane, Ontario. More precisely, a 2.3-km portion of the tributary extending northwards and downstream from the outlet of the unnamed headwater pond referred to in item 20, to the centre of a dam constructed at 50°02′43″ north latitude and 79°40′20″ west longitude.
22	A portion of an unnamed tributary to Linden Creek, Ontario	A portion of an unnamed tributary to Linden Creek, Ontario, located approximately 145 km northeast of the town of Cochrane, Ontario. More precisely, a 1.8-km portion of the tributary extending southwards and downstream from the northern perimeter of a waste rock disposal area at 50°00′17″ north latitude and 79°43′37″ west longitude to the southern perimeter of the waste rock disposal area at 49°59′30″ north latitude and 79°43′07″ west longitude.
23	A portion of an unnamed tributary to an unnamed lake in the Linden Creek watershed, Ontario	A portion of an unnamed tributary to an unnamed lake in the Linden Creek watershed, Ontario, located approximately 145 km northeast of the town of Cochrane, Ontario. More precisely, a 1.4-km portion of the tributary extending southwards and downstream from the headwaters of the tributary at 50°00′17″ north latitude and 79°42′39″ west longitude to the southern perimeter of a waste rock disposal area at 49°59′25″ north latitude and 79°42′27″ west longitude.
24	A portion of Trail Creek, British Columbia	A portion of Trail Creek, located approximately 20 km southeast of the community of Iskut, British Columbia. More precisely, a 0.6 km portion of the creek extending southwards and downstream from a natural barrier located at 57°42′59″ north latitude and 129°44′10″ west longitude, to the centre of a dam constructed at 57°42′43″ north latitude and 129°44′20″ west longitude.
25	Lake Hesse, Quebec	Lake Hesse, located at 52°46′21″ north latitude and 67°20′58″ west longitude, approximately 15 km west of the town of Fermont, Quebec. More precisely, the area bounded by **(a)** the contour of elevation around Lake Hesse at the 620 m level, **(b)** the dam built at the north end of Lake Hesse, and **(c)** the control dam built at the south end of Lake Hesse.

	Colonne 1	Colonne 2
Article	Eaux ou lieux	Description
21	Une partie d'un tributaire sans nom du ruisseau East, Ontario	La partie d'un tributaire sans nom du ruisseau East située à environ 145 km au nord-est de la ville de Cochrane, en Ontario et, plus précisément, la partie du tributaire qui s'étend sur 2,3 km vers le nord et en aval de la décharge de l'étang d'amont sans nom visé à l'article 20 de la présente annexe, jusqu'au centre du barrage situé par 50°02′43″ de latitude N. et 79°40′20″ de longitude O.
22	Une partie d'un tributaire sans nom du ruisseau Linden, Ontario	La partie d'un tributaire sans nom du ruisseau Linden situé à environ 145 km au nord-est de la ville de Cochrane, en Ontario et, plus précisément, la partie du tributaire qui s'étend sur 1,8 km vers le sud et en aval du périmètre nord d'une aire de décharge de stériles située par 50°00′17″ de latitude N. et 79°43′37″ de longitude O., jusqu'au périmètre sud de l'aire de décharge de stériles située par 49°59′30″ de latitude N. et 79°43′07″ de longitude O.
23	Une partie d'un tributaire sans nom d'un lac sans nom du bassin hydrographique du ruisseau Linden, Ontario	La partie d'un tributaire sans nom d'un lac sans nom du bassin hydrographique du ruisseau Linden située à environ 145 km au nord-est de la ville de Cochrane, en Ontario et, plus précisément, la partie du tributaire qui s'étend sur 1,4 km vers le sud et en aval des eaux d'amont du tributaire située par 50°00′17″ de latitude N. et 79°42′39″ de longitude O., jusqu'au périmètre sud d'une aire de décharge de stériles située par 49°59′25″ de latitude N. et 79°42′27″ de longitude O.
24	Une partie du ruisseau Trail, Colombie-Britannique	Une partie du ruisseau Trail situé en Colombie-Britannique à environ 20 km au sud-est de la communauté d'Iskut et, plus précisément, la partie du ruisseau qui s'étend sur 0,6 km vers le sud et en aval de la barrière naturelle située par 57°42′59″ de latitude N. et 129°44′10″ de longitude O. jusqu'au centre du barrage situé par 57°42′43″ de latitude N. et 129°44′20″ de longitude O.
25	Le lac Hesse, Québec	Le lac Hesse, situé par 52°46′21″ de latitude N. et 67°20′58″ de longitude O., à environ 15 km à l'ouest de la ville de Fermont, au Québec, et, plus précisément, la région délimitée par : **a)** la courbe de niveau à 620 m autour du lac Hesse; **b)** le barrage construit à l'extrémité nord du lac Hesse; **c)** le barrage de régulation construit à l'extrémité sud du lac Hesse.

Item	Column 1 Water or Place	Column 2 Description
26	An unnamed lake approximately 20 km west of Fermont, Quebec and a portion of its outlet	An unnamed lake, located at 52°49′43″ north latitude and 67°22′23″ west longitude, approximately 20 km west of the town of Fermont, Quebec, and a portion of its outlet. More precisely, the area bounded by **(a)** the contour of elevation around the lake at the 660 m level, and **(b)** the outlet of the lake extending from the mouth of an outlet stream at 52°49′33″ north latitude and 67°22′18″ west longitude for a distance of 30 m downstream from that mouth.
27	A portion of an unnamed stream discharging waters from an unnamed lake, other than the one referred to in item 26, approximately 20 km west of Fermont, Quebec	A portion of an unnamed stream discharging waters from an unnamed lake, other than the one referred to in item 26, approximately 20 km west of the town of Fermont, Quebec. More precisely, the 1815 m portion of the stream that extends southwards and downstream from the point located at 52°50′02″ north latitude and 67°21′29″ west longitude to the point located at 52°49′20″ north latitude and 67°21′39″ west longitude.

SOR/2006-239, ss. 21 to 23; SOR/2008-216, s. 1; SOR/2009-27, s. 1; SOR/2009-156, s. 2; SOR/2010-250, s. 1; SOR/2011-202, s. 1; SOR/2015-45, s. 1; SOR/2016-87, s. 1; SOR/2016-196, s. 1.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
26	Un lac sans nom situé à environ 20 km à l’ouest de Fermont, Québec et une partie de sa décharge	Un lac sans nom, situé par 52°49′43″ de latitude N. et 67°22′23″ de longitude O., à environ 20 km à l’ouest de la ville de Fermont, au Québec, et une partie de sa décharge, et, plus précisément, la région délimitée par : **a)** la courbe de niveau à 660 m autour du lac; **b)** la décharge du lac s’étendant de l’embouchure de l’émissaire situé par 52°49′33″ de latitude N. et 67°22′18″ de longitude O., sur une distance de 30 m en aval de son embouchure.
27	Une partie d’un ruisseau sans nom évacuant les eaux d’un lac sans nom, autre que celui mentionné à l’article 26, situé à environ 20 km à l’ouest de Fermont, Québec	Une partie d’un ruisseau sans nom évacuant les eaux d’un lac sans nom, autre que celui mentionné à l’article 26, situé à environ 20 km à l’ouest de la ville de Fermont, au Québec, et, plus précisément, la partie du ruisseau s’étendant sur une distance de 1815 m, au sud et en aval à partir du point situé par 52°50′02″ de latitude N. et 67°21′29″ de longitude O. jusqu’au point situé par 52°49′20″ de latitude N. et 67°21′39″ de longitude O.

DORS/2006-239, art. 21 à 23; DORS/2008-216, art. 1; DORS/2009-27, art. 1; DORS/2009-156, art. 2; DORS/2010-250, art. 1; DORS/2011-202, art. 1; DORS/2015-45, art. 1; DORS/2016-87, art. 1; DORS/2016-196, art. 1.

SCHEDULE 3

(Subsections 1(1), 12(2) and 20(5))

Analytical Requirements for Metal Mining Effluent

	Column 1	Column 2	Column 3	Column 4
Item	Deleterious Substance/pH	Precision[1]	Accuracy[2]	Method Detection Limit (MDL)
1	Arsenic	10%	100 ± 10%	0.010 mg/L
2	Copper	10%	100 ± 10%	0.010 mg/L
3	Cyanide	10%	100 ± 10%	0.010 mg/L
4	Lead	10%	100 ± 10%	0.030 mg/L
5	Nickel	10%	100 ± 10%	0.020 mg/L
6	Zinc	10%	100 ± 10%	0.010 mg/L
7	Total Suspended Solids	15%	100 ± 15%	2.000 mg/L
8	Radium 226	10%	100 ± 10%	0.01 Bq/L
9	pH	0.1 pH unit	0.1 pH unit	Not Applicable

[1] Relative standard deviation at concentrations 10 times above the MDL.

[2] Analyte recovery at concentrations above 10 times the MDL.

SOR/2006-239, s. 24.

ANNEXE 3

(paragraphes 1(1), 12(2) et 20(5))

Exigences analytiques pour les effluents des mines de métaux

	Colonne 1	Colonne 2	Colonne 3	Colonne 4
Article	Substance nocive/pH	Précision[1]	Exactitude[2]	Limite de détection de la méthode (LDM)
1	Arsenic	10 %	100 ± 10 %	0,010 mg/L
2	Cuivre	10 %	100 ± 10 %	0,010 mg/L
3	Cyanure	10 %	100 ± 10 %	0,010 mg/L
4	Plomb	10 %	100 ± 10 %	0,030 mg/L
5	Nickel	10 %	100 ± 10 %	0,020 mg/L
6	Zinc	10 %	100 ± 10 %	0,010 mg/L
7	Total des solides en suspension	15 %	100 ± 15 %	2,000 mg/L
8	Radium 226	10 %	100 ± 10 %	0,01 Bq/L
9	pH	0,1 unité pH	0,1 unité pH	Sans objet

[1] Écart-type relatif à des concentrations dix fois supérieures à la LDM.

[2] Récupération de l’analyte à des concentrations de plus de dix fois la LDM.

DORS/2006-239, art. 24.

SCHEDULE 4

(Section 3, paragraph 4(1)(a), subsections 12(1) and (3), section 13, subsections 15(1), 19.1(1) and 20(1), paragraphs 21(2)(b) and (f), 24(1)(a) and 34(1)(b), subsection 34(3), paragraphs 34(4)(a) and (5)(a) and (b), 35(2)(b), 36(d) and 37(1)(a) and Schedules 5 and 7)

Authorized Limits of Deleterious Substances

Item	Column 1 Deleterious Substance	Column 2 Maximum Authorized Monthly Mean Concentration	Column 3 Maximum Authorized Concentration in a Composite Sample	Column 4 Maximum Authorized Concentration in a Grab Sample
1	Arsenic	0.50 mg/L	0.75 mg/L	1.00 mg/L
2	Copper	0.30 mg/L	0.45 mg/L	0.60 mg/L
3	Cyanide	1.00 mg/L	1.50 mg/L	2.00 mg/L
4	Lead	0.20 mg/L	0.30 mg/L	0.40 mg/L
5	Nickel	0.50 mg/L	0.75 mg/L	1.00 mg/L
6	Zinc	0.50 mg/L	0.75 mg/L	1.00 mg/L
7	Total Suspended Solids	15.00 mg/L	22.50 mg/L	30.00 mg/L
8	Radium 226	0.37 Bq/L	0.74 Bq/L	1.11 Bq/L

NOTE: All concentrations are total values.

SOR/2006-239, s. 25.

ANNEXE 4

(article 3, alinéa 4(1)a), paragraphes 12(1) et (3), article 13, paragraphes 15(1), 19.1(1) et 20(1), alinéas 21(2)b) et f), 24(1)a) et 34(1)b), paragraphe 34(3), alinéas 34(4)a) et (5)a) et b), 35(2)b), 36d) et 37(1)a) et annexes 5 et 7)

Limites permises pour certaines substances nocives

Article	Colonne 1 Substance nocive	Colonne 2 Concentration moyenne mensuelle maximale permise	Colonne 3 Concentration maximale permise dans un échantillon composite	Colonne 4 Concentration maximale permise dans un échantillon instantané
1	Arsenic	0,50 mg/L	0,75 mg/L	1,00 mg/L
2	Cuivre	0,30 mg/L	0,45 mg/L	0,60 mg/L
3	Cyanure	1,00 mg/L	1,50 mg/L	2,00 mg/L
4	Plomb	0,20 mg/L	0,30 mg/L	0,40 mg/L
5	Nickel	0,50 mg/L	0,75 mg/L	1,00 mg/L
6	Zinc	0,50 mg/L	0,75 mg/L	1,00 mg/L
7	Total des solides en suspension	15,00 mg/L	22,50 mg/L	30,00 mg/L
8	Radium 226	0,37 Bq/L	0,74 Bq/L	1,11 Bq/L

NOTE : Toutes les concentrations sont des valeurs totales.

DORS/2006-239, art. 25.

SCHEDULE 5

(Section 7, subsection 15(1) and paragraph 32(1)(c))

Environmental Effects Monitoring Studies

Interpretation

1 The following definitions apply in this Schedule.

effect on fish tissue means measurements of concentrations of total mercury that exceed 0.5 µg/g wet weight in fish tissue taken in an exposure area and that are statistically different from and higher than the concentrations of total mercury in fish tissue taken in a reference area. (*effet sur les tissus de poissons*)

effect on the benthic invertebrate community means a statistical difference between data referred to in subparagraph 16(a)(iii) from a study respecting the benthic invertebrate community conducted in

(a) an exposure area and a reference area; or

(b) sampling areas within an exposure area where there are gradually decreasing effluent concentrations. (*effet sur la communauté d'invertébrés benthiques*)

effect on the fish population means a statistical difference between data relating to the indicators referred to in subparagraph 16(a)(i) from a study respecting fish population conducted in

(a) an exposure area and a reference area; or

(b) sampling areas within an exposure area where there are gradually decreasing effluent concentrations. (*effet sur la population de poissons*)

exposure area means all fish habitat and waters frequented by fish that are exposed to effluent. (*zone exposée*)

fish means fish as defined in section 2 of the *Fisheries Act* but does not include parts of fish, parts of shellfish, parts of crustaceans or parts of marine animals. (*poisson*)

reference area means water frequented by fish that is not exposed to effluent and that has fish habitat that, as far as practicable, is most similar to that of the exposure area. (*zone de référence*)

sampling area means the area within a reference or exposure area where representative samples are collected. (*zone d'échantillonnage*)

ANNEXE 5

(article 7, paragraphe 15(1) et alinéa 32(1)c))

Études de suivi des effets sur l'environnement

Définitions

1 Les définitions qui suivent s'appliquent à la présente annexe.

effet sur la communauté d'invertébrés benthiques Différence statistique entre les données visées au sous-alinéa 16a)(iii) d'une étude sur la communauté d'invertébrés benthiques effectuée :

a) soit dans la zone exposée et dans la zone de référence;

b) soit dans les zones d'échantillonnage de la zone exposée qui présentent un gradient décroissant de concentration d'effluent. (*effect on the benthic invertebrate community*)

effet sur la population de poissons Différence statistique entre les données portant sur les indicateurs visés au sous-alinéa 16a)(i) d'une étude sur la population de poissons effectuée :

a) soit dans la zone exposée et dans la zone de référence;

b) soit dans les zones d'échantillonnage de la zone exposée qui présentent un gradient décroissant de concentration d'effluent. (*effect on the fish population*)

effet sur les tissus de poissons Mesures de la concentration du mercure total dans les tissus de poissons, prises dans la zone exposée, supérieures à 0,5 µg/g (poids humide), présentant une différence statistique et ayant une concentration plus élevée par rapport à celles mesurées dans les tissus de poissons prises dans la zone de référence. (*effect on fish tissue*)

poisson S'entend au sens de l'article 2 de la *Loi sur les pêches*, à l'exclusion des parties de poissons, de mollusques, de crustacés et d'animaux marins. (*fish*)

zone d'échantillonnage Partie de la zone de référence ou de la zone exposée où les échantillons représentatifs sont prélevés. (*sampling area*)

zone de référence Les eaux où vivent des poissons et où se trouve un habitat du poisson, qui ne sont pas exposées à un effluent et qui présentent, dans la mesure du possible, les caractéristiques les plus semblables à celles de la zone exposée. (*reference area*)

zone exposée Les eaux où vivent des poissons et l'habitat du poisson qui sont exposés à un effluent. (*exposure area*)

2 Environmental effects monitoring studies consist of the effluent and water quality monitoring studies set out in Part 1, and the biological monitoring studies set out in Part 2, of this Schedule.

PART 1

Effluent and Water Quality Monitoring Studies

Required Studies

3 Effluent and water quality monitoring studies consist of effluent characterization, sublethal toxicity testing and water quality monitoring.

Effluent Characterization

4 (1) Effluent characterization is conducted by analysing a sample of effluent and recording the hardness, alkalinity, electrical conductivity and temperature of the sample and the concentrations, in total values, of the following:

(a) aluminum;

(b) cadmium;

(c) iron;

(d) subject to subsection (3), mercury;

(e) molybdenum;

(f) selenium;

(g) ammonia; and

(h) nitrate.

(2) The effluent characterization shall be conducted four times per calendar year and not less than one month apart, on aliquots of effluent sample collected under sections 12 and 13 of these Regulations, with the first characterization to be conducted on an aliquot of effluent sample collected not later than six months after the day on which the mine becomes subject to section 7 of these Regulations.

(3) The recording of the concentration of total mercury in effluent referred to in paragraph (1)(d) may be discontinued if that concentration is less than 0.10 µg/L in 12 consecutive samples collected under subsection (2).

(4) Quality assurance and quality control measures shall be implemented that will ensure the accuracy of the effluent characterization data.

2 Les études de suivi des effets sur l'environnement se composent des études de suivi de l'effluent et de la qualité de l'eau prévues à la partie 1 et des études de suivi biologique prévues à la partie 2.

PARTIE 1

Études de suivi de l'effluent et de la qualité de l'eau

Composition des études

3 Les études de suivi de l'effluent et de la qualité de l'eau se composent de la caractérisation de l'effluent, des essais de toxicité sublétale et du suivi de la qualité de l'eau.

Caractérisation de l'effluent

4 (1) La caractérisation de l'effluent s'effectue par l'analyse d'un échantillon d'effluent et par l'enregistrement de sa dureté, de son alcalinité, de sa conductivité électrique, de sa température et des concentrations, exprimées en valeurs totales, des substances suivantes :

a) l'aluminium;

b) le cadmium;

c) le fer;

d) sous réserve du paragraphe (3), le mercure;

e) le molybdène;

f) le sélénium;

g) l'ammoniac;

h) le nitrate.

(2) La caractérisation de l'effluent est effectuée quatre fois par année civile et à au moins un mois d'intervalle, sur une portion aliquote de l'échantillon d'effluent prélevé en application des articles 12 et 13 du présent règlement, la première caractérisation se faisant sur une portion aliquote d'un échantillon prélevé au plus tard six mois suivant la date à laquelle la mine devient assujettie à l'article 7 du présent règlement.

(3) La concentration en mercure total n'a plus à être enregistrée aux termes de l'alinéa (1)d) si la concentration de mercure total de douze échantillons consécutifs prélevés selon le paragraphe (2) est inférieure à 0,10 µg/L.

(4) Des mesures d'assurance de la qualité et de contrôle de la qualité sont prises pour garantir l'exactitude des données visant la caractérisation de l'effluent.

Sublethal Toxicity Testing

5 (1) Sublethal toxicity testing shall be conducted by following the applicable methods referred to in subsections (3) and (4) and recording the results for

(a) a fish species, an invertebrate species, a plant species and an algal species, in the case of effluent deposited into fresh waters; and

(b) a fish species, an invertebrate species and an algal species, in the case of effluent deposited into marine or estuarine waters.

(2) The sublethal toxicity tests shall be conducted on the aliquots of effluent sample collected in accordance with subsection 4(2) from the mine's final discharge point that has potentially the most adverse environmental impact on the environment, taking into account the mass loadings of the deleterious substances set out in column 1 of Schedule 4 as determined under subsection 20(2) of these Regulations and the manner in which the effluent mixes within the exposure area.

(3) The sublethal toxicity tests under paragraph (1)(a) shall be conducted using the following test methodologies, as amended from time to time, as applicable to each species:

(a) in the case of a fish species,

(i) *Biological Test Method: Test of Larval Growth and Survival Using Fathead Minnows* (Report EPS 1/RM/22), February 1992, published by the Department of the Environment, or

(ii) *Biological Test Method: Toxicity Tests Using Early Life Stages of Salmonid Fish (Rainbow Trout)* (Reference Method EPS 1/RM/28), July 1998, published by the Department of the Environment;

(b) in the case of an invertebrate species, *Biological Test Method: Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia* (Report EPS 1/RM/21), February 1992, published by the Department of the Environment;

(c) in the case of a plant species, *Biological Test Method: Test for Measuring the Inhibition of Growth Using the Freshwater Macrophyte, Lemna minor* (Reference Method EPS 1/RM/37), March 1999, published by the Department of the Environment; and

(d) in the case of an algal species,

(i) *Biological Test Method: Growth Inhibition Test Using Freshwater Alga Selenastrum capricornutum* (Report EPS 1/RM/25), November 1992, published by the Department of the Environment, or

(ii) *Détermination de l'inhibition de la croissance chez l'algue Selenastrum capricornutum* (Reference Method MA 500-S.cap.2.0), September 1997, published by the

Essais de toxicité sublétale

5 (1) Les essais de toxicité sublétale sont effectués en conformité avec les méthodes applicables prévues aux paragraphes (3) et (4) et par enregistrement des résultats portant sur :

a) une espèce de poissons, d'invertébré, de plante et d'algue, lorsque l'effluent est rejeté dans l'eau douce;

b) une espèce de poissons, d'invertébré et d'algue, lorsque l'effluent est rejeté dans l'eau de mer ou l'eau d'estuaire.

(2) Les essais de toxicité sublétale sont effectués sur une portion aliquote d'un échantillon d'effluent prélevé en application du paragraphe 4(2) au point de rejet final de la mine ayant le plus grand risque de répercussions néfastes sur l'environnement, compte tenu de la charge des substances nocives visées à la colonne 1 de l'annexe 4 déterminée conformément au paragraphe 20(2) du présent règlement et de la façon dont l'effluent se mélange dans la zone exposée.

(3) Les essais de toxicité sublétale visés à l'alinéa (1)a) sont effectués conformément aux méthodes ci-après, avec leurs modifications successives, et selon les espèces en cause :

a) dans le cas d'une espèce de poissons :

(i) soit la *Méthode d'essai biologique : essai de croissance et de survie sur des larves de tête-de-boule* (Rapport SPE 1/RM/22), publiée en février 1992 par le ministère de l'Environnement,

(ii) soit la *Méthode d'essai biologique : essais toxicologiques sur des salmonidés (truite arc-en-ciel) aux premiers stades de leur cycle biologique* (Méthode de référence SPE 1/RM/28), publiée en juillet 1998 par le ministère de l'Environnement;

b) dans le cas d'une espèce d'invertébré, la *Méthode d'essai biologique : essai de reproduction et de survie sur le cladocère Ceriodaphnia dubia* (Rapport SPE 1/RM/21), publiée en février 1992 par le ministère de l'Environnement;

c) dans le cas d'une espèce de plante, la *Méthode d'essai biologique : essai de mesure de l'inhibition de la croissance de la plante macroscopique dulcicole, Lemna minor* (Méthode de référence SPE 1/RM/37), publiée en mars 1999 par le ministère de l'Environnement;

d) dans le cas d'une espèce d'algue :

(i) soit la *Méthode d'essai biologique : essai d'inhibition de la croissance de l'algue d'eau douce Selenastrum capricornutum* (Rapport SPE 1/RM/25), publiée en novembre 1992 par le ministère de l'Environnement, Centre d'expertise en analyse environnementale du Québec.

(4) The sublethal toxicity tests under paragraph (1)(b) shall be conducted using the following test methodologies, as amended from time to time, as applicable to each species:

(a) *Biological Test Method: Fertilization Assay Using Echinoids (Sea Urchins and Sand Dollars)* (Report EPS 1/RM/27), December 1992, published by the Department of the Environment;

(b) *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms* (Third Edition) (Reference Method EPA/821/R-02/014), October 2002, published by the U.S. Environmental Protection Agency; and

(c) *Short-term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to West Coast Marine and Estuarine Organisms* (First Edition) (Reference Method EPA/600/R-95-136), August 1995, published by the U.S. Environmental Protection Agency.

6 (1) Subject to subsection (2), the sublethal toxicity tests under section 5 shall be conducted two times each calendar year for three years and once each year after the third year, with the first testing to occur on an effluent sample collected not later than six months after the mine becomes subject to section 7 of these Regulations.

(2) Sublethal toxicity testing may be conducted once each calendar year, if the results of six sublethal toxicity tests conducted after December 31, 1997, on a fish species, an invertebrate species and either an aquatic plant species or an algal species are submitted to the authorization officer not later than six months after the mine becomes subject to section 7 of these Regulations.

Water Quality Monitoring

7 (1) Water quality monitoring is conducted by

(a) collecting samples of water from

(i) the exposure area surrounding the point of entry of effluent into water from each final discharge point and from the related reference areas, and

(ii) the sampling areas that are selected under paragraphs 12(b) and 13(a);

(b) recording the temperature of the water and the dissolved oxygen concentration in the water in the exposure and reference areas where the samples are collected;

(c) recording the concentration of the substances set out in paragraphs 4(1)(a) to (h) and,

(ii) soit la méthode intitulée *Détermination de la toxicité Inhibition de la croissance chez l'algue Selenastrum capricornutum* (Méthode de référence MA 500-S.cap.2.0), publiée en septembre 1997 par le Centre d'expertise en analyse environnementale du Québec.

(4) Les essais de toxicité sublétale visés à l'alinéa (1)b) sont effectués conformément aux méthodes ci-après, avec leurs modifications successives, et selon les espèces en cause :

a) la *Méthode d'essai biologique : essai sur la fécondation chez les échinides (oursins verts et oursins plats)* (Rapport SPE/1/RM/27), publiée en décembre 1992 par le ministère de l'Environnement;

b) la méthode intitulée *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms* (Third Edition) (Méthode de référence EPA/821/R-02/014), publiée en octobre 2002 par l'Environmental Protection Agency des États-Unis;

c) la méthode intitulée *Short-term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to West Coast Marine and Estuarine Organisms* (First Edition) (Méthode de référence EPA/600/R-95-136), publiée en août 1995 par l'Environmental Protection Agency des États-Unis.

6 (1) Sous réserve du paragraphe (2), les essais de toxicité sublétale visés à l'article 5 sont effectués deux fois par année civile pendant trois ans et, par la suite, une fois par année, le premier essai se faisant sur un échantillon d'effluent prélevé au plus tard six mois suivant la date à laquelle la mine devient assujettie à l'article 7 du présent règlement.

(2) Les essais de toxicité sublétale peuvent être effectués une fois par année civile si les résultats de six essais de toxicité sublétale effectués après le 31 décembre 1997 sur une espèce de poisson et une espèce d'invertébré et une espèce de plante aquatique ou d'algue sont présentés à l'agent d'autorisation au plus tard six mois suivant la date à laquelle la mine devient assujettie à l'article 7 du présent règlement.

Suivi de la qualité de l'eau

7 (1) Le suivi de la qualité de l'eau s'effectue :

a) par prélèvement d'échantillons d'eau :

(i) dans la zone exposée entourant l'endroit où l'effluent rejeté par chaque point de rejet final se mélange à l'eau, et dans les zones de référence connexes,

(ii) dans les zones d'échantillonnage choisies aux termes des alinéas 12b) et 13a);

b) par enregistrement de la température de l'eau et de la concentration d'oxygène dissous dans l'eau des zones exposées et des zones de référence où les échantillons sont prélevés;

(i) in the case of effluent that is deposited into fresh water, recording the pH, hardness, alkalinity and electrical conductivity of the water samples,

(ii) in the case of effluent that is deposited into estuarine waters, recording the pH, hardness, alkalinity, electrical conductivity and salinity of the water samples, and

(iii) in the case of effluent that is deposited into marine waters, recording the salinity of the water samples;

(d) recording the concentration of the deleterious substances set out in column 1 of Schedule 4, but

(i) not recording the concentrations of cyanide if that substance is not used as a process reagent within the operations area, and

(ii) not recording the concentrations of radium 226 if the conditions of subsection 13(2) of these Regulations are met; and

(e) implementing quality assurance and quality control measures that will ensure the accuracy of water quality monitoring data.

(2) The water quality monitoring shall be conducted, starting not later than six months after the day on which the mine becomes subject to section 7 of these Regulations,

(a) four times per calendar year and not less than one month apart on the samples of water collected, while the mine is depositing effluent, from the areas referred to in subparagraph (1)(a)(i); and

(b) at the same time that the biological monitoring studies are conducted on samples of water collected in the areas referred to in subparagraph (1)(a)(ii).

Effluent and Water Quality Monitoring Report

8 A report on the effluent and water quality monitoring studies conducted during a calendar year under sections 4 to 7 shall be submitted to the authorization officer not later than March 31 of the following year, and shall include

(a) the dates on which each sample was collected for effluent characterization, sublethal toxicity testing and water quality monitoring;

(b) the locations of the final discharge points from which samples were collected for effluent characterization;

(c) the location of the final discharge point from which samples were collected for sublethal toxicity testing and

c) par enregistrement de la concentration des substances énumérées aux alinéas 4(1)a) à h) et :

(i) dans le cas où l’effluent est rejeté dans l’eau douce, par enregistrement du pH, de la dureté, de l’alcalinité et de la conductivité électrique des échantillons d’eau,

(ii) dans le cas où il est rejeté dans l’eau d’estuaire, par enregistrement du pH, de la dureté, de l’alcalinité, de la conductivité électrique et de la salinité des échantillons d’eau,

(iii) dans le cas où il est rejeté dans l’eau de mer, par enregistrement de la salinité des échantillons d’eau;

d) par enregistrement de la concentration des substances nocives énumérées à la colonne 1 de l’annexe 4, sous réserve de ce qui suit :

(i) la concentration de cyanure n’est enregistrée que si cette substance est utilisée comme réactif de procédé sur le chantier,

(ii) la concentration de radium 226 n’est pas enregistrée si les conditions mentionnées au paragraphe 13(2) du présent règlement sont remplies;

e) par la prise des mesures d’assurance de la qualité et de contrôle de la qualité pour garantir l’exactitude des données visant le suivi de la qualité de l’eau.

(2) Le suivi de la qualité de l’eau est effectué à la fréquence prévue aux alinéas a) et b), le premier se faisant au plus tard six mois suivant la date à laquelle la mine devient assujettie à l’article 7 du présent règlement :

a) quatre fois par année civile et à au moins un mois d’intervalle sur les échantillons d’eau prélevés lorsque la mine rejette l’effluent dans les zones visées au sous-alinéa (1)a)(i);

b) en même temps que les études de suivi biologique, sur les échantillons d’eau prélevés dans les zones visées au sous-alinéa (1)a)(ii).

Rapport des études de suivi de l’effluent et de la qualité de l’eau

8 Un rapport des études de suivi de l’effluent et de la qualité de l’eau effectuées au cours d’une année civile en application des articles 4 à 7 est présenté à l’agent d’autorisation au plus tard le 31 mars de l’année suivante et comporte les renseignements suivants :

a) les dates de prélèvement des échantillons pour la caractérisation de l’effluent, les essais de toxicité sublétale et le suivi de la qualité de l’eau;

b) l’emplacement des points de rejet final où les échantillons ont été prélevés pour la caractérisation de l’effluent;

the data on which the selection of the final discharge point was made in compliance with subsection 5(2);

(d) the latitude and longitude of sampling areas for water quality monitoring, in degrees, minutes and seconds, and a description that is sufficient to identify the location of the sampling areas;

(e) the results of effluent characterization, sublethal toxicity testing and water quality monitoring;

(f) the methodologies used to conduct effluent characterization and water quality monitoring, and the related method detection limits; and

(g) a description of quality assurance and quality control measures that were implemented and the data related to the implementation of those measures.

PART 2

Biological Monitoring Studies

Required Studies

9 Biological monitoring studies consist of

(a) a site characterization;

(b) a study respecting the fish population, if the concentration of effluent in the exposure area is greater than 1% in the area located within 250 m of a final discharge point;

(c) a study respecting fish tissue, if during effluent characterization conducted under paragraph 4(1)(d) a concentration of total mercury in the effluent is identified that is equal to or greater than 0.10 µg/L; and

(d) a study respecting benthic invertebrate community.

DIVISION 1

The First Biological Monitoring Studies

First Study Design

10 Prior to the conduct of the biological monitoring studies, a study design shall be submitted in accordance with section 14 that contains

(a) a site characterization that includes the information required by section 11;

c) l’emplacement du point de rejet final où les échantillons ont été prélevés pour les essais de toxicité sublétale et les données qui ont servi à le sélectionner conformément au paragraphe 5(2);

d) la latitude et la longitude des zones d’échantillonnage utilisées pour le suivi de la qualité de l’eau, exprimées en degrés, minutes et secondes, et une description qui permet de reconnaître l’emplacement de ces zones;

e) les résultats de la caractérisation de l’effluent, des essais de toxicité sublétale et du suivi de la qualité de l’eau;

f) les méthodes utilisées pour la caractérisation de l’effluent et le suivi de la qualité de l’eau, ainsi que les limites de détection de celles-ci;

g) les précisions voulues sur les mesures d’assurance de la qualité et de contrôle de la qualité qui ont été prises ainsi que les données associées à leur mise en œuvre.

PARTIE 2

Études de suivi biologique

Composition des études

9 Les études de suivi biologique se composent :

a) de la caractérisation du site;

b) d’une étude sur la population de poissons dans le cas où la concentration de l’effluent dans la zone exposée est supérieure à 1 % en deçà de 250 m d’un point de rejet final;

c) d’une étude sur les tissus de poissons si une concentration de mercure total égale ou supérieure à 0,10 µg/L a été relevée lors de la caractérisation de l’effluent aux termes de l’alinéa 4(1)d);

d) d’une étude sur la communauté d’invertébrés benthiques.

SECTION 1

Premières études de suivi biologique

Premier plan d’étude

10 Avant que soient effectuées les études de suivi biologique, un plan d’étude est présenté conformément à l’article 14 et comporte les éléments suivants :

a) la caractérisation du site comportant les renseignements prévus à l’article 11;

(b) a description of how the study respecting the fish population will be conducted, if such a study is required under paragraph 9(b), that includes

(i) the information referred to in paragraphs 12(a) to (d), and

(ii) how the study will provide the information necessary to determine if the effluent has an effect on the fish population;

(c) a description of how the study respecting fish tissue will be conducted, if that study is required under paragraph 9(c), that includes

(i) the information referred to in paragraphs 12(a) to (d), and

(ii) how the study will provide the information necessary to determine if the effluent has an effect on fish tissue;

(d) a description of how the study respecting the benthic invertebrate community will be conducted that includes

(i) the information referred to in paragraphs 13(a) to (d), and

(ii) how the study will provide the information necessary to determine if the effluent has an effect on the benthic invertebrate community;

(e) the dates and times that the samples will be collected for the biological monitoring;

(f) a description of the quality assurance and quality control measures that will be implemented to ensure the validity of the data that is collected; and

(g) a summary of the results of any biological monitoring studies that were submitted under subparagraph 14(b)(iii).

11 A site characterization shall include the following information:

(a) a description of the manner in which the effluent mixes within the exposure area, including an estimate of the concentration of effluent in water at 250 m from each final discharge point;

(b) a description of the reference and exposure areas where the biological monitoring studies will be conducted that includes information on the geological, hydrological, oceanographical, limnological, chemical and biological features of those areas;

(c) the type of production process used by the mine, and the environmental protection practices in place at the mine;

(d) a summary of any federal, provincial or other laws applicable to the mine in respect of effluent and environmental monitoring;

b) les précisions voulues sur le déroulement de l'étude sur la population de poissons, si une telle étude est exigée en vertu de l'alinéa 9b), notamment :

(i) les renseignements prévus aux alinéas 12a) à d),

(ii) la façon dont l'étude fournira les renseignements permettant de déterminer si l'effluent a un effet sur la population de poissons;

c) les précisions voulues sur le déroulement de l'étude sur les tissus de poissons, si une telle étude est exigée en vertu de l'alinéa 9c), notamment :

(i) les renseignements prévus aux alinéas 12a) à d),

(ii) la façon dont l'étude fournira les renseignements permettant de déterminer si l'effluent a un effet sur les tissus de poissons;

d) les précisions voulues sur le déroulement de l'étude sur la communauté d'invertébrés benthiques, notamment :

(i) les renseignements prévus aux alinéas 13a) à d),

(ii) la façon dont l'étude fournira les renseignements permettant de déterminer si l'effluent a un effet sur la communauté d'invertébrés benthiques;

e) les date et heure de prélèvement de tous les échantillons;

f) les précisions voulues sur les mesures d'assurance de la qualité et de contrôle de la qualité qui seront prises pour garantir la validité des données recueillies;

g) un sommaire des résultats de toutes études de suivi biologique présentés aux termes du sous-alinéa 14b)(iii).

11 La caractérisation du site comporte les renseignements suivants :

a) une description de la façon dont l'effluent se mélange dans la zone exposée, y compris une estimation de la concentration de l'effluent à 250 m de chacun des points de rejet final;

b) une description des zones de référence et des zones exposées où les études de suivi biologique seront effectuées, y compris les renseignements sur les caractéristiques géologiques, hydrologiques, océanographiques, limnologiques, chimiques et biologiques de ces zones;

c) le type de procédé de production utilisé par la mine et les pratiques de protection de l'environnement appliquées à la mine;

d) un sommaire des exigences législatives fédérales, provinciales ou autres visant la mine et portant sur le suivi de l'effluent et de l'environnement;

(e) a description of any anthropogenic, natural or other factors that are not related to the effluent under study and that may reasonably be expected to contribute to any observed effect; and

(f) any additional information relevant to the site characterization.

12 The information respecting the fish population and fish tissue studies shall include a description of and the scientific rationale for

(a) the fish species selected, taking into account the abundance of the species most exposed to effluent;

(b) the sampling areas selected;

(c) the sample size selected; and

(d) the field and laboratory methodologies selected.

13 The information respecting the benthic invertebrate community studies shall include a description of and the scientific rationale for

(a) the sampling areas selected, taking into account the benthic invertebrate diversity and the area most exposed to effluent;

(b) the sample size selected;

(c) the sampling season selected; and

(d) the field and laboratory methodologies selected.

Submission of the First Study Design

14 The first study design shall be submitted to the authorization officer not later than

(a) 12 months after the day on which the mine becomes subject to section 7 of these Regulations; or

(b) 24 months after the day on which the mine becomes subject to section 7 of these Regulations if

(i) biological monitoring studies are completed before the mine becomes subject to section 7 of these Regulations,

(ii) the biological monitoring studies referred to in subparagraph (i) determine whether the effluent was causing an effect on fish population, fish tissue or the benthic invertebrate community, and

(iii) the results of the biological monitoring studies are submitted to the authorization officer along with a report that contains scientific data to support the results

e) les facteurs anthropiques, naturels ou autres non liés à l'effluent étudié, mais dont on peut raisonnablement s'attendre à ce qu'ils contribuent à tout effet observé;

f) tout renseignement supplémentaire propre à la caractérisation du site.

12 Les renseignements concernant l'étude sur la population de poissons et l'étude sur les tissus de poissons comprennent, motifs scientifiques à l'appui, les éléments suivants :

a) les espèces de poissons choisies, compte tenu de l'abondance des espèces les plus exposées à l'effluent;

b) les zones d'échantillonnage choisies;

c) la taille des échantillons choisie;

d) les méthodes sur le terrain et en laboratoire qui ont été choisies.

13 Les renseignements concernant les études sur la communauté d'invertébrés benthiques comprennent, motifs scientifiques à l'appui, les éléments suivants :

a) les zones d'échantillonnage choisies, compte tenu de la diversité des invertébrés benthiques et de la zone la plus exposée à l'effluent;

b) la taille des échantillons choisie;

c) la période d'échantillonnage choisie;

d) les méthodes sur le terrain et en laboratoire qui ont été choisies.

Présentation du premier plan d'étude

14 Le premier plan d'étude est présenté à l'agent d'autorisation :

a) soit au plus tard douze mois suivant la date à laquelle la mine devient assujettie à l'article 7 du présent règlement;

b) soit au plus tard vingt-quatre mois suivant la date à laquelle la mine devient assujettie à l'article 7 du présent règlement si les conditions suivantes sont réunies :

(i) les études de suivi biologique ont été faites avant cette date,

(ii) les études indiquent si l'effluent produit un effet sur les populations de poissons, sur les tissus de poissons ou sur la communauté d'invertébrés benthiques,

(iii) les résultats des études sont présentés à l'agent d'autorisation au plus tard douze mois suivant cette date et sont accompagnés d'un rapport comportant les données scientifiques justificatives.

not later than 12 months after the day on which the mine becomes subject to section 7 of these Regulations.

Conducting the First Biological Monitoring Studies

15 (1) Subject to subsection (2), the first biological monitoring studies shall start not sooner than six months after the day on which a study design is submitted under section 14, and shall be conducted in accordance with that study design.

(2) If it is impossible to follow the study design because of unusual circumstances, the owner or operator may deviate from the study design but shall inform the authorization officer without delay of those circumstances and of how the study was or will be conducted.

Assessment of Data Collected from Studies

16 The data collected during the biological monitoring studies shall be used

(a) to calculate the mean, the median, the standard deviation, the standard error and the minimum and maximum values in the sampling areas for

(i) in the case of a fish population survey, indicators of growth, reproduction, condition and survival that include, where practicable, the length, total body weight and age of the fish, the weight of its liver or hepatopancreas and, if the fish are sexually mature, the egg size, fecundity and gonad weight of the fish,

(ii) in the case of the fish tissue analyses, the concentration of total mercury wet weight in the fish tissue, and

(iii) in the case of a benthic invertebrate community survey, the total benthic invertebrate density, the evenness index, the taxa richness and the similarity index and, if the survey is conducted in an area where it is possible to sample sediment, the total organic carbon content of sediment and the particle size distribution of sediment; and

(b) to identify the sex of the fish sampled and the presence of any lesions, tumours, parasites or other abnormalities;

(c) to conduct an analysis of the results of the calculations under paragraph (a) and information identified under paragraph (b) to determine if there is a statistical difference between the sampling areas; and

(d) to conduct a statistical analysis of the results of the calculations under paragraph (a) to estimate the probability of correctly detecting an effect of a pre-defined size and the degree of confidence that can be placed in the calculations.

Délais pour effectuer les premières études de suivi biologique

15 (1) Sous réserve du paragraphe (2), les premières études de suivi biologique débutent au plus tôt six mois suivant la date à laquelle le plan d’étude a été présenté en application de l’article 14 et sont effectuées conformément à ce plan.

(2) Le propriétaire ou l’exploitant n’a pas à suivre le plan d’étude si des circonstances inhabituelles l’en empêchent, auquel cas il en avise sans délai l’agent d’autorisation et l’informe des modifications à apporter aux modalités du déroulement de l’étude.

Évaluation des données des études

16 Les données des études de suivi biologique doivent être utilisées :

a) pour calculer la moyenne, la médiane, l’écart-type, l’erreur-type ainsi que les valeurs minimales et maximales dans la zone d’échantillonnage quant aux éléments suivants :

(i) dans le cas de l’étude sur la population de poissons, les indicateurs de la croissance des poissons, de leur reproduction, de leur condition et de leur survie qui comprennent, dans la mesure du possible, la longueur, le poids corporel total, l’âge, le poids du foie ou de l’hépatopancréas et, si les poissons ont atteint la maturité sexuelle, la taille des œufs, le taux de fécondité et le poids des gonades,

(ii) dans le cas de l’étude sur les tissus de poissons, la concentration de mercure total (poids humide) dans les tissus,

(iii) dans le cas de l’étude sur la communauté d’invertébrés benthiques, la densité totale des invertébrés benthiques, l’indice de régularité, la richesse des taxons et l’indice de similitude et, si des sédiments peuvent être prélevés à l’endroit où s’effectue l’étude, la teneur en carbone organique total des sédiments et la distribution granulométrique de ceux-ci;

b) pour déterminer le sexe des poissons pris et la présence de lésions, de tumeurs, de parasites et autres anomalies;

c) pour effectuer une analyse des résultats des calculs effectués en application de l’alinéa a) et de l’information déterminée au titre de l’alinéa b) qui indique s’il existe une différence statistique entre les zones d’échantillonnage;

d) pour effectuer une analyse statistique des résultats des calculs effectués en application de l’alinéa a) qui indique la probabilité de détection correcte d’un effet d’une ampleur prédéterminée ainsi que le degré de confiance pouvant être accordé aux calculs.

First Interpretative Report

17 The first biological monitoring studies conducted under section 15 shall be followed by an interpretative report that contains the following information:

(a) a description of any deviation from the study design that occurred while the biological monitoring studies were being conducted and any impact that the deviation had on the studies;

(b) the latitude and longitude of sampling areas in degrees, minutes and seconds and a description of the sampling areas sufficient to identify the location of the sampling areas;

(c) the dates and times when samples were collected;

(d) the sample sizes;

(e) the results of the data assessment made under section 16 and any supporting raw data;

(f) based on the results referred to in paragraph (e), the identification of any effect on

(i) the fish population,

(ii) fish tissue, and

(iii) the benthic invertebrate community;

(g) a summary of the results of effluent characterization, sublethal toxicity testing and water quality monitoring reported under paragraph 8(e) since the day on which the mine becomes subject to section 7 of these Regulations;

(h) the conclusions of the biological monitoring studies, taking into account

(i) the results of any previous biological monitoring studies submitted under paragraph 14(b),

(ii) the presence of anthropogenic, natural or other factors that are not related to the effluent under study and that may reasonably be expected to contribute to any observed effect,

(iii) the results of the statistical analysis conducted under paragraphs 16(c) and (d), and

(iv) a description of quality assurance or quality control measures that were implemented and the data related to the implementation of those measures;

(i) a description of how the results will impact the study design for subsequent biological monitoring studies; and

(j) the date when the next biological monitoring study will be conducted.

18 The first interpretative report shall be submitted

Premier rapport d'interprétation

17 Les premières études de suivi biologique effectuées en application de l'article 15 sont suivies d'un rapport d'interprétation qui comporte les éléments suivants :

a) les écarts par rapport au plan d'étude qui se sont produits durant les études et l'incidence de ces écarts sur les études;

b) la latitude et la longitude des zones d'échantillonnage, exprimées en degrés, en minutes et en secondes, et une description qui permet de reconnaître l'emplacement de ces zones;

c) les dates et heures de prélèvement des échantillons;

d) la taille des échantillons;

e) les résultats de l'évaluation des données effectuée en application de l'article 16 et les données brutes justificatives;

f) selon les résultats visés à l'alinéa e), l'indication :

(i) de tout effet sur la population de poissons,

(ii) de tout effet sur les tissus de poissons,

(iii) de tout effet sur la communauté d'invertébrés benthiques;

g) un résumé des résultats de la caractérisation de l'effluent, des essais de toxicité sublétale et du suivi de la qualité de l'eau visés à l'alinéa 8e) à partir du date où la mine devient assujettie à l'article 7 du présent règlement;

h) les conclusions des études de suivi biologique compte tenu des éléments suivants :

(i) les résultats de toute étude de suivi biologique antérieure présentée en application de l'alinéa 14b),

(ii) la présence de facteurs anthropiques, naturels ou autres non liés à l'effluent à l'étude et dont on peut raisonnablement s'attendre à ce qu'ils contribuent à tout effet observé,

(iii) les résultats de l'analyse statistique effectuée au titre des alinéas 16c) et d),

(iv) les précisions voulues sur les mesures d'assurance de la qualité et de contrôle de la qualité qui ont été prises ainsi que les données associées à leur mise en œuvre;

i) l'incidence des résultats sur le plan d'étude des études de suivi biologique subséquentes;

j) la date de la prochaine étude de suivi biologique.

18 Le premier rapport d'interprétation est présenté :

(a) not later than 30 months after the date the mine becomes subject to section 7 of these Regulations, if the study design was submitted under paragraph 14(a); or

(b) not later than 42 months after the date the mine becomes subject to section 7 of these Regulations, if the study design was submitted under paragraph 14(b).

a) soit au plus tard trente mois suivant la date à laquelle la mine devient assujettie à l'article 7 du présent règlement, dans le cas où le plan d'étude a été présenté en application de l'alinéa 14a);

b) soit au plus tard quarante-deux mois suivant la date à laquelle la mine devient assujettie à l'article 7 du présent règlement, dans le cas où le plan d'étude a été présenté en application de l'alinéa 14b).

DIVISION 2

Subsequent Biological Monitoring Studies

Subsequent Study Designs

19 (1) Subject to subsection (2), the study design for a second and any subsequent biological monitoring study shall be submitted to the authorization officer at least six months before a second or subsequent biological monitoring study is conducted, and shall include

(a) a summary of the information referred to in paragraph 10(a) and, where applicable, a detailed description of any changes to that information since the submission of the most recent study design;

(b) the information referred to in paragraphs 10(b) to (f);

(c) a summary of the results of any previous biological monitoring studies that were conducted after the coming into force of section 7 of these Regulations respecting the fish population, fish tissue analyses and the benthic invertebrate community; and

(d) if the results of the two previous biological monitoring studies indicate a similar type of effect on the fish population, on fish tissue or on the benthic invertebrate community, a description of one or more additional sampling areas within the exposure area that shall be used to assess the magnitude and geographic extent of the effect.

(2) If the results of the previous biological monitoring study indicate the magnitude and geographic extent of an effect on the fish population, on fish tissue or on the benthic invertebrate community, the study design shall include the information required by paragraph (1)(c) and a detailed description of what field and laboratory studies will be used to determine the cause of the effect.

SECTION 2

Études de suivi biologique subséquentes

Plans des études subséquents

19 (1) Sous réserve du paragraphe (2), le plan de la deuxième étude de suivi biologique et de toute étude de suivi biologique subséquente est présenté à l'agent d'autorisation au moins six mois avant le début de l'étude et comporte :

a) un sommaire des renseignements prévus à l'alinéa 10a) ainsi qu'une description détaillée des modifications apportées depuis la soumission de la dernière étude de suivi biologique, le cas échéant;

b) les renseignements prévus aux alinéas 10b) à f);

c) un sommaire des résultats de toute étude de suivi biologique sur la population de poissons, sur les tissus de poissons et sur la communauté d'invertébrés benthiques qui a été effectuée après l'entrée en vigueur de l'article 7 du présent règlement;

d) la description d'une ou de plusieurs zones d'échantillonnage supplémentaires dans la zone exposée qui doivent être ajoutées pour permettre la détermination de l'ampleur et de la portée géographique de l'effet, si les résultats des deux dernières études de suivi biologique indiquent un effet semblable sur la population de poissons, sur les tissus de poissons ou sur la communauté d'invertébrés benthiques.

(2) Si les résultats de la dernière étude de suivi biologique indiquent l'ampleur et la portée géographique de l'effet sur la population de poissons, sur les tissus de poissons ou sur la communauté d'invertébrés benthiques, le plan d'étude comporte les renseignements prévus à l'alinéa (1)c) ainsi que les précisions voulues sur les études sur le terrain et les études en laboratoire qui seront effectuées pour déterminer la cause de l'effet.

Conduct of Subsequent Biological Monitoring Studies

20 (1) Subject to subsection (2), the second and any subsequent monitoring studies shall be conducted in accordance with the study design submitted under section 19.

(2) If unusual circumstances make it impossible to follow the study design, the owner or operator must inform the authorization officer without delay.

Content of Subsequent Interpretative Reports

21 (1) Subject to subsection (2), the second and subsequent biological monitoring studies conducted under section 20 shall be followed by an interpretative report that contains

(a) the information referred to in paragraphs 17(a) to (f) and (h) to (j);

(a.1) a summary of the results of effluent characterization, sublethal toxicity testing and water quality monitoring reported under paragraph 8(e) since the day on which the interpretative report of the previous biological monitoring study was required to be submitted; and

(b) if the study design that was submitted under subsection 19(1) contains information referred to in paragraph 19(1)(d), the magnitude and geographic extent of the effect referred to in that paragraph.

(2) If the study design was submitted under subsection 19(2), the interpretative report shall contain only the cause of the effect referred to in that subsection and, if the cause was not determined, an explanation of why and a description of any steps that must be taken in the next study to determine that cause.

Submission of the Subsequent Interpretative Reports

22 (1) Subject to subsection (2), the interpretative report of the second and any subsequent biological monitoring studies shall be submitted to an authorization officer not later than 36 months after the day on which the interpretative report of the previous biological monitoring study was required to be submitted.

(2) The interpretative report of the second and subsequently conducted biological monitoring studies shall be submitted

(a) not later than 36 months after the day on which the interpretative report of the previous study was required to be submitted, if the results of the previous study indicate an effect on fish populations, on fish tissue and on the benthic invertebrate community;

Déroulement des études de suivi biologique subséquentes

20 (1) Sous réserve du paragraphe (2), la deuxième étude de suivi biologique et toute étude de suivi biologique subséquente sont effectuées conformément au plan d'étude présenté en application de l'article 19.

(2) Si des circonstances inhabituelles font qu'il est impossible de se conformer au plan d'étude, le propriétaire ou l'exploitant en informe sans délai l'agent d'autorisation.

Rapports d'interprétation subséquents

21 (1) Sous réserve du paragraphe (2), la deuxième étude de suivi biologique et toute étude de suivi biologique subséquente effectuées en application de l'article 20 sont suivies d'un rapport d'interprétation qui comporte les éléments suivants :

a) les renseignements visés aux alinéas 17a) à f) et h) à j);

a.1) un résumé des résultats de la caractérisation de l'effluent, des essais de toxicité sublétale et du suivi de la qualité de l'eau visés à l'alinéa 8e) à partir de la date limite de présentation du rapport d'interprétation de la dernière étude de suivi biologique;

b) si le plan d'étude présenté en application du paragraphe 19(1) comporte les renseignements visés à l'alinéa 19(1)d), l'ampleur et la portée géographique de l'effet visé à cet alinéa.

(2) Si le plan d'étude est présenté en application du paragraphe 19(2), le rapport d'interprétation ne comporte que la cause de l'effet visé à ce paragraphe et, si la cause n'a pas été déterminée, les raisons de l'échec ainsi que les mesures à prendre pour déterminer cette cause lors de la prochaine étude.

Fréquence de la présentation des rapports d'interprétation

22 (1) Sous réserve du paragraphe (2), le rapport d'interprétation de la deuxième étude de suivi biologique et de toute étude de suivi biologique subséquente est présentée à l'agent d'autorisation au plus tard trente-six mois suivant la date limite de présentation du rapport d'interprétation de la dernière étude de suivi biologique.

(2) Le rapport d'interprétation de la deuxième étude de suivi biologique et celui de toute étude subséquente sont présentés :

a) soit au plus tard trente-six mois suivant la date limite de présentation du rapport d'interprétation de la dernière étude si les résultats de cette étude indiquent un effet sur la population de poissons, sur les tissus de poissons et sur la communauté d'invertébrés benthiques;

(b) not later than 72 months after the day on which the interpretative report of the previous study was required to be submitted, if the results of the previous two consecutive biological monitoring studies indicate no effect on fish populations, on fish tissue and on the benthic invertebrate community; or

(c) not later than 36 months after the day on which the interpretative report of the previous study was required to be submitted, if the results of the previous two consecutive biological monitoring studies indicate a similar type of effect on fish populations, on fish tissue or on the benthic invertebrate community, and if the magnitude or geographic extent of the effect or cause of the effect is not known.

(3) For the purposes of subsection (2), if an owner or operator of a mine is not required to conduct a study on the fish population or on fish tissue under paragraph 9(b) or (c), the effluent is considered to have no effect on the fish population or on fish tissue respectively.

DIVISION 3

Final Biological Monitoring Study prior to Closing Mine

Final Study Design

23 (1) If an owner or operator of a mine has provided to the authorization officer a notice to close a mine under subsection 32(1) of these Regulations, a study design shall be submitted to the authorization officer, not later than six months after providing the notice, and shall include

(a) if study design is submitted for the first time, the information referred to in paragraph 10(a) and, in all other cases, a summary of the information referred to in paragraph 10(a) and, where applicable, a detailed description of any changes to that information since the submission of the most recent study design;

(b) the information referred to in paragraphs 10(b) to (f);

(c) a summary of the results of any previous biological monitoring studies that were conducted after June 6, 2002 respecting the fish population, fish tissue and the benthic invertebrate community; and

(d) if the results of the two previous biological monitoring studies indicate a similar type of effect on the fish population, on fish tissue or on the benthic invertebrate community, a description of one or more additional sampling areas within the exposure area, which additional sampling areas shall be used to assess the magnitude and geographic extent of the effect.

(2) If the results of the previous biological monitoring studies indicate the magnitude and geographic extent of an effect on fish population, on fish tissue or on the benthic invertebrate

b) soit au plus tard soixante-douze mois suivant la date limite de présentation du rapport d'interprétation de la dernière étude si les résultats des deux dernières études consécutives n'indiquent aucun effet sur la population de poissons, sur les tissus de poissons et sur la communauté d'invertébrés benthiques;

c) soit au plus tard trente-six mois suivant la date limite de présentation du rapport d'interprétation de la dernière étude si les résultats des deux dernières études consécutives indiquent un effet semblable sur la population de poissons, sur les tissus de poissons ou sur la communauté d'invertébrés benthiques et que l'ampleur ou la portée géographique de l'effet ou sa cause sont inconnues.

(3) Pour l'application du paragraphe (2), si une étude sur la population de poissons ou une étude sur les tissus de poissons n'a pas à être faite en application des alinéas 9b) ou c), il est considéré que l'effluent n'a pas d'effet sur cette population ou sur ces tissus.

SECTION 3

Étude de suivi biologique finale avant la fermeture d'une mine

Plan de l'étude finale

23 (1) Lorsque le propriétaire ou l'exploitant d'une mine a présenté à l'agent d'autorisation un avis de fermeture de sa mine en application du paragraphe 32(1) du présent règlement, le plan d'étude est présenté à l'agent d'autorisation au plus tard six mois suivant la date de présentation de l'avis et comporte :

a) s'il s'agit du premier plan d'étude, les renseignements prévus à l'alinéa 10a) et, dans les autres cas, un sommaire des renseignements prévus à l'alinéa 10a) ainsi qu'une description détaillée des modifications apportées depuis la soumission de la dernière étude de suivi biologique, le cas échéant;

b) les renseignements prévus aux alinéas 10b) à f);

c) un sommaire des résultats de toute étude de suivi biologique antérieure effectuée après le 6 juin 2002 et portant sur la population de poissons, les tissus de poissons et la communauté d'invertébrés benthiques;

d) la description d'une ou plusieurs zones d'échantillonnage supplémentaires dans la zone exposée qui doivent être ajoutées pour permettre la détermination de l'ampleur et de la portée géographique de l'effet, si les résultats des deux dernières études de suivi biologique indiquent un effet semblable sur la population de poissons, sur les tissus de poissons ou sur la communauté d'invertébrés benthiques.

(2) Si les résultats de la dernière étude de suivi biologique indiquent l'ampleur et la portée géographique de l'effet sur la population de poissons, sur les tissus de poissons ou sur la community, the study design shall include the information required by paragraph (1)(c) and a detailed description of what field and laboratory studies will be used to determine the cause of the effect.

Conduct of Final Biological Monitoring Studies

24 (1) Subject to subsection (2), the final monitoring studies shall be conducted in accordance with the study design submitted under section 23 not sooner than six months after the day on which the final study design has been submitted.

(2) If unusual circumstances make it impossible to follow the study design, the owner or operator must inform the authorization officer without delay.

Content of Final Interpretative Report

25 The final biological monitoring studies conducted under section 24 shall be followed by an interpretative report that contains

(a) the information referred to in paragraphs 17(a) to (f) and (h);

(a.1) a summary of the results of effluent characterization, sublethal toxicity testing and water quality monitoring reported under paragraph 8(e) since the day on which the interpretative report of the previous biological monitoring study was required to be submitted;

(b) if the study design that was submitted under subsection 23(1) contains the information referred to in paragraph 23(1)(d), the magnitude and geographic extent of the effect referred to in that paragraph; and

(c) if the study design was submitted under subsection 23(2), the cause of the effect referred to in that subsection.

Submission of the Final Interpretative Report

26 The final interpretative report shall be submitted to the authorization officer not later than 36 months after the day on which the notice to close the mine was provided under subsection 32(1) of these Regulations.

SOR/2006-239, ss. 26 to 33, 34(F); SOR/2012-22, ss. 10 to 17.

communauté d'invertébrés benthiques, le plan d'étude comporte les renseignements prévus à l'alinéa (1)c) ainsi que les précisions voulues sur les études sur le terrain et sur les études en laboratoire qui seront effectuées pour déterminer la cause de l'effet.

Déroulement de l'étude de suivi biologique finale

24 (1) Sous réserve du paragraphe (2), l'étude de suivi biologique finale est effectuée conformément au plan d'étude présenté en application de l'article 23 au plus tôt six mois après la soumission du plan.

(2) Si des circonstances inhabituelles font qu'il est impossible de se conformer au plan d'étude, le propriétaire ou l'exploitant en informe sans délai l'agent d'autorisation.

Rapport d'interprétation final

25 L'étude de suivi biologique finale effectuée en application de l'article 24 est suivie par un rapport d'interprétation qui comporte les éléments suivants :

a) les renseignements visés aux alinéas 17a) à f) et h);

a.1) un résumé des résultats de la caractérisation de l'effluent, des essais de toxicité sublétale et du suivi de la qualité de l'eau visés à l'alinéa 8e) à partir de la date limite de présentation du rapport d'interprétation de la dernière étude de suivi biologique;

b) si le plan d'étude a été présenté en application du paragraphe 23(1) et comporte les renseignements visés à l'alinéa 23(1)d), l'ampleur et la portée géographique de l'effet visé à cet alinéa;

c) si le plan d'étude a été présenté en application du paragraphe 23(2), la cause de l'effet visé à ce paragraphe.

Présentation du rapport d'interprétation final

26 Le rapport d'interprétation final est présenté à l'agent d'autorisation au plus tard trente-six mois suivant la date de remise de l'avis de fermeture de la mine en application du paragraphe 32(1) du présent règlement.

DORS/2006-239, art. 26 à 33 et 34(F); DORS/2012-22, art. 10 à 17.

SCHEDULE 6

(Section 22)

Annual Report Summarizing Effluent Monitoring Results

PART 1

Identifying Information

1 Name of the mine

2 Address of the mine

3 Name of the operator of the mine

4 Operator's telephone number and e-mail address, if any

5 Reporting period

6 Date of report

PART 2

Test Results Respecting Each Final Discharge Point

1 Complete the following table with the monthly mean concentration for the deleterious substances set out in the table for each final discharge point and identify the location of the final discharge point.

2 Any measurement not taken because there was no deposit from the final discharge point shall be identified by the letters "NDEP" (No Deposit).

3 Any measurement not taken because no measurement was required in accordance with the conditions set out in section 12 or 13 of the *Metal Mining Effluent Regulations* shall be identified by the letters "NMR" (No Measurement Required).

ANNEXE 6

(article 22)

Rapport annuel résumant les résultats du suivi de l'effluent

PARTIE 1

Renseignements identificatoires

1 Nom de la mine

2 Adresse de la mine

3 Nom de l'exploitant de la mine

4 Numéro de téléphone de l'exploitant et adresse électronique, le cas échéant

5 Période visée

6 Date du rapport

PARTIE 2

Résultats des essais à chacun des points de rejet final

1 Remplir le tableau suivant pour chaque point de rejet final, identifier son emplacement et indiquer la moyenne mensuelle de la concentration des substances nocives.

2 S'il n'y a pas eu de résultats parce qu'il n'y avait pas de rejet à partir du point de rejet final, inscrire « A.R. » (aucun rejet).

3 S'il n'y a pas eu de mesure parce que l'article 12 ou 13 du *Règlement sur le effluents des mines de métaux* n'en exigeait aucune, inscrire « A.M.E. » (aucune mesure exigée).

Location of final discharge point:

Month	As (mg/L)	Cu (mg/L)	CN (mg/L)	Pb (mg/L)	Ni (mg/L)	Zn (mg/L)	TSS (mg/L)	Ra 226 (Bq/L)	Lowest pH	Highest pH	Effluent Volume (m^3)
Jan											
Feb											
Mar											
Apr											
May											
June											
July											
Aug											
Sept											
Oct											
Nov											
Dec											

Emplacement du point de rejet final :											
Mois	As (mg/L)	Cu (mg/L)	CN (mg/L)	Pb (mg/L)	Ni (mg/L)	Zn (mg/L)	TSS (mg/L)	Ra 226 (Bq/L)	pH le plus bas	pH le plus haut	Volume d'effluent (m^3)
Janv											
Févr.											
Mars											
Avr											
Mai											
Juin											
Juill.											
Août											
Sept											
Oct											
Nov											
Déc											

PART 3

Results of Acute Lethality Tests and Daphnia Magna Monitoring Tests

Location of final discharge point:		
Date Sample Collected	Results for Rainbow Trout Acute Lethality Tests (mean percentage mortality in 100% effluent test concentration)	Results for *Daphnia magna* Monitoring Tests (mean percentage mortality in 100% effluent test concentration)

PARTIE 3

Résultats des essais de détermination de la létalité aiguë et des essais de suivi avec bioessais sur la daphnia magna

Emplacement du point de rejet final :		
Date du prélèvement de l'échantillon	Résultats des essais de détermination de la létalité aiguë sur la truite arc-en-ciel (pourcentage moyen de mortalité dans l'effluent non dilué)	Résultats des essais de suivi avec bioessais sur la *Daphnia magna* (pourcentage moyen de mortalité dans l'effluent non dilué)

PART 4

Non-compliance Information

1 If the results of the effluent monitoring tests indicate that the limits set out in Schedule 4 were exceeded, indicate the cause(s) of that non-compliance and remedial measures planned or implemented.

2 Indicate remedial measures planned or implemented in response to the failure of rainbow trout acute lethality tests.

SOR/2006-239, s. 35.

PARTIE 4

Renseignements sur la non-conformité

1 Si les résultats des essais de suivi de l’effluent montrent que les limites prévues à l’annexe 4 ont été dépassées, en indiquer les causes ainsi que les mesures correctives projetées ou prises.

2 Indiquer les mesures correctives projetées ou prises en cas de résultats non conformes des essais de détermination de la létalité aiguë sur la truite arc-en-ciel .

DORS/2006-239, art. 35.

SCHEDULE 6.1

(Section 29)

Prescribed Persons for Reporting

	Column 1	Column 2
Item	Province	Position
1	Ontario	Regional Director Environmental Enforcement Division — Ontario Environment Canada
2	Quebec	Regional Director Environmental Enforcement Division — Quebec Environment Canada
3	Nova Scotia	Regional Director Environmental Enforcement Division — Atlantic Environment Canada
4	New Brunswick	Regional Director Environmental Enforcement Division — Atlantic Environment Canada
5	Manitoba	Regional Director Environmental Enforcement Division — Prairie and Northern Environment Canada
6	British Columbia	Regional Director Environmental Enforcement Division — Pacific and Yukon Environment Canada
7	Prince Edward Island	Regional Director Environmental Enforcement Division — Atlantic Environment Canada
8	Saskatchewan	Executive Director Compliance and Field Services Branch Saskatchewan Ministry of Environment
9	Alberta	Director Enforcement and Monitoring Division Alberta Ministry of Environment
10	Newfoundland and Labrador	Regional Director Environmental Enforcement Division — Atlantic Environment Canada
11	Yukon	Regional Director Environmental Enforcement Division — Pacific and Yukon Environment Canada
12	Northwest Territories	Regional Director Environmental Enforcement Division — Prairie and Northern Environment Canada

ANNEXE 6.1

(article 29)

Autorités désignées aux fins de rapport

	Colonne 1	Colonne 2
Article	Province	Poste
1	Ontario	Directeur régional Division de l’application de la loi en environnement — Ontario Environnement Canada
2	Québec	Directeur régional Division de l’application de la loi en environnement — Québec Environnement Canada
3	Nouvelle-Écosse	Directeur régional Division de l’application de la loi en environnement — Atlantique Environnement Canada
4	Nouveau-Brunswick	Directeur régional Division de l’application de la loi en environnement — Atlantique Environnement Canada
5	Manitoba	Directeur régional Division de l’application de la loi en environnement — Prairies et Nord Environnement Canada
6	Colombie-Britannique	Directeur régional Division de l’application de la loi en environnement — Pacifique et Yukon Environnement Canada
7	Île-du-Prince-Édouard	Directeur régional Division de l’application de la loi en environnement — Atlantique Environnement Canada
8	Saskatchewan	Executive Director Compliance and Field Services Branch Saskatchewan Ministry of Environment
9	Alberta	Director Enforcement and Monitoring Division Alberta Ministry of Environment
10	Terre-Neuve-et-Labrador	Directeur régional Division de l’application de la loi en environnement — Atlantique Environnement Canada
11	Yukon	Directeur régional Division de l’application de la loi en environnement — Pacifique et Yukon Environnement Canada
12	Territoires du Nord-Ouest	Directeur régional Division de l’application de la loi en environnement — Prairies et Nord Environnement Canada

Item	Column 1 Province	Column 2 Position
13	Nunavut	Regional Director Environmental Enforcement Division — Prairie and Northern Environment Canada

SOR/2006-239, s. 35; SOR/2011-92, s. 7.

Article	Colonne 1 Province	Colonne 2 Poste
13	Nunavut	Directeur régional Division de l’application de la loi en environnement — Prairies et Nord Environnement Canada

DORS/2006-239, art. 35; DORS/2011-92, art. 7.

SCHEDULE 7

(Paragraphs 34(4)(a) and (d) and (5)(a) and (d))

PART 1

Information to Be Included in an Application for a Transitional Authorization

1 The name, address and telephone number of the applicant.

2 The name, position title, telephone number, facsimile number and E-mail address of a contact person.

3 The name, mailing address and geographic location of the mine.

4 A general description of the mining operation with details of the parts of the operation for which the application is made.

5 A site plan showing the location of the main mining and milling facilities, the effluent treatment facilities and all the final discharge points.

6 All available pH data and data related to the monthly mean concentrations of the deleterious substances set out in column 1 of Schedule 4 in the effluent for which the application is made for the one-year period immediately preceding the date of application.

7 The effluent flow rate at each final discharge point.

8 The available results of all acute lethality tests related to the effluent for which the application is made for the one-year period immediately preceding the date of application.

9 Plans, specifications and other information on the design and capability of the effluent treatment process in place at the mine on the date of application.

10 Based on the best available information at the time of application, a description of the facilities and procedures that are necessary to produce a non-acutely lethal effluent that complies with the authorized limits of the substances set out in column 1 of Schedule 4.

11 A proposed schedule for the construction of the facilities and implementation of the procedures.

12 The details of any effluent monitoring results related to fish, fish habitat or the human use of fish that are known to the operator.

13 A signed statement indicating whether there is a law in the jurisdiction where the mine is located, and the identification of that law, that requires the mine to produce

- **(a)** a non-acutely lethal effluent;
- **(b)** an effluent containing a deleterious substance in a concentration that is equal to or less than the limits set out in Schedule 4; or
- **(c)** an effluent with a pH equal to or greater than 6.0 but not greater than 9.5.

ANNEXE 7

(alinéas 34(4)a) et d) et (5)a) et d))

PARTIE 1

Renseignements devant figurer dans la demande d’autorisation transitoire

1 Les nom, adresse et numéro de téléphone du demandeur.

2 Les nom, fonction, numéros de téléphone et de télécopieur et l’adresse électronique d’une personne-ressource.

3 Les nom, adresse postale et emplacement géographique de la mine.

4 Une description générale de l’exploitation minière, avec des précisions sur les éléments de l’exploitation qui sont visés par la demande.

5 Un plan du site indiquant l’emplacement des principales installations d’extraction et de préparation du minerai, des installations de traitement de l’effluent et de tout point de rejet final.

6 Toutes les données disponibles sur le pH et celles portant sur les concentrations mensuelles moyennes des substances nocives énumérées à la colonne 1 de l’annexe 4 dans l’effluent visé par la demande pour la période d’un an précédant la date de la demande.

7 Le débit de l’effluent à chaque point de rejet final.

8 Les résultats disponibles de tous les essais de détermination de la létalité aiguë de l’effluent visé par la demande pour la période d’un an précédant la date de la demande.

9 Les plans, les spécifications et tous autres renseignements sur la conception et la capacité du procédé de traitement de l’effluent en place à la mine à la date de la demande.

10 Selon les meilleures données connues au moment de la demande, une description des installations et des pratiques nécessaires pour produire un effluent à létalité non aiguë qui respecte les limites permises pour les substances énumérées à la colonne 1 de l’annexe 4.

11 Un projet de calendrier de construction des installations et de mise en œuvre des pratiques.

12 Le détail de tous les résultats du suivi de l’effluent se rapportant au poisson, à son habitat ou à l’utilisation du poisson par l’homme, qui sont connus de l’exploitant.

13 Une déclaration signée qui fait mention de toute loi de l’autorité législative du territoire où est située la mine exigeant la production par la mine d’un effluent qui possède les caractéristiques suivantes :

- **a)** il présente une létalité non aiguë;
- **b)** toute substance nocive qu’il contient a une concentration égale ou inférieure aux limites établies à l’annexe 4;
- **c)** son pH est égal ou supérieur à 6,0 mais ne dépasse pas 9,5;

14 Any further information that is required to support the application.

PART 2

Statement of Certification

I certify that the information provided under Part 1 of Schedule 7 to the *Metal Mining Effluent Regulations* was prepared by persons with sufficient knowledge to evaluate the information. I further certify, based on my reasonable inquiry of the persons responsible for making the determination, that the information submitted is true, accurate and complete.

Date: __________

Signature : ____________________
(operator, owner or their authorized representative)

____
(Position title)

SOR/2006-239, s. 36(F).

14 Tous les autres renseignements nécessaires à l'appui de la demande.

PARTIE 2

Attestation

J'atteste que les renseignements soumis en application de la partie 1 de l'annexe 7 du *Règlement sur les effluents de mines de métaux* ont été établis par des personnes qui possèdent les connaissances suffisantes pour les évaluer. J'atteste, en outre, à la lumière d'une enquête raisonnable que j'ai effectuée sur les personnes responsables de cette détermination, que les renseignements fournis sont véridiques, exacts et complets.

Date : __________

Signature : ____________________
(propriétaire, exploitant ou leur représentant autorisé)

____
(fonction)

DORS/2006-239, art. 36(F).

SCHEDULE 8

(Subsection 35(2))

(PART 1)

Transitional Authorization for Acutely Lethal Effluent

(*Name and address of the owner and operator of the mine*)

Owner: ________________ Operator: ________________
________________ ________________
________________ ________________
________________ ________________

(*Name and address of the mine*)

____
____
____

is (are) hereby authorized as of (*date*) __________ to deposit acutely lethal effluent until (*date*) __________ for effluent from (*identify final discharge point*)

____

IMPORTANT: Please refer to sections 6 to 27 and subsection 28(1) of the *Metal Mining Effluent Regulations* (MMER) for conditions governing the authority to deposit. In addition, please note that this authorization may be revoked under section 38 of those Regulations.

Authorization Officer:

(*Signature*): ________________

(*Name*): ________________

(*Position*): ________________

(*Date*): ________________

PART 2

Transitional Authorization for Deleterious Substances

(*Name and address of the owner and operator of the mine*)

Owner: ________________ Operator: ________________
________________ ________________
________________ ________________
________________ ________________

ANNEXE 8

(paragraphe 35(2))

PARTIE 1

Autorisation transitoire visant un effluent à létalité aiguë

(*Nom et adresse du propriétaire et de l'exploitant de la mine*)

Propriétaire : ________________ Exploitant : ________________
________________ ________________
________________ ________________
________________ ________________

(*Nom et adresse de la mine*)

____
____
____

est (sont) autorisé(s), à compter du (*date*) __________, à rejeter un effluent à létalité aiguë jusqu'au (*date*) __________ en ce qui concerne l'effluent provenant de (*préciser le point de rejet final*)

____

IMPORTANT : Prière de consulter les articles 6 à 27 et le paragraphe 28(1) du *Règlement sur les effluents des mines de métaux* pour les conditions régissant l'autorisation de rejeter. Veuillez également prendre note que l'autorisation peut être révoquée en vertu de l'article 38 de ce règlement.

Agent d'autorisation

(*Signature*) : ________________

(*Nom*) : ________________

(*Fonction*) : ________________

(*Date*) : ________________

PARTIE 2

Autorisation transitoire visant des substances nocives

(*Nom et adresse du propriétaire et de l'exploitant de la mine*)

Propriétaire : ________________ Exploitant : ________________
________________ ________________
________________ ________________
________________ ________________

(*Name and address of the mine*)

____

____

____

is (are) hereby authorized as of (*date*) ________ to deposit the deleterious substances specified below until (*date*) ________ for effluent from (*identify final discharge point*) ____.

Deleterious Substance	Maximum Authorized Monthly Mean Concentration[1]	Maximum Authorized Concentration in a Composite Sample[2]	Maximum Authorized Concentration in a Grab Sample[3]
Arsenic			
Copper			
Cyanide			
Lead			
Nickel			
Zinc			
Radium 226			
Total Suspended Solids			

Authorized Effluent pH Range[4]: ______________________

IMPORTANT: Please refer to sections 6 to 27 and subsection 28(1) of the *Metal Mining Effluent Regulations* for conditions governing the authority to deposit. In addition, please note that this authorization may be revoked under section 38 of those Regulations.

Authorization Officer:

(*Signature*): ______________________

(*Name*): ______________________

(*Position*): ______________________

(*Date*): ______________________

[1] The maximum monthly mean concentration of the deleterious substance in effluent is the greater of the maximum monthly mean concentration of the substance recorded during the 12-month period preceding the date of the application for the transitional authorization and the authorized monthly mean concentration set out in column 2 of Schedule 4. The maximum monthly mean concentration for a substance may not exceed the concentration required by the jurisdiction where the mine is located, if applicable.

[2] The maximum authorized concentration of the deleterious substance in each composite sample collected is equal to 1.5 times the maximum authorized monthly mean concentration.

[3] The maximum authorized concentration of the deleterious substance in each grab sample collected is equal to 2.0 times the maximum authorized monthly mean concentration.

[4] The lower limit of the authorized pH range is equal to the lowest pH recorded during the 12-month period preceding the date of the application for the transitional authorization or 6.0, whichever is less. The upper limit of the authorized pH range is

(*Nom et adresse de la mine*)

____

____

____

est (sont) autorisé(s), à compter du (*date*) ________, à rejeter les substances nocives ci-après jusqu'au (*date*) ________ en ce qui concerne l'effluent provenant de (*préciser le point de rejet final*)

____.

Substance nocive	Concentration moyenne mensuelle maximale permise[1]	Concentration maximale permise dans un échantillon composite[2]	Concentration maximale permise dans un échantillon instantané[3]
Arsenic			
Cuivre			
Cyanure			
Plomb			
Nickel			
Zinc			
Radium 226			
Total des solides en suspension			

Plage permise pour le pH[4] de l'effluent : ______________________

IMPORTANT : Prière de consulter les articles 6 à 27 et le paragraphe 28(1) du *Règlement sur les effluents des mines de métaux* pour les conditions régissant l'autorisation de rejeter. Veuillez également prendre note que l'autorisation peut être révoquée en vertu de l'article 38 de ce règlement.

Agent d'autorisation

(*Signature*) : ______________________

(*Nom*) : ______________________

(*Fonction*) : ______________________

(*Date*) : ______________________

[1] La concentration moyenne mensuelle maximale d'une substance nocive dans un effluent représente soit la concentration moyenne mensuelle maximale enregistrée au cours des douze mois précédant la date de la demande, soit la concentration moyenne mensuelle permise prévue à la colonne 2 de l'annexe 4, selon la plus élevée de ces concentrations. Cependant, la concentration moyenne mensuelle maximale ne peut pas dépasser la concentration fixée par l'autorité législative du territoire où est situé la mine, le cas échéant.

[2] La concentration maximale permise d'une substance nocive dans un échantillon composite est égale au produit de 1,5 par la concentration moyenne mensuelle maximale permise de la substance.

[3] La concentration maximale permise d'une substance nocive dans un échantillon instantané est égale au produit de 2,0 par la concentration moyenne mensuelle maximale permise de la substance.

[4] Le niveau inférieur de la plage permise pour le pH est égal à soit le pH le plus bas enregistré au cours des douze mois précédant la date de la demande, soit une valeur de 6,0, selon la plus

equal to the highest pH recorded during the 12-month period preceding the date of the application or 9.5, whichever is greater.

basse de ces valeurs. Le niveau supérieur de la plage permise pour le pH est égal à soit le pH le plus élevé enregistré au cours des douze mois précédant la date de la demande, soit une valeur de 9,5, selon la plus élevée de ces valeurs.

APPENDIX D
EMERGENCY RESPONSE TRUCK INVENTORY

MRT Emergency Response Truck

Right Side:

Left Side:

Baffinland

Rescue EMG-006

Equipment checklist **Date:** **Time:** **Inspector:**

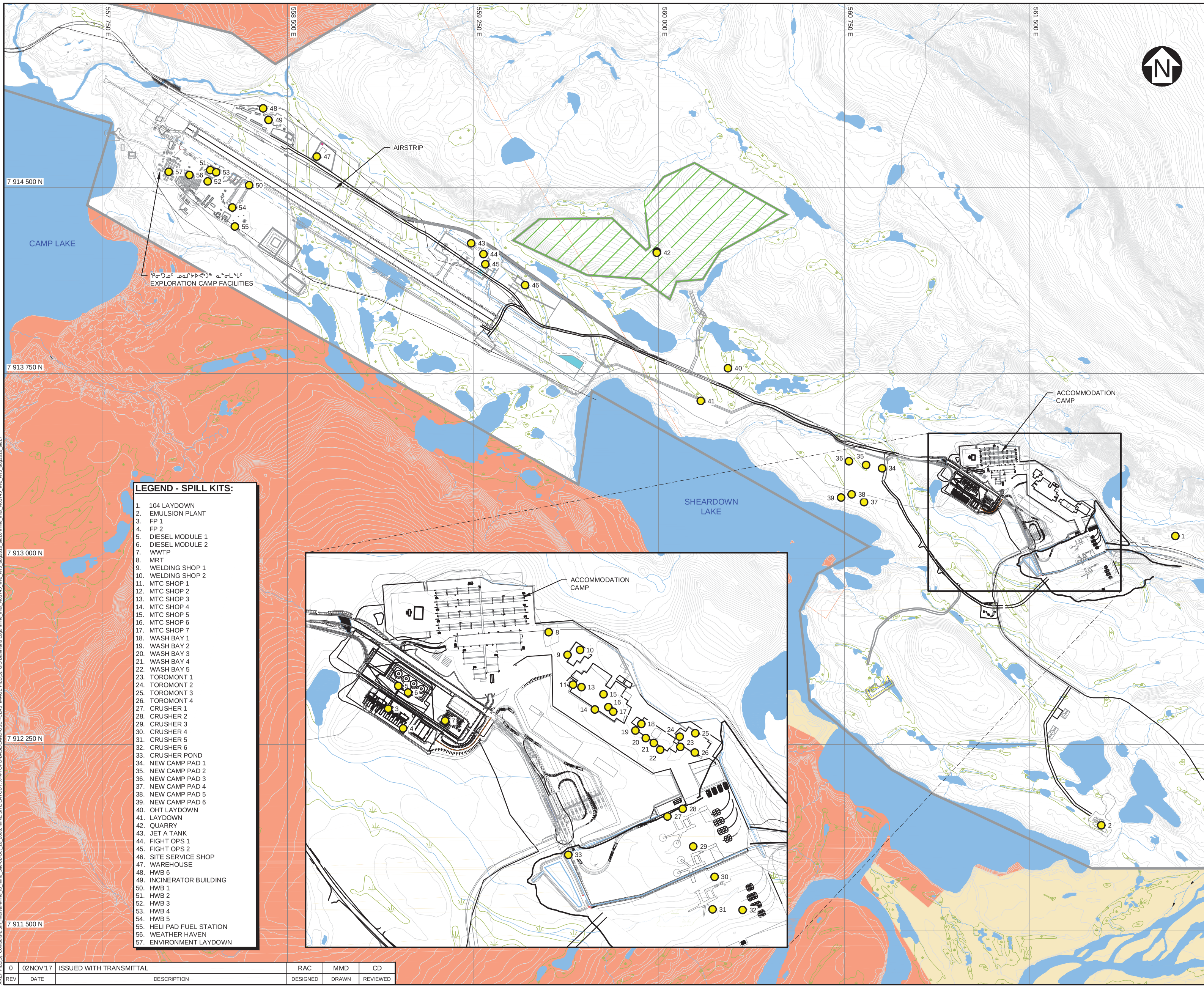
N/A - Not Applicable

Compartment	Items		Yes	Condition	Full	Empty	Tested	Comments
Cabin	**1**	Safety Glasses clear box						
	1	Safety glasses Darks box						
	1	Binoculars						
	1	Rolls of duck tape						
	1	Emergency Road kit						
	1	First Aid kit						
	2	Care Flare						
	1	Thermal Imaging Camera						**Change with spare battery**
	2	Caution Tape/ Danger Tape						
	1	2.5 pound fire extinguisher						
1 Left Compartment	**7**	SCBA						
	18	SCBA Cylinder						
	12	SCBA Face masks						
	1	RIT pack						
	10	Banks Pelican flashlights						
	2	Wheel Chock						
2 Left Compartment	**2**	Shovel (Spade, Shovel)						
	2	Rakes						
	1	Cable power puller						
	1	Saws all (reciprocating saw)						
	2	Saws all blades (kits)						
	3	Drill bit set						
	2	Cordless drill						
	1	Socket set						
	1	Tool box						
	2	bolt cutters (Large/Small)						
	1	D size 12 pack batteries						
	1	C Size 12 pack Batteries						
	3	9 Volt Batteries						
	1	4 AAA Batteries						
	6	Led head liters with 4AAA Batt						
	1	4 AA batteries						
	2	sledge hammer						
	1	Halligan bar						
	3	Big axe						
	4	Winter Gloves						
	1	Steel jerry can (gas)						
	1	Plastic jerry can (gas)						
	1	Portable fan						**Start and run for 5 min**
	1	Power pack for jaws of life						**Start and run for 5 min**
	1	Miscellaneous oils						
	1	Air star Light						
	2PG	Balaclava						
	2	Rolls duct tape						
	1	Hole Saw (kit)						
	1	Standard set wrench's						
		work gloves						
3 Left Compartment	**1**	Portable fan (electric)						
	4	Tarps						
	3	Various Valves and adaptors						
	1	hydraulic air hammer						
	1	Spreader						
	1	Cutter						
	1	Pincher						
	1	Brace bar (hydraulic brace)						
	2	Air Bags Hoses						
	1	Chainsaw						**Start and run for 5 min**

	1	Chop saw						**Start and run for 5 min**
	1	1/2 Impact gun						
	1	Grizzly Struts						
	3	Hydraulic Hoses						
4 Left Compartment	2	1.5 inch hose (yellow)						
	2	2.5 inch hose (white)						
	2	Pistol Grip 2.5 hose nozzle						
	1	Splitter 2.5" to 1.5"						
	1	life ring						
	1	Pistol Grip 1.5 inch nozzle						
	4	Mustang Suits						
	4	Rollgliss R550 Kit						
	4	1.5 inch portable spray nozzle						
	1	Victaulic coupler						
		Wood (cribbing)						
5 Left Compartment	4	Black Mustang Survivor Vest						
	1	Pulley's carabineers, bag						
	1	Prusik						
	2	Mini 4:1						
	3	Bag Carbineer						
	2	Assender kits						
	4	Climbing harness **Kits**						
	1	Bag webbing &slings						
	4	Beam Clamps						
	7	Helmets & Gloves						
	2	400' Rope Bags						
	5	HH Life Vests						
	2	Mustang Survival Suits **Red Fire Bag**						
	3	Mustang Self Inflatable						
	6	Orange PFD Vest **Red Fire Bag**						
	3	Petzl AVAO Harness						
	4	Boots (pairs) **Red Fire Bag**						
	2	Rescue rope (200 foot bags)						
	2	Rope abrasion protection						
	2	Rescue ring						
	4	"Confined space" SCBA						
	2	Telescopic reach pole						
1 Right Compartment	2	Back Boards						
	2	Ferno Head Immobilizers						
	2	Ked Extrication Kits						
	1	Trauma Kit						
	3	Blankets						
	6	Insulated Coveralls						
	4	Regular Coveralls						
	6	Hi-Viz Vests						
	4	Granola bars Box						
	5	Ferno spider straps						
	3	Ferno CPR masks						
	1	IC Command Center Board						
	2	Box Safety Glasses (Dark/Clear)						
	1	Misc. rigid splints (sets) (orange bag)						
	1	RsQmax Kit						
	1	Jug of Water						
	1	Box Of Sorbent Boom						
	1	Bank of Batteries (X6)						
	1	Large box of Gloves						
	1	Sleeve of cups						
	7	Folding stretchers						
	2	Basket Stretcher kits (complete)						
2 Right Compartment	6	Pylons						
	2	padded splint						
	5	Pails						
3 Right Compartment	3	Grey Spill Pads (Bag)						
	3	White Spill Pads (Bag)						
	3	Box Absorbent Socks						
	1	Plug & dyke						
	1	20L Pail Gap Seal						
	2	Lithium fire extinguisher						
	2	15000 liter Onion bladder						

	1	Ferno Stair chair						
	4	Magnesium fire extinguisher						
4 Right Compartment	1	15000 VSG Bladder						
	1	Onion Skin						
	4	Quatrex bags (white)						
	1	Stair Chair						
	3	Bladder repair kits						
	3	Bladder fitting kit						
	1	Mazar Rescue Board						
5 Right Compartment	5	Quatrex Bags(white)						
	1	spill response generator						**Start and run for 5 min**
	2	Medical disaster kits						**Check Expiry Data (Burn Kits, Sterile water)**
	2	Arctic soft extension cords						
	2	Chicken wire (roll)						
	3	Tarps						
	2	2X2 Duck Pond						
	5	EXO Fit Harness						
	1	Helmet Face Shield						
	15	Long gloves (pair)						
	1	Honda GX 270 trash pump						**Start and run Quickly shut off**
	4	hip wader steel toe						
		Tyvek coveralls suits						
	1	Funnel						
	3	rubber suits						

APPENDIX E
MINE SITE SPILL KIT INVENTORY AND LOCATIONS



LEGEND - SPILL KITS:

1. 104 LAYDOWN
2. EMULSION PLANT
3. FP 1
4. FP 2
5. DIESEL MODULE 1
6. DIESEL MODULE 2
7. WWTP
8. MRT
9. WELDING SHOP 1
10. WELDING SHOP 2
11. MTC SHOP 1
12. MTC SHOP 2
13. MTC SHOP 3
14. MTC SHOP 4
15. MTC SHOP 5
16. MTC SHOP 6
17. MTC SHOP 7
18. WASH BAY 1
19. WASH BAY 2
20. WASH BAY 3
21. WASH BAY 4
22. WASH BAY 5
23. TOROMONT 1
24. TOROMONT 2
25. TOROMONT 3
26. TOROMONT 4
27. CRUSHER 1
28. CRUSHER 2
29. CRUSHER 3
30. CRUSHER 4
31. CRUSHER 5
32. CRUSHER 6
33. CRUSHER POND
34. NEW CAMP PAD 1
35. NEW CAMP PAD 2
36. NEW CAMP PAD 3
37. NEW CAMP PAD 4
38. NEW CAMP PAD 5
39. NEW CAMP PAD 6
40. OHT LAYDOWN
41. LAYDOWN
42. QUARRY
43. JET A TANK
44. FIGHT OPS 1
45. FIGHT OPS 2
46. SITE SERVICE SHOP
47. WAREHOUSE
48. HWB 6
49. INCINERATOR BUILDING
50. HWB 1
51. HWB 2
52. HWB 3
53. HWB 4
54. HWB 5
55. HELI PAD FUEL STATION
56. WEATHER HAVEN
57. ENVIRONMENT LAYDOWN

LEGEND:

- INUIT OWNED LAND - SURFACE ONLY EXCLUDING MINERALS
- INUIT OWNED LAND - SURFACE AND SUBSURFACE INCLUDING MINERALS
- WATER
- QUARRY AREA (EXISTING UNDER Q13C301)
- RIVER/STREAM/DRAINAGE
- ROAD
- QIA SURFACE COMMERCIAL LEASE BOUNDARY
- SPILL KIT LOCATION

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 17N.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PLAN BASED ON INFORMATION PROVIDED BY HATCH, DATED JAN 13, 2015, AND 2017.
4. CONTOUR INTERVAL IS 2.5 METRES.

SCALE A 150 75 0 250 500 750 m

Baffinland

MARY RIVER PROJECT

MINE SITE SPILL KIT LOCATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.	REV
NB102-181/41	NB17-00729	0

FIGURE 2

0	02NOV'17	ISSUED WITH TRANSMITTAL	RAC	MMD	CD
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED

SAVED: I:\102\00181\41\A\Acad\FIGS\B11_r0, 11/2/2017 3:09:41 PM, MDEMERS PRINTED: 11/2/2017 3:13:13 PM, PLAN, MDEMERS

Inventory of Typical Spill Kits	
Amount	**Description**
1	30 Gallon Drum with Lid
50	Sorbent Pads
4	Sorbent Socks
2	Sorbent Booms
1	Shaker of Safety Sorb
1	Neoprene Drain Cover
1	Disposable Bag
2 Pair	Safety Goggles
2 Pair	Nitrile Gloves

* Best efforts are made to ensure spill kits remain fully stocked at their designated locations.

APPENDIX F
NT-NU SPILL REPORT FORM

Northwest Territories · Nunavut · Canada

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # ______ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER ____-__________
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME		

C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS
F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS		

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC	SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN	FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

APPENDIX G

EEM INTERPRETIVE REPORT

APPENDIX G

EEM INTERPRETIVE REPORT

minnow environmental inc.
A Trinity Consultants Company

Mary River Project Phase 1 Environmental Effects Monitoring (2017) Interpretive Report

Prepared for:
Baffinland Iron Mines Corporation
Oakville, Ontario

Prepared by:
Minnow Environmental Inc.
Georgetown, Ontario

January 2018

Mary River Project Phase 1
Environmental Effects Monitoring (2017)
Interpretive Report

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EXECUTIVE SUMMARY

The Mary River Project is an operating high-grade iron mine located in the Qikiqtani Region of northern Baffin Island, Nunavut. Owned and operated by Baffinland Iron Mines Corporation (Baffinland), the mine began commercial operation in 2015. Mining activities at the Mary River Project include open pit ore extraction, ore haulage, stockpiling, crushing, and screening, followed by transport by truck to Milne Port for subsequent seasonal loading onto bulk carrier ships for transfer to European markets. No milling or additional processing of the ore is conducted on-site and therefore no tailings are produced at the Mary River Project. Mine waste management facilities at the Mary River Project thus consist simply of a mine waste rock stockpile and surface runoff collection/containment ponds currently situated near the mine waste rock stockpile and ore stockpile areas.

The Mary River Project became subject to the Metal Mining Effluent Regulations (MMER) under the *Fisheries Act* in July 2015. The MMER outline requirements for routine effluent and water quality monitoring and for biological monitoring, collectively referred to as Environmental Effects Monitoring (EEM) studies. The objective of EEM is to determine whether mine effluent is causing an effect on the fish population, the use of fisheries resources (i.e., mercury accumulation in fish tissues) and/or fish habitat (benthic invertebrate communities). A Study Design for the initial phase of biological EEM at the Mary River Project was submitted to, and following comments and discussions, approved by Environment and Climate Change Canada (ECCC). The field component of the Phase 1 EEM biological study at Mary River Project was implemented in August 2017 using the approach outlined in the approved study design, focusing on the evaluation of effects at effluent-exposed areas of two watercourses, Mary River Tributary-F and Mary River. In accordance with MMER requirements, this Interpretive Report provides a summary of effluent and water quality monitoring data and the results of the Mary River Project Phase 1 EEM biological study.

Effluent from the Mary River Project primary discharge (MS-08) met all MMER limits during normal mine operations in 2015, 2016 and, with the exception of the discharge of effluent with low pH and elevated mean monthly Total Suspended Solids (TSS) concentrations in August and/or September, also met MMER limits in 2017. The mine effluent was non-acutely lethal to rainbow trout and *Daphnia magna* in each of 2015 and 2016, but was acutely toxic to both test species in an August 2017 test and to *D. magna* in a September 2017 test. Due diligence and corrective actions related to these non-compliant discharges were undertaken by Baffinland in 2017 (Appendix B). Sublethal toxicity tests conducted using final effluent samples showed no effects on survival or growth of fathead minnow or on growth of green algae over the Phase 1 EEM period. Occasional effects on survival and/or reproduction of planktonic invertebrates and more consistent growth inhibition to duckweed were shown in effluent sublethal toxicity tests conducted from 2015 to 2017. However, effects to these test organisms were observed at effluent concentrations higher than those typically expected within the mine receiving environment, suggesting limited potential for similar sublethal toxicity effects within the immediate Mary River Tributary-F effluent-exposed area. Effluent concentrations estimated for the immediate receiving waters of Mary River Tributary-F were less than 1% after complete mixing based on extrapolation of field specific conductance measures and hydrological gauging station data in 2017.

Water chemistry at effluent-exposed areas of Mary River Tributary-F showed slightly elevated ammonia, nitrate and/or sulphate concentrations compared to reference conditions during periods of effluent discharge in 2016 and 2017, but concentrations of these parameters were consistently well below applicable water quality guidelines (WQG). Within the effluent-exposed area of Mary River, average nitrate concentrations were slightly elevated compared to the applicable reference area, but only in 2017 and concentrations remained well below WQG, suggesting that the elevated nitrate concentrations were not ecologically meaningful.

The benthic invertebrate community survey indicated no significant differences in primary EEM endpoints of density, richness, Simpson's Evenness and Bray-Curtis Index between effluent-exposed and reference areas of Mary River Tributary-F. In turn, this suggested no adverse influences to the benthic invertebrate community of Mary River Tributary-F associated with exposure to mine effluent. The fish population survey indicated no substantial differences in community species composition between the effluent-exposed and reference areas of Mary River, but potentially higher abundance of fish at the effluent-exposed area due to natural habitat factors. The Mary River arctic charr (*Salvelinus alpinus*) population showed no significant difference in size (length-frequency) structure, and no significant difference in proportion of young-of-the-year (YOY) individuals between the effluent-exposed and reference areas. In addition, length and weight of non-YOY arctic charr did not differ significantly between populations sampled at the effluent-exposed and reference areas of Mary River. Although non-YOY arctic charr captured at the effluent-exposed area had significantly lower condition (length-at-weight relationship) than those captured at the reference area, the magnitude of this difference was small (i.e., -4.5%) and within the applicable fish condition Critical Effect Size of ±10% used for EEM studies, suggesting that this difference was not ecologically meaningful.

Overall, the Mary River Project Phase 1 EEM indicated very low effluent concentrations within the immediate Mary River Tributary-F receiving environment. Commensurately, only minor effluent-related influences on water quality of this watercourse and farther downstream at Mary River during periods of effluent discharge were indicated, with pH and concentrations of all parameters potentially associated with the mine effluent consistently meeting applicable WQG in both watercourses. Although Mary River non-YOY arctic charr had lower condition at the effluent-exposed area than at the reference area, concentrations of mine-related parameters well below WQG and no effluent-related influences on primary EEM benthic invertebrate community endpoints closer to the effluent discharge at Mary River Tributary-F suggested that factors other than mine-effluent accounted for this difference in non-YOY arctic charr condition.

Based on the prescribed EEM frequency under the MMER, the Study Design for the next Mary River Project EEM biological study must be submitted to ECCC no later than six months prior to implementing field collections in 2020. Using the EEM framework, the next phase of biological monitoring (Phase 2) will require an effects assessment, in part, to determine whether the occurrence of the difference in fish condition indicated in this initial Phase 1 EEM is consistent. The corresponding Interpretive Report will be required to be submitted to ECCC by January 10th, 2021.

TABLE OF CONTENTS

EXECUTIVE SUMMARY i

1 INTRODUCTION 6

2 METHODS 8
- 2.1 Overview 8
- 2.2 Study Area Locations and Habitat Characterization 8
- 2.3 Effluent and Water Quality Monitoring 11
  - 2.3.1 Effluent Quality 11
  - 2.3.2 Receiving Environment Water Quality 12
- 2.4 Benthic Invertebrate Community Survey 14
  - 2.4.1 Overview 14
  - 2.4.2 Sample Collection and Laboratory Analysis 16
  - 2.4.3 Data Analysis 17
- 2.5 Fish Population Survey 19
  - 2.5.1 Overview 19
  - 2.5.2 Sample Collection and Field and Laboratory Processing 21
  - 2.5.3 Data Analysis 22

3 EFFLUENT QUALITY AND SUBLETHAL TOXICITY 26
- 3.1 Effluent Volume and Quality 26
- 3.2 Effluent Sublethal Toxicity 27

4 WATER QUALITY 31
- 4.1 Mary River Tributary-F 31
- 4.2 Mary River 33

5 BENTHIC INVERTEBRATE COMMUNITY SURVEY 36

6 FISH POPULATION SURVEY 41
- 6.1 Fish Community 41
- 6.2 Arctic Charr Population Evaluation 42

7 CONCLUSIONS 45

8 REFERENCES 48

APPENDIX A STUDY DESIGN APPROVAL CORRESPONDENCE

APPENDIX B 2017 MS-08 DISCHARGE SUPPLEMENTAL INFORMATION

APPENDIX C HABITAT CHARACTERIZATION INFORMATION

APPENDIX D EFFLUENT AND WATER QUALITY DATA

APPENDIX E BENTHIC INVERTEBRATE COMMUNITY DATA

APPENDIX F FISH POPULATION SURVEY DATA

LIST OF FIGURES

Figure 1.1: Baffinland Iron Mines Corporation, Mary River Project Location ... 7
Figure 2.1: Mary River Project Water Quality Monitoring and Field Study Habitat Stations ... 9
Figure 2.2: Benthic Invertebrate Community Station Locations for the Mary River Project EEM, August 2017 ... 15
Figure 2.3: Fish Survey Sampling Locations for the Mary River Project EEM, August 2017 ... 20
Figure 3.1: Mary River Project Average Monthly and Cumulative Effluent Discharge (Station MS-08) for the Phase 1 EEM Period (2015 - 2017) ... 26
Figure 4.1: Comparison of In Situ Water Quality Variables Measured at Mary River Tributary-F Benthic Stations and Mary River Fish Population Study Areas, Mary River Project Phase 1 EEM, August 2017 ... 32
Figure 5.1: Comparison of Benthic Invertebrate Community Primary EEM Endpoints for Mary River Tributary-F Effluent-Exposed and Reference Study Areas ... 37
Figure 5.2: Comparison of Dominant Benthic Invertebrate Community Compositional Groups between Mary River Tributary-F EEM Study Areas, Mary River Project Phase 1 EEM, August 2017 ... 39
Figure 6.1: Length-frequency Distributions for Arctic Charr Collected at Mary River Project Phase 1 EEM Effluent-Exposed and Reference Study Areas, August 2017 ... 43
Figure 6.2: Comparison of Condition (Weight-at-Fork Length Relationship) for Arctic Charr Non-Young-of-the-Year (Non-YOY) Collected at Mary River Effluent-Exposed and Reference Areas, August 2017 ... 44

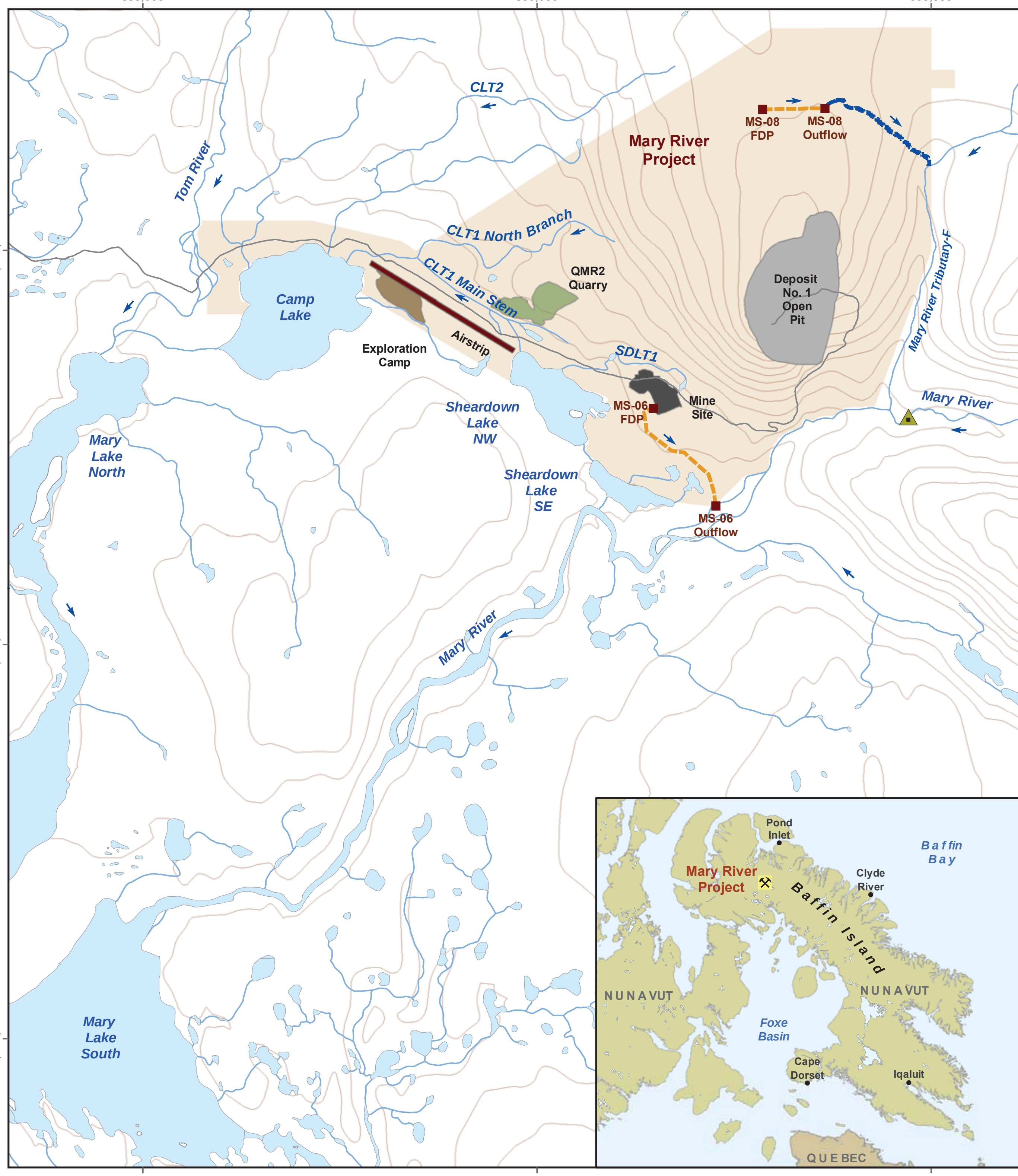
LIST OF TABLES

Table 2.1: Magnitude of Difference Categorizations for Water Chemistry Comparisons ... 14
Table 2.2: Required and Supporting Endpoints to be Examined for EEM Benthic Invertebrate Community Survey ... 18
Table 2.3: Endpoints to be Examined for the EEM Lethal and Non-Lethal Fish Population Survey ... 23
Table 3.1: Summary of Routine MMER and Effluent Characterization Data (Station MS-08) for the Mary River Project Phase 1 EEM period, 2015 to 2017 ... 28
Table 3.2: Sublethal Toxicity Test Effluent Effect Concentration Results (% effluent) using Mary River Project Final Effluent (Station MS-08), 2015 - 2017 ... 29
Table 4.1: Annual Average Water Chemistry at Mary River EEM Stations during Periods of Effluent Discharge, 2015 to 2017 ... 35
Table 5.1: Benthic Invertebrate Community Statistical Comparison Results between Mary River Tributary-F Effluent-Exposed and Reference Study Areas Calculated for Primary EEM Metrics and Dominant Taxa, FFG and HPG ... 38
Table 6.1: Summary of Fish Catches at Mary River Project Phase 1 EEM Fish Population Study Areas, August 2017 ... 41
Table 6.2: Summary of Arctic Charr Population Statistical Comparison Results between Effluent-Exposed and Reference Areas of Mary River, August 2017 ... 44

1 INTRODUCTION

The Mary River Project, owned and operated by Baffinland Iron Mines Corporation (Baffinland), is a high-grade iron ore mining operation located in the Qikiqtani Region of northern Baffin Island, Nunavut (Figure 1.1). Open pit mining, including pit bench development, ore haulage and stockpiling, and the crushing and screening of high-grade iron ore, commenced at the Mary River Project in mid-September 2014. No milling or additional ore processing is conducted on-site. For the initial mining stages at the Mary River Project, as much as 4.2 million tonnes (Mt) of crushed/screened ore is transported annually by truck to Milne Port, which is located approximately 100 km north of the mine site. At Milne Port, the ore is stockpiled before being loaded onto bulk carrier ships for transport to European markets during the summer ice-free period. No tailings are produced during ore processing, and therefore mine waste management facilities at the Mary River Project include a mine waste rock stockpile and surface runoff collection ponds currently situated near the mine waste rock stockpile and ore stockpile areas.

The Mary River Project became subject to the Metal Mining Effluent Regulations (MMER) under the *Fisheries Act* in July 2015 as a result of the discharge of effluent in excess of 50 cubic meters (m^3) per day from a temporary mine waste rock settling pond. The MMER outline requirements for routine effluent and water quality monitoring and for biological monitoring, collectively referred to as Environmental Effects Monitoring (EEM) studies, as a condition governing the authority to discharge effluent (Environment Canada 2012; Government of Canada 2017). The objective of EEM is to determine whether mine effluent is causing an effect on the fish population, the use of fisheries resources (i.e., mercury accumulation in fish tissues) and/or fish habitat (benthic invertebrate communities; Environment Canada 2012). In August 2016, a Study Design for the initial phase of biological EEM at the Mary River Project (herein referred to as the Mary River Project Phase 1 EEM) was provided to Environment and Climate Change Canada (ECCC; Minnow 2016a). Approval of the study design was received from ECCC following comment and discussions conducted at the site on August 16th and 17th, 2017 (Appendix A). The field component of the initial Phase 1 EEM biological study at the Mary River Project was implemented in August 2017 with no deviations from the approved Study Design. In accordance with MMER requirements, this Interpretive Report provides a summary of effluent and water quality monitoring data and the methods, results and conclusions of the Mary River Project Phase 1 EEM biological study.



LEGEND

- Final Discharge Point (FDP)
- Mary River Cascade Barrier
- Discharge Line
- Overland Effluent Channel
- QMR2 Quarry
- Airstrip
- Exploration Camp
- Mine Site
- Open Pit
- Mary River Project

Baffinland Iron Mines Corporation, Mary River Project Location

0 1 2 4 km

Map Projection: UTM Zone 17N NAD 1983
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Figure 1.1

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2 METHODS

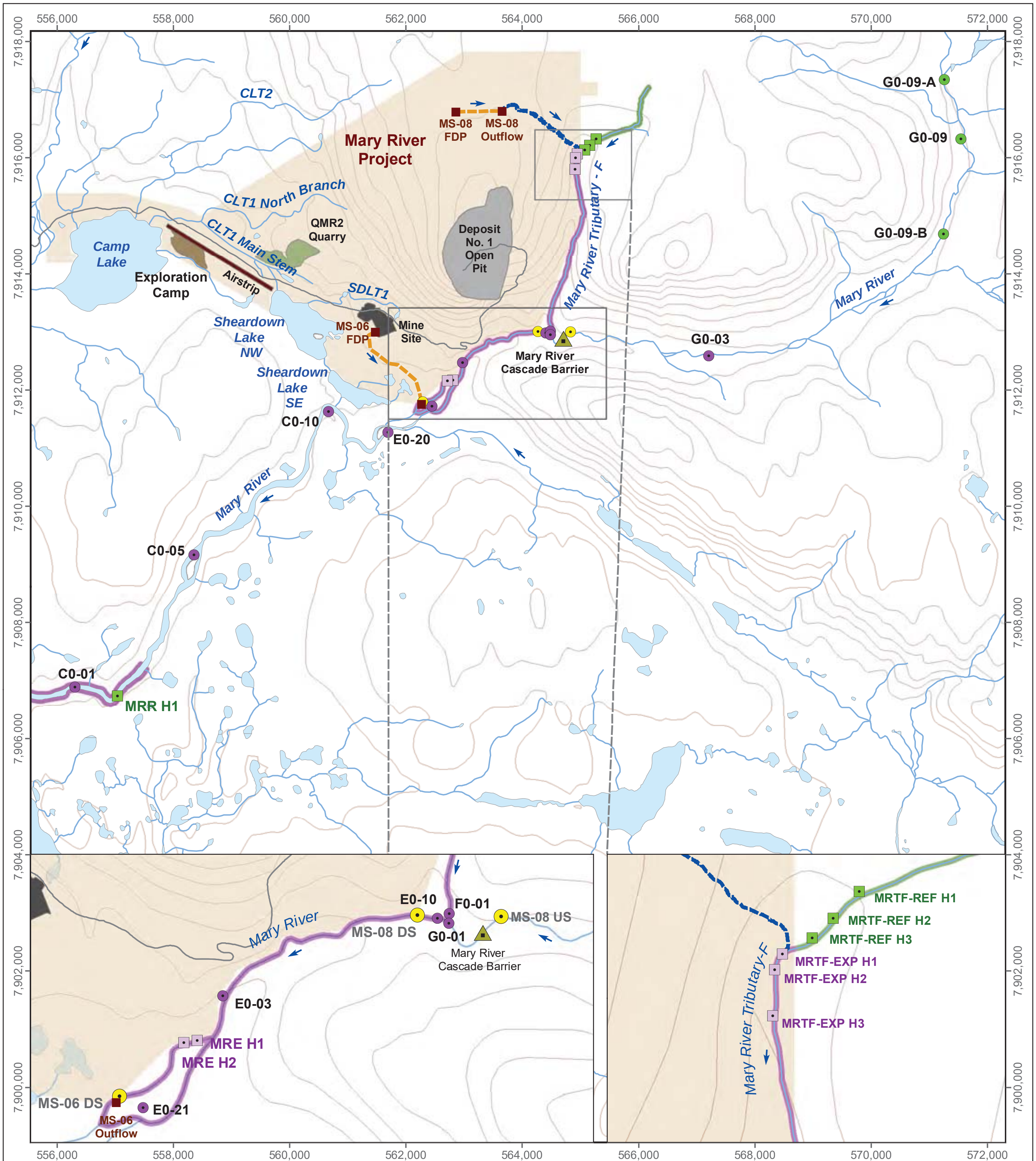
2.1 Overview

The EEM program consists of effluent and receiving environment water quality studies and biological studies (Government of Canada 2017). Effluent characterization, effluent sublethal toxicity testing, and receiving environment water quality monitoring was conducted by Baffinland environment department personnel during periods of effluent discharge in accordance with EEM requirements (Environment Canada 2012) over the 2015 to 2017 Phase 1 EEM period. Additional receiving environment water quality data were also collected at the same time as implementation of the biological monitoring field study. The Mary River Project Phase 1 EEM biological study, including a benthic invertebrate community survey and a fish population survey, was implemented from August 24th to 28th, 2017 led by Minnow Environmental Inc. (Minnow) biologists. The Phase 1 EEM biological field study also included collection of habitat information to support the interpretation of benthic invertebrate community and fish population data (Appendix C). Effluent total mercury concentrations were consistently below 0.10 µg/L since the mine became subject to the MMER in July 2015, and therefore no fish tissue survey was required as part of the Mary River Project Phase 1 EEM biological study in accordance with the MMER statutes (Environment Canada 2012; Minnow 2016a). Each EEM study component incorporated a data quality program to provide checks for sample collection and analysis, and to allow for data quality to be assessed in the context of the study objectives. A description of the Mary River Project Phase 1 EEM study areas and the methods used for sample collection, sample processing and data analysis for each study component are described in the sub-sections below.

2.2 Study Area Locations and Habitat Characterization

Wastewater management at the Mary River Project includes the collection of surface and seepage water originating from the mine waste rock stockpile into a containment pond. Following solids removal via pond-based settling and verification that effluent quality is compliant with applicable territorial and federal limits, effluent is piped to a Final Discharge Point (FDP) located approximately 875 m southeast of the containment pond, referred to as Station MS-08 (Figure 2.1). At the MS-08 FDP, mine effluent is released overland (i.e., no defined channel) into a depression that then meets with an unnamed tributary to the Mary River, herein referred to as Mary River Tributary-F, approximately 2.2 km southeast of the discharge point. From this confluence, Mary River Tributary-F flows south approximately 3.3 km before discharging into Mary River (Figure 2.1).

For the purposes of the Phase 1 EEM biological study, Mary River Tributary-F downstream of the effluent confluence and Mary River extending approximately 2 km downstream of the Mary River



LEGEND

Final Discharge Point (FDP)

Habitat Station

Effluent-Exposed

Reference

CREMP Water Quality Monitoring Station

Mine Exposed

Reference

EEM Water Quality Monitoring Station

Discharge Line

Overland Effluent Channel

EEM Effluent-Exposed Area

EEM Reference Area

Mary River Project Water Quality Monitoring and Field Study Habitat Stations

0 1.5 3 6 km

N E S W

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Figure 2.1

Document Path: S:\Projects\177202\177202.0033 - Baffinland 2017\2 - Mapping\Interpretive Report\17-33 Fig 2.1 Mary River CREMP and EEM WQ Stations.mxd

Tributary-F confluence served as the mine effluent-exposed areas for the benthic invertebrate community survey and fish population survey, respectively (Figure 2.1). Reference areas for the 2017 EEM study included Mary River Tributary-F upstream of the effluent channel for the benthic invertebrate community survey, and Mary River just upstream of Mary Lake for the fish population survey (Figure 2.1). Separate reference areas were required for the benthic invertebrate and fish community surveys because in part, as confirmed during the Phase 1 EEM biological study, fish are naturally absent from Mary River Tributary-F. Similarly, an approximately 20 m high cascade located on Mary River just upstream of the Mary River Tributary-F confluence acts as an impassable barrier to fish migration, contributing to the natural absence of fish from areas located upstream of this confluence and precluding its use as a reference area. Following consultation with ECCC during meetings held on August 16th and 17th, 2017, it was agreed that Mary River upstream of Mary Lake would serve as an appropriate reference area for the fish population survey given known differences in water quality at other candidate reference areas (e.g., Tom River) and authorized fish collection permit conditions.

Habitat characterization was conducted at the Phase 1 EEM study areas to allow evaluation of comparability in abiotic and biotic features between the effluent-exposed and reference study areas used for the benthic invertebrate community and fish population surveys (Figure 2.1). At each study area, a general characterization of riffle habitat was conducted at one to three stations[1] that included transect measurements of wetted and bankfull channel width (m), water depth (cm), water velocity (m/s) and substrate size (intermediate axis diameter in mm). In addition, determination of stream gradient, and qualitative estimates for features including stream morphology, relative substrate composition, instream vegetation (e.g., algae and/or macrophytes) and relative amounts of functional instream fish cover structure was conducted at each station. At each transect, channel width was determined using a measuring tape, and water depth and velocity were measured from 3 – 19 points[1] using a standard wading rod and a Hach FH950 Velocity Flow Meter with electromagnetic sensor (Hach, Loveland, CO), respectively. Gradient was determined using a Suunto PM-5/360 PC clinometer (Suunto, Vantaa, Finland). The habitat characterization data formed the basis for habitat descriptions for each study area, which are appended in this report (Appendix C). Where station replication allowed (i.e., minimum of three stations per area), quantitative data were compared statistically between the effluent-exposed

[1] Habitat characterization was conducted at three stations from each benthic invertebrate community study area, two stations at the effluent-exposed fish population study area, and one station at the reference fish population study area. The number of stations, and number of sampling points along transects, varied based on channel width, habitat complexity and relative ease of sampling (as dictated by depth, water velocity and safety concerns associated with these variables).

and reference areas. These results, as well as the general comparisons of qualitative features, were taken into consideration during interpretation of the EEM biological data.

2.3 Effluent and Water Quality Monitoring

Effluent monitoring (effluent volume, chemical characterization, and sub-lethal toxicity) and receiving environment water quality monitoring (chemical characterization) were conducted at the Mary River Project in accordance with MMER requirements (Environment Canada 2012). As part of its EEM requirements, Baffinland must provide an annual effluent and receiving environment water quality monitoring report to ECCC by March 31st of the following year that includes sampling locations, dates, methods and results together with information on quality assurance and quality control (QA/QC) for this sampling (Government of Canada 2017). Only a summary of routine effluent and water quality monitoring data need be included in the EEM interpretive report, and therefore the following paragraphs provide a brief overview of the effluent and receiving environment water quality monitoring methods. Additional receiving environment water quality samples were collected at the same time as the biological study to support interpretation of the benthic invertebrate community and fish population data, and therefore more detailed methods pertaining to the collection and analyses of these samples are provided below.

2.3.1 Effluent Quality

Effluent quality monitoring included routine monitoring for MMER deleterious substances, effluent characterization, and effluent sub-lethal toxicity sampling and testing. During periods of discharge, effluent volume and chemistry samples for routine MMER sampling and chemical characterization were collected at two final discharge points of compliance, referred to as Station MS-08 and Station MS-06 (Figure 2.1). Volumes of effluent discharged from the final discharge points monitored continuously in cubic metres per day (m^3/day) were compared using monthly averages and cumulative totals (in m^3) by year. In addition to MMER deleterious substances (total suspended solids, arsenic, copper, lead, nickel, zinc and radium-226) and pH, effluent characterization included analysis of temperature, conductivity, hardness, alkalinity, ammonia, nitrate, sulphate and other metals required for EEM (i.e., aluminum, cadmium, iron, mercury, molybdenum and selenium). Effluent characterization samples were collected up to four times per calendar year at intervals of not less than 30 days apart from the final effluent discharge point in accordance with the MMER[2]. Monthly means were calculated for each of the monitored parameters, with those for deleterious substances and mercury compared to MMER limits and to

[2] Because effluent is discharged intermittently over the course of a relatively short open-water period (i.e., approximately 3 – 4 months), the requirement that effluent characterization and sublethal toxicity samples be collected not less than 30 days apart can result in a frequency of sampling events lower than four and two times per year, respectively.

the EEM fish tissue survey trigger limit (i.e., 0.1 µg/L), respectively. The monthly mean data were also compared over the Phase 1 EEM period as a means to track changes in effluent quality over time.

Effluent samples were collected monthly for acute lethality testing, and up to two times per calendar year for sublethal toxicity testing using effluent collected at Station MS-08[2]. Final effluent samples were collected into pre-labelled plastic containers provided by the toxicity laboratory, put on ice inside coolers, and shipped to the toxicity laboratory where they arrived within 48 hours of collection. Acute toxicity tests were conducted using rainbow trout (*Oncorhynchus mykiss*) and the invertebrate *Daphnia magna* in accordance with standard Environment Canada (1990, 2000) protocols. Sublethal toxicity tests were conducted using fathead minnow (*Pimephales promelas;* 7-day survival and growth test), a cladoceran invertebrate (*Ceriodaphnia dubia;* 7-day survival and reproduction test), duckweed (*Lemna minor*; 7-day growth inhibition test), and a green alga (*Pseudokirchneriella subcapitata*; 3-day growth inhibition test) using standard test methods (i.e., Environment Canada 2007a,b,c; 2011). For fathead minnow and *C. dubia* tests, an LC_{50} (i.e., lethal concentration to 50% of test organisms) was calculated from the mortality data by laboratory personnel. Chronic toxicity test IC_{25} (inhibitory concentration that reduced larval fathead minnow growth by 25%, reduced the number of *C. dubia* neonates produced by 25%, inhibited *P. subcapitata* and *L. minor* growth and/or frond production by 25%) values were calculated from the growth or reproductive data. Reference toxicant testing was employed to ensure that all test systems met protocol criteria during effluent testing. All IC_{25} data were derived by the toxicity laboratory using non-linear regression models or linear interpolation, as appropriate, aided by Comprehensive Environmental Toxicity Information System (CETIS) software (Tidepool Scientific Software, McKinleyville, CA). As required under the MMER, the sub-lethal toxicity data were reported to ECCC as part of Baffinland quarterly and annual reporting for the Mary River Project, the results of which are summarized in this report.

2.3.2 Receiving Environment Water Quality

2.3.2.1 Sample Collection and Laboratory Analysis

Receiving environment water quality monitoring included collection of *in situ* measurements and samples for water chemistry analysis. During biological monitoring, *in situ* water temperature, dissolved oxygen, pH and specific conductance (i.e., temperature standardized measurement of conductivity) was measured near the bottom of the water column at all benthic invertebrate community (benthic) stations and fish population study areas. These measurements were made using a calibrated YSI ProDSS (Digital Sampling System) meter equipped with a 4-Port sensor (YSI Inc., Yellow Springs, OH). Additional supporting water quality information, including observations of water colour and clarity, were also recorded at each benthic station during EEM biological sampling.

Receiving environment water quality monitoring data were collected routinely by Baffinland personnel at two designated MMER-EEM stations located on Mary River. Water sampling for EEM is conducted at an effluent-exposed station located downstream of the Mary River Tributary-F confluence on Mary River (Station MS-08-DS), and at a reference station situated upstream of the cascade barrier and Mary River Tributary-F confluence on Mary River (Station MS-08-US; Figure 2.1). In accordance with the MMER, the routine receiving environment water samples were collected during periods of effluent discharge not less than 30 days between sampling events up to four times per calendar year[3]. In addition to the sampling stations indicated above, routine water quality monitoring is conducted on Mary River Tributary-F (Station FO-01) and additional reference (GO series stations), effluent-exposed (EO series stations) and other (CO series stations) locations on Mary River (Figure 2.1) to meet environmental regulatory requirements outside of the MMER. Water chemistry samples were collected by hand from mid-column directly into labelled sample bottles pre-dosed with required chemical preservatives or into collection bottles triple-rinsed with ambient water for analyses not requiring sample preservation using methods consistent with Baffinland standard operating procedures. Following collection, the water quality samples were placed in coolers and maintained at cool temperatures during shipment to the analytical laboratory. Water quality samples collected during the biological field study were shipped to ALS Global (Waterloo, ON) for analysis. The water chemistry samples were analyzed for the same parameters indicated previously for routine effluent monitoring and effluent characterization using standard laboratory methods. Although holding times for water chemistry samples were generally adhered to, logistical constraints related to the remoteness of the Mary River Project occasionally resulted in the analysis of parameters such as pH that were outside of recommended holding times.

2.3.2.2 Data Analysis

In situ water quality measurements were compared statistically between Mary River Tributary-F effluent-exposed and reference benthic study areas, and between Mary River fish population survey study areas using Analysis-of-Variance (ANOVA). Prior to conducting the ANOVA tests, data were $\log_{10}$ transformed as required to meet assumptions of normality and homogeneity of variance. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney U-tests were used to validate the statistical results from the ANOVA

[3] Because effluent is discharged intermittently over the course of a relatively short open-water period (i.e., approximately 3 – 4 months), the requirement that receiving environment water chemistry samples be collected not less than 30 days apart can result in a frequency of sampling events lower than four times per year.

tests. Similarly, in instances in which variances of normal data could not be homogenized by transformation, pair-wise comparisons were conducted using Student's t-tests assuming unequal variance to validate the statistical findings of the ANOVA tests. All statistical comparisons were conducted using SPSS Version 12.0 software (SPSS Inc., Chicago, IL). In addition to these comparisons, dissolved oxygen and pH data from each station were compared to applicable Water Quality Guidelines for the protection of aquatic life (WQG)[4]. Effluent concentration in the mine receiver at the time of EEM biological sampling was estimated through extrapolation of field measured specific conductance at the benthic effluent-exposed and reference areas and daily average specific conductance of the MS-08 effluent discharge from August 30th to September 5th, 2017 (i.e., 2,658 µS/cm) as described in Environment Canada (2012).

Water chemistry data were compared between the mine effluent-exposed and reference areas and to applicable WQG. To simplify the discussion of results, the magnitude of difference in parameter concentrations was calculated as the effluent-exposed area concentration divided by the respective reference area concentration. The magnitude of difference in parameter concentrations was qualitatively assigned as slightly, moderately or highly elevated compared to concentrations measured at the reference area using the categorization described in Table 2.1.

Table 2.1: Magnitude of Difference Categorizations for Water Chemistry Comparisons

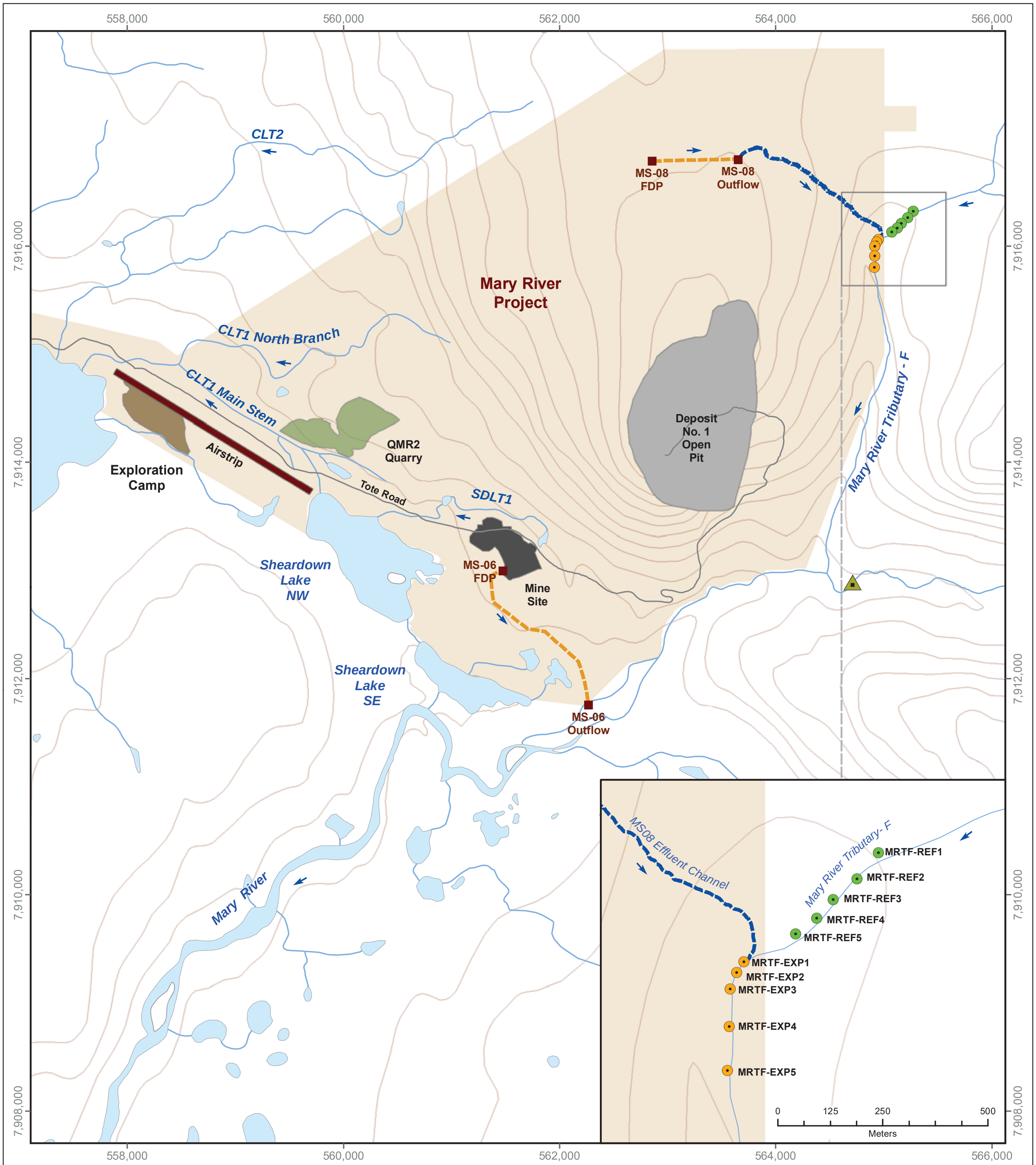
Categorization	Magnitude of Difference Criterion
Slightly elevated	Concentration 3-fold to 5-fold higher at effluent-exposed area versus the reference area.
Moderately elevated	Concentration 5-fold to 10-fold higher at effluent-exposed area versus the reference area.
Highly elevated	Concentration ≥ 10-fold higher at effluent-exposed area versus the reference area.

2.4 Benthic Invertebrate Community Survey

2.4.1 Overview

A standard EEM benthic invertebrate community (benthic) survey was conducted for the Mary River Project Phase 1 EEM (Minnow 2016a). The benthic survey employed a Control-Impact design with sampling conducted at Mary River Tributary-F downstream (MRTF-EXP; effluent-exposed) and upstream (MRTF-REF; reference) of the channel receiving effluent from the MS-08 FDP (Figure 2.2). Five stations were sampled at each study area to provide adequate statistical

[4] Canadian Environmental Quality Guidelines (CCME 1999, 2017) were used as the primary source for WQG. For parameters in which no CCME guideline was available, Ontario Provincial Water Quality Objectives (OMOEE 1994) or British Columbia Water Quality Guidelines (BCMOE 2017) were used as WQG.



LEGEND

Benthic Invertebrate Station

- Effluent-Exposed
- Reference
- Final Discharge Point (FDP)
- Mary River Cascade Barrier
- Discharge Line
- Overland Effluent Channel

Benthic Invertebrate Community Station Locations for the Mary River Project EEM, August 2017

0 0.75 1.5 3 km

N E S W

Map Projection: UTM Zone 17N NAD 1983

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Figure 2.2

Document Path: S:\Projects\177202\177202.0033 - Baffinland 2017\2 - Mapping\Interpretive Report\17-33 Fig 2.2 BI Station Locations.mxd power to detect differences in benthic metrics of ± two standard deviations at an α and β of 0.10, which is consistent with EEM guidance (Environment Canada 2012). Habitat features including sampling depth and physical properties of the substrate were standardized among stations and between areas, to the extent possible, to minimize natural habitat influences as a factor contributing to benthic invertebrate community differences between study areas.

2.4.2 Sample Collection and Laboratory Analysis

Shallow (≤0.3 m) riffle-run habitat characterized by cobble-gravel substrate (i.e., erosional habitat) was targeted for benthic sampling at study areas within the Mary River Tributary-F (MRTF) system. Water depths in riffle habitat at MRTF study areas at the time of the August 2017 EEM field study were typically less than 10 cm (Appendix C) and at least 15 cm of water is required to effectively sample with a Hess sampler. Water depths as little as 3 cm can be sampled using a Surber sampler and therefore, following consultation with ECCC, the collection equipment for the EEM benthic invertebrate community survey was changed to a Surber sampler rather than a Hess sampler as indicated in the original Minnow (2016a) study design[5]. The Surber sampler used to collect the benthic samples had a sampling area 0.093 m^2 and was equipped with 500-µm mesh. At each station, one sample representing a composite of three sub-samples (i.e., 0.279 m^2 total area), was collected to ensure a representative sample. Each sub-sample was collected by carefully placing the sampler on undisturbed substrate and subsequently scrubbing all coarse material within the sampler area (to a depth of approximately 10 cm) while allowing the current to carry all dislodged organisms into the sampler net. After all substrate within the sampler was completely washed, the sampler was moved to the next sub-sample location and the procedure repeated. Following collection of the third sub-sample using the above procedure, all material and organisms retained in the collection net were carefully transferred into pre-labeled wide-mouth plastic jars. As a precautionary measure, internal sample labels were also used to ensure correct sample identification at the lab. Supporting information collected at each station included measurement of sampling depth (cm), water velocity (m/s), and substrate size (intermediate axis diameter in mm), qualitative estimates of substrate embeddedness (%) and vegetation presence (type and %), general habitat notes (e.g., presence of oxyhydroxide precipitate/deposition), *in situ* surface water quality at the sediment-water interface (see Section 2.3.2), and global positioning system (GPS) coordinates (recorded in latitude and longitude decimal degrees and based on the North America Datum of 1983 [NAD 83]).

The benthic samples were preserved to a level of 10% buffered formalin in ambient water following collection. At the conclusion of the field study, the benthic samples were submitted to

[5] The change is sampling equipment was requested through, and granted by, Erik Allen (ECCC, Prairie and Northern Regions) via e-mail correspondence on August 24, 2017.

Zeas Inc. (Nobleton, ON) for analysis following standard sorting methods and incorporating recommended Environment Canada (2012) QA/QC procedures for assessing sub-sampling error and sorting recovery checks (Appendix E). Upon arrival at the laboratory, a biological stain was added to each benthic invertebrate community sample to facilitate greater sorting accuracy. The samples were washed free of formalin in a 500 µm sieve and the remaining sample material was then examined under a stereomicroscope at a magnification of at least ten times by a technician. All benthic invertebrates were removed from the sample debris and placed into vials containing a 70% ethanol solution according to major taxonomic groups (e.g., phyla, orders). A senior taxonomist later enumerated and identified the benthic organisms to the lowest practical level (typically to genus or species) using up-to-date taxonomic keys. Following identification, representative specimens of each taxon were preserved in a 75% ethanol/3% glycerol solution, placed in separately labeled vials, and stored as part of a voucher collection for potential future reference for the Mary River Project EEM.

2.4.3 Data Analysis

Analysis of benthic invertebrate community data was completed at both family level (FL) and lowest practical level (LPL) of taxonomic identification. Although statistical analysis of the data was conducted at both levels of taxonomy (Appendix E), FL taxonomy was used as the basis for evaluation of ‘effects’ as this level of taxonomy is recommended for EEM (Environment Canada 2012), with the LPL taxonomy used to provide more comprehensive evaluation of the benthic data. Benthic invertebrate communities were assessed using EEM primary metrics of mean taxonomic richness (number of taxa), mean invertebrate abundance (or “density”; average number of organisms per m^2), Simpson’s Evenness Index (E) and the Bray-Curtis Index of Dissimilarity as required under the MMER (Table 2.2; Environment Canada 2012). Simpson’s E and Bray-Curtis indices were calculated separately for FL and LPL taxonomy using formula provided by Environment Canada (2012). Additional comparisons were conducted using absolute densities and the percent composition of dominant/indicator taxa, functional feeding groups and habitat preference groups (calculated as the abundance of each respective taxon group relative to the total number of organisms in the sample). Dominant/indicator taxon groups were defined as those groups representing greater than 10% of the community at any one station and/or an average of greater than 5% of the community at any one study area, or any groups considered to be important indicators of environmental stress. Functional feeding groups (FFG) and habitat preference groups (HPG) were assigned based on Pennak (1989), Mandaville (2002), and/or Merritt et al. (2008) designations for each taxon.

All required and supplementary benthic invertebrate community endpoints were summarized by separately reporting mean, median, minimum, maximum, standard deviation, standard error and

Table 2.2: Required and Supporting Endpoints to be Examined for EEM Benthic Invertebrate Community Survey

Response	Endpoint	Critical Effect Size
Effects on Benthic Invertebrates [a]	Organism density (number of invertebrates·m^2)	± 2 reference standard deviations of the mean
	Taxonomic richness (number of taxa)	± 2 reference standard deviations of the mean
	Simpson's Evenness	± 2 reference standard deviations of the mean
	Bray-Curtis Index of dissimilarity	± 2 reference standard deviations of the mean
Supporting Response Variables [b]	Proportion of dominant groups	-
	Proportion of metal-sensitive groups	-
	Proportion of Functional Feeding Groups (FFG)	-
	Shannon-Wiener Diversity	-
	Proportion of Habitat Preference Groups (HPG)	-

[a] Endpoints to be used for determining "effects" as designated by statistically significant differences betw een effluent-exposed and reference areas (Environment Canada 2012)

[b] These analyses are for informational purposes and significant differences betw een exposure and reference areas are not necessarily used to designate an effect (Environment Canada 2012).

sample size for each study area. Differences between the effluent-exposed and reference areas were preferentially tested using ANOVA and untransformed, normally distributed data. However, in the event that data were determined to be non-normal, a suite of transformations including $\log_{10}$, square root, fourth root, and $power_2$ was applied to the data and evaluated for normality. The transformation that resulted in normal data with lowest skew and kurtosis values was then used for statistical testing using ANOVA. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney U-tests were used to validate the statistical results from the ANOVA tests. All statistical comparisons were conducted using R programming (R Foundation for Statistical Computing, Vienna, Austria). An effect on the benthic invertebrate community was defined as a statistically significant difference in taxon richness, density, Simpson’s E or Bray-Curtis Index, calculated at FL taxonomy, between the effluent-exposed area and the reference area at an alpha level of 0.10 (Environment Canada 2012).

In addition to statistical comparisons, the magnitude of difference between effluent-exposed and reference area means was calculated for each benthic invertebrate community metric where a significant difference was detected. The benthic invertebrate community survey was designed to have sufficient power to detect a difference (effect size) of ± two standard deviations (SD), and therefore, the magnitude of the difference was calculated to reflect the number of reference mean SD (SD_{REF}) using equations provided by Environment Canada (2012). A Critical Effect Size for the benthic invertebrate community survey (CES_{BIC}) of $\pm$ 2 SD_{REF} was used to define any ecologically relevant 'effects', which is analogous to differences beyond those expected to occur naturally between two areas that are uninfluenced by any anthropogenic inputs (i.e., between pristine reference areas; see Munkittrick et al. 2009; Environment Canada 2012). If a significant difference between areas was not detected for a benthic invertebrate community metric, then the minimum effect size that would be detectable was calculated using the mean square error generated from the ANOVA as an estimate of variability, with alpha and beta equal to 0.10. The minimum detectable effect size was calculated using equations provided by Environment Canada (2012), which are based on the minimum number of reference area standard deviations.

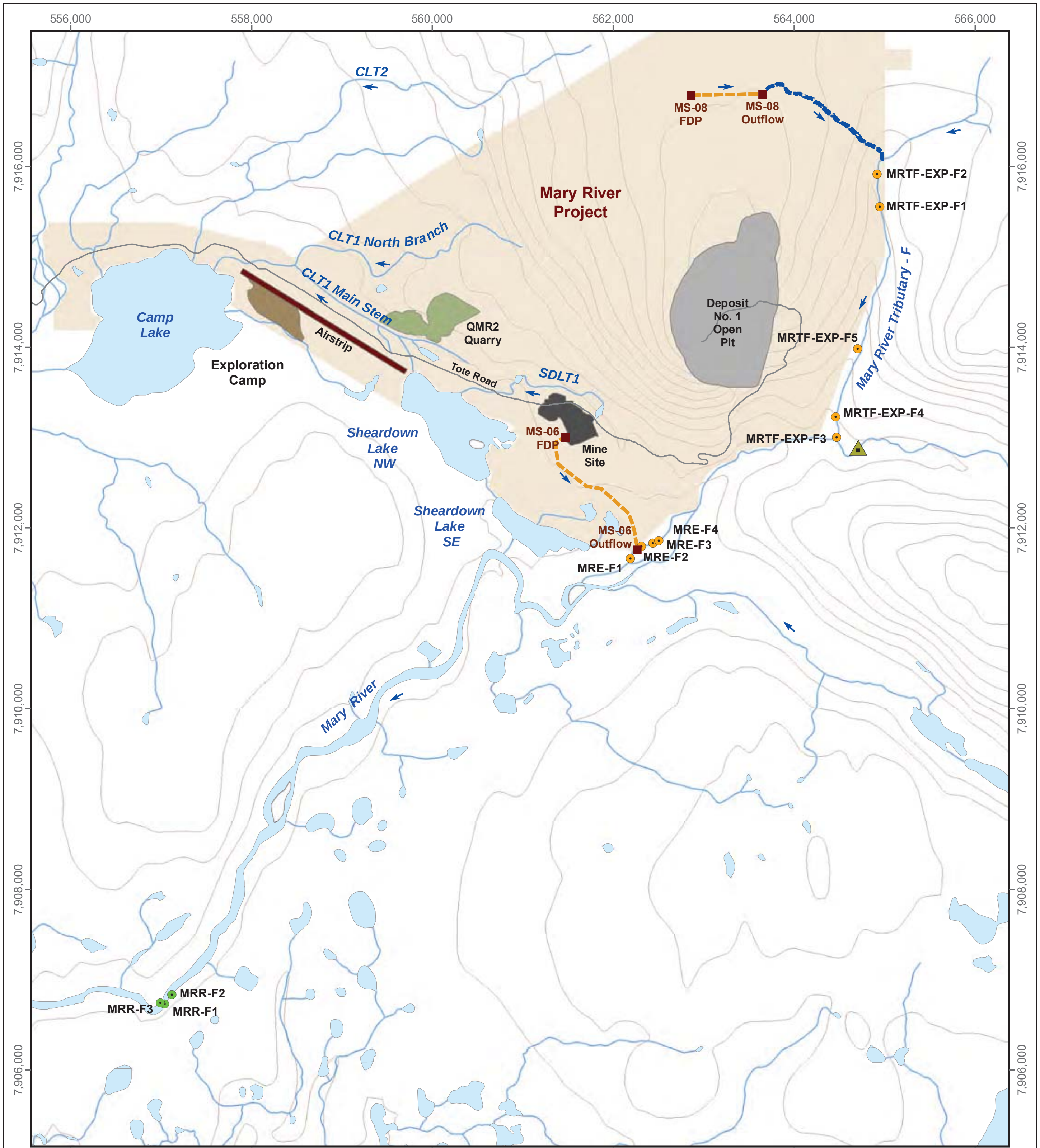
2.5 Fish Population Survey

2.5.1 Overview

The Mary River Project Phase 1 EEM fish population survey employed a non-lethal sampling approach targeting arctic charr (*Salvelinus alpinus*) at representative effluent-exposed and reference study areas (Minnow 2016a). Initial fish sampling conducted at Mary River Tributary-F study areas that were used for benthic sampling indicated that fish were absent at these areas, as well as the entire length of Mary River Tributary-F extending to Mary River (Appendix F). The absence of fish at Mary River Tributary-F is believed to reflect the combination of complete freezing overwinter, a relatively higher stream gradient, and the presence of natural in-stream barriers. An average gradient of 12% was documented through the lower approximate 750 m of Mary River Tributary-F during EEM fish population sampling. In addition, an approximately 1.75 m high step-drop over large boulder habitat occurred approximately 50 m upstream of Mary River on Mary River Tributary-F (Appendix Photo Plate C.1), presenting an impassable barrier for upstream migration by fish. As a result of the natural absence of fish from Mary River Tributary-F, two areas of Mary River were sampled for the EEM fish population survey. A safely-accessible reach on Mary River, located near the confluence with Mary River Tributary-F, and a downstream reach, located near the Mary River outlet to Mary Lake, served as effluent-exposed and reference study areas, respectively, for the fish population survey as agreed upon during meetings held between Baffinland, ECCC and Minnow on August 16th and 17th, 2017 (Figure 2.3)[6].

The targeting of only arctic charr for the Mary River Project EEM, as opposed to two species normally recommended for EEM (Environment Canada 2012), reflected the fact that only this species had been captured in the Mary River system previously (Baffinland 2014). A non-lethal

[6] See Section 2.2 for additional details regarding selection of study areas for the fish population survey.



LEGEND

Fish Survey Sampling Location

- Reference
- Effluent-Exposed
- Final Discharge Point (FDP)
- Mary River Cascade Barrier
- Discharge Line
- Overland Effluent Channel

Fish Survey Sampling Locations for the Mary River Project EEM, August 2017

0 1 2 4 km

N E S W

Map Projection: UTM Zone 17N NAD 1983
Data Source: Reproduced under licence from Her Majesty the Queen in Rights of Canada, Department of Natural Resources Canada. All rights reserved.

Date: January 2018
Project 177202.0033

minnow environmental inc.

Figure 2.3

Document Path: S:\Projects\177202\177202.0033 - Baffinland 2017\2 - Mapping\Interpretive Report\17-33 Fig 2.3 Fish Survey Sampling Locations.mxd sampling approach was implemented, in part, because typically only juvenile arctic charr migrate upstream from lakes into rivers and creeks of the Mary River Project region as the latter freeze entirely in the winter (NSC 2015; Minnow 2016a). Moreover, adult arctic charr spawn only every two to three years at latitudes similar to those of the Mary River Project and thus, for those few adults that migrate upstream in rivers, less than half would be expected to be in sufficient reproductive condition, resulting in unacceptable sacrifice to support a lethal sampling approach (Minnow 2016a)[7]. Consistent with EEM sample size requirements for EEM, a minimum of 100 arctic charr juveniles older than young-of-the-year (YOY; referred to as non-YOY herein) were targeted from each study area. Habitat features including sampling depth and physical properties of the substrate were standardized as much as possible between areas during fish population sampling to minimize natural habitat influences as a factor contributing to differences in fish population endpoints between study areas.

2.5.2 Sample Collection and Field and Laboratory Processing

Sampling for the fish population survey was conducted by an electrofishing team consisting of a backpack electrofisher operator and a single netter. At Mary River effluent-exposed and reference study areas, 'open station' sampling was conducted in an upstream direction at four side-channel stations and three shoreline stations, respectively (Figure 2.3). Fish captured at each station were placed into buckets containing aerated water. At the conclusion of sampling at each station, total shocking effort (i.e., electrofishing seconds) was recorded to allow calculation of time-standardized catch, station upstream and downstream boundaries were georeferenced using a handheld GPS unit, and habitat notes pertinent to the fish population survey were recorded. All captured fish were identified, enumerated and with the exception of arctic charr retained for subsequent body measurements (see description below), released at the area of capture. Following the collection of body measurements, arctic charr were released to the waters from which they were captured with the exception of individuals sacrificed for age structure removal.

All retained arctic charr were transported to a dedicated field laboratory for measurements, general observations, and collection of age determination samples required for EEM as timely as possible following collection (Environment Canada 2012). Initial observations conducted at the outset of the processing of individual fish included external condition evaluation for abnormalities and presence/incidence of parasites. For each fish, fork and total length were measured to the nearest millimetre using a standard measuring board, and weight was measured to the nearest

[7] Approximately 39% of arctic charr in the 'adult' size range sampled in August 2015 from Mary River Project area lakes contained sufficiently developed gonads suitable for assessment of reproductive endpoints, of which almost all (97%) of those showing sufficient gonad development were female (Minnow 2016b).

milligram using a digital balance outfitted with a surrounding draft shield. A subset of individuals spanning the entire size range of captured fish was sacrificed for age determination (i.e., approximately 10% of the total number of fish sampled from each study area). These fish were placed in labelled plastic bags following collection of all required morphometric data, and then frozen upon return from the field, for later removal of otoliths for age determination.

Aging samples were shipped frozen to AAE Tech Services Inc. (LaSalle, Manitoba) for otolith removal and processing at the completion of the field program. Pectoral fin rays and/or scales were used as backup aging structures for age determinations. Otoliths were prepared for aging using a "crack and burn" method. If fin rays were used, each was cleaned, embedded in epoxy resin and, after the epoxy hardened, sectioned using a Buehler Isomet (Lake Bluff, IL) low-speed diamond saw. Each otolith or fin ray sample was then mounted on a glass slide using a mounting medium and examined under a compound microscope using transmitted light to determine fish age. For each structure, the age and edge condition was recorded along with a confidence rating for the age determination. Age determinations for half of the otolith samples were also conducted by a second independent analyst to satisfy recommended QA/QC for EEM studies that suggest age confirmation be conducted on a minimum of 10% of samples (Environment Canada 2012).

2.5.3 Data Analysis

Fish community data from respective Mary River effluent-exposed and reference study areas were compared based on total fish species richness, total catch, and total catch-per-unit-effort (CPUE), the latter calculated as the number of fish captured per electrofishing minute. The fish population survey data analysis initially included calculation of mean, median, minimum, maximum, standard deviation, standard error and sample size statistics for arctic charr length, weight and age measurement data by study area, separating YOY from non-YOY (juvenile/adult) life history stages where applicable. These data were used as the basis for evaluating four response categories (survival, growth, reproduction and energy storage; Table 2.3) according to the procedures outlined for a non-lethal, small-bodied fish assessment (Environment Canada 2012). Length-frequency distributions were compared using a non-parametric two-sample Kolmogorov-Smirnov (K-S) goodness of fit test. The size-frequency distributions and confirmatory aging were used to distinguish YOY (age-0) fish from non-YOY age classes, which were then subject to separate evaluation of health endpoints between study areas.

Potential differences in reproductive success between EEM study areas was based on evaluation of the relative proportion of arctic charr YOY between the effluent-exposed and reference areas, and by comparing the results of KS tests conducted with and without YOY individuals included in the data sets. Mean length and body weight were compared between the effluent-exposed and reference study areas using ANOVA, with data evaluated for normality and homogeneity of

Table 2.3: Endpoints to be Examined for EEM Lethal and Non-Lethal Fish Population Survey

Response			Endpoint	Statistical Test[c,d,e]	Critical Effect Size
Lethal Comparisons	Effects on Fish[a]	Survival	Age	ANOVA	± 25%
			Age-frequency distribution	K-S Test	-
		Growth	Size-at-age (body weight against age)	ANCOVA	± 25%
		Reproduction	Relative gonad size (gonad weight against body weight)	ANCOVA	± 25%
		Energy Storage	Condition (body weight against length)	ANCOVA	± 10%
			Relative liver size (liver weight against body weight)	ANCOVA	± 25%
	Supporting Response Variables[b]	Growth	Size-at-age (length against age)	ANCOVA	± 25%
		Reproduction	Relative fecundity (# of eggs against body weight)	ANCOVA	± 25%
		Energy Storage	Relative egg size (mean egg weight against body weight)	ANCOVA	± 25%
Non-Lethal Comparisons	Effects on Fish[a]	Survival	Length-frequency distribution	K-S Test	-
		Growth	Length	ANOVA	± 25%
			Weight	ANOVA	± 25%
		Reproduction	Relative abundance of YOY (% composition)	None	-
		Energy Storage	Condition (body weight against length)	ANCOVA	± 10%

[a] Endpoints to be used for determining "effects" as designated by statistically significant differences between exposure and reference areas (Environment Canada 2012).

[b] These analyses are for informational purposes and significant differences between exposure and reference areas are not necessarily used to designate an effect (Environment Canada 2012).

[c] ANOVA (Analysis of Variance) used except for non-parametric data, where Mann Whitney U-test may be used to verify the results by ANOVA.

[d] ANCOVA (Analysis of Covariance). For the ANCOVA analyses, the first term in parentheses is the endpoint (dependent variable Y) that is analyzed for an effluent effect. The second term in parentheses is the covariate, X (age, weight, or length).

[e] K-S Test (Kolmogorov-Smirnov test).

variance before applying parametric statistical procedures. In cases where data did not meet the assumptions of ANOVA despite transformation, a non-parametric Mann-Whitney U-test was performed to test for/validate significant differences between study areas indicated by the ANOVA. Differences in non-YOY arctic charr condition (weight-at-length relationship) between the effluent-exposed and reference areas were assessed using Analysis of Covariance (ANCOVA) according to methods recommended for EEM by Environment Canada (2012).

Prior to conducting the ANCOVA tests, scatter plots of all variable and covariate combinations were examined to identify outliers, leverage values or other unusual data. The scatter plots were also examined to ensure there was adequate overlap between the effluent-exposed and reference area groups, and that there was a linear relationship between the variable and the covariate. In order to verify the existence of a linear relationship, each relationship was tested using linear regression analysis by area and evaluated at an alpha level of 0.05. If it was determined that there was no significant linear regression relationship between the variable and covariate for the effluent-exposed and/or reference areas, then the ANCOVA was not performed.

Once it was determined that ANCOVA could be used for statistical analysis, the first step in the ANCOVA analysis was to test whether the slopes of the regression lines for the reference and exposure areas were equal. This was accomplished by including an interaction term (dependent × covariate) in the ANCOVA model and evaluating if the interaction term was significantly different, in which case the regression slopes would not be equal between areas and the resulting ANCOVA would provide spurious results. In such cases, two methodologies were employed to assess whether a full ANCOVA could proceed. In order of preference these were: 1) removal of influential points using Cook's distance and re-assessment of equality of slopes; and 2) Coefficients of Determination that considered slopes equal regardless of an interaction effect (Environment Canada 2012). For the Coefficients of Determination, the full ANCOVA was completed to test for main effects, and if the r^2 value of both the parallel regression model (interaction term) and full regression model were greater than 0.8 and within 0.02 units in value, the full ANCOVA model was considered valid (Environment Canada 2012). If both methods proved unacceptable, the magnitude of effect calculation was estimated at both the minimum and maximum overlap of covariate variables between areas (Environment Canada 2012). In this event of a statistically significant interaction effect (slopes are not equal), the calculation of the magnitude of difference at the minimum and maximum values of covariate overlap was not assigned statistical difference as it would under a full ANCOVA model. If the interaction term was not significant (i.e., homogeneous slopes between the two populations), then the full ANCOVA model was run without the interaction term to test for differences in adjusted means between the two populations. The adjusted mean was then used as an estimate of the population mean based on the value of the covariate in the ANCOVA model.

For endpoints showing significant area differences, the magnitude of difference between reference and exposure areas was calculated as described by Environment Canada (2012) using mean (ANOVA), adjusted mean (ANCOVA with no significant interaction) or predicted values (ANCOVA with significant interaction). The anti-log of the mean, adjusted mean, or predicted value was used in the equations for endpoints that were log_{10}-transformed. In addition, the magnitude of difference for ANCOVA with a significant interaction was calculated for each of the minimum and maximum values of the covariate. If there was no significant difference indicated between areas, the minimum detectable effect size was calculated as a percent difference from the reference mean for ANOVA or adjusted reference mean for ANCOVA at alpha = beta = 0.10 using the square root of the mean square error (generated during either the ANOVA or ANCOVA procedures) as a measure of variability in the sample population based on the formula provided by Environment Canada (2012). If outliers or leverage values were observed in a data set(s) upon examination of scatter plots and residuals, then the values were removed and ANOVA or ANCOVA tests were repeated with the reduced data, with both sets of results then provided. Similar to the Critical Effect Sizes (CES) applied to the benthic invertebrate community survey, a fish population survey CES magnitude of difference of ± 25% was applied to general endpoints (CES_G) of survival, growth, reproduction and relative liver size, and a magnitude of difference of ± 10% was applied for condition (CES_C) to define any ecologically relevant differences, consistent with those recommended for EEM (Table 2.3; Munkittrick et al. 2009; Environment Canada 2012).

Finally, an *a priori* power analysis was completed to determine appropriate fish sample sizes for future surveys as recommended by Environment Canada (2012). These analyses were completed based on the mean square error values generated during the ANOVA or ANCOVA procedures and were calculated with alpha and beta set equally at 0.10 for the analysis. Two main assumptions served as the basis for the power analysis. The first assumption was that the fish caught in each of the effluent-exposed and reference areas were representative of the population at large (i.e., similar distribution and variance with respect to the parameters examined). The second assumption was that the characteristics of the populations as a whole would not change substantially prior to the next study. Results were reported as the minimum sample size (number of fish/area) required to detect a given magnitude of difference (effect size) between the effluent-exposed and reference area populations for each endpoint. The magnitude of the difference was presented as a percentage of the reference mean for each endpoint as measured during the fish population study.

3 EFFLUENT QUALITY AND SUBLETHAL TOXICITY

3.1 Effluent Volume and Quality

Effluent discharge from the MS-08 Final Discharge Point (FDP) over the Phase 1 EEM period occurred in July and August in 2015, and from July to September in each of 2016 and 2017 (Figure 3.1), corresponding to the usual open-water period for non-coastal areas of the Mary River Project region. The total monthly volume of effluent discharge ranged from approximately 517 to 7,429 cubic metres (m^3) over this period (Figure 3.1). Notably, effluent was released intermittently on an as-needed basis (i.e., to attempt to maintain sufficient capacity for a 1 in 10-year storm event in the containment pond), typically for a duration of one to three days but up to a maximum of 14 days (Appendix Table D.1). Monthly and cumulative volumes of effluent discharged to the receiving environment were considerably higher in 2017 than in the previous two years of the Phase 1 EEM period (Figure 3.1). Relatively high amounts of effluent released in 2017, on both a daily and cumulative basis (Figure 3.1; Appendix Table D.1), reflected the discharge of site waters stored from the previous season and upgrades to the waste management infrastructure at the Mary River Project between the open water periods of 2016 and 2017. Effluent was discharged from the MS-06 FDP on only a single day in 2016, on September 12th, when approximately 86 m^3 of effluent was discharged from the MS-06 FDP directly to Mary River (Appendix Table D.6).

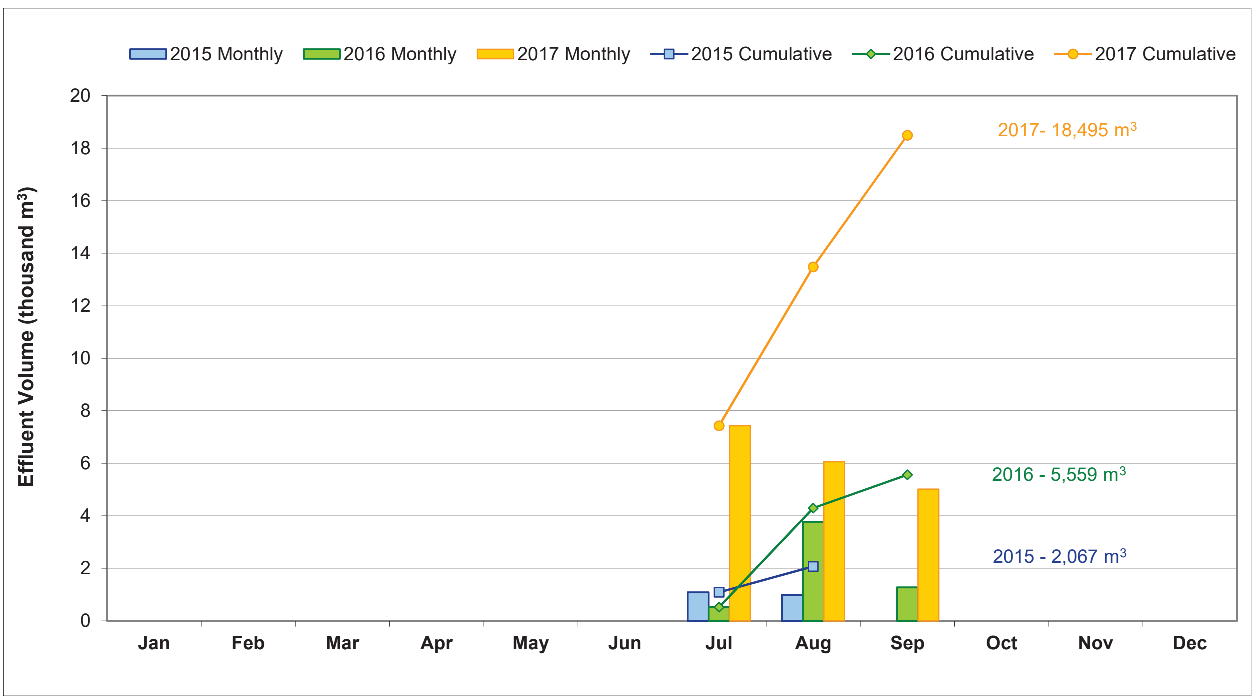


Figure 3.1: Mary River Project Average Monthly and Cumulative Effluent Discharge (Station MS-08) for the Phase 1 EEM Period (2015 - 2017)

Final effluent at MS-08 met MMER authorized pH limits and monthly mean and grab-sample concentration limits in 2015 and 2016 (Table 3.1; Appendix Tables D.2 and D.3). With the exception of pH below the MMER range limit in August and September, and a total suspended solids (TSS) concentration above the MMER monthly mean concentration limit (August) the MS-08 final effluent met all MMER deleterious substance concentration grab limits in 2017 (Table 3.1; Appendix Table D.4). Additional information regarding the non-compliant discharges are appended (Appendix B). Effluent characterization indicated that individual grab-sample mercury concentrations were well below the 0.10 µg/L trigger for an EEM fish tissue survey throughout the Phase 1 EEM period (Appendix Tables D.2 to D.4). On average, MS-08 effluent alkalinity, conductivity, hardness and concentrations of ammonia, cadmium, iron, nickel, nitrate and zinc were higher in August and September 2017 than corresponding monthly averages in 2015 and 2016 (Table 3.1). Higher concentrations of these parameters in 2017 was potentially related to additional containment pond treatment to raise effluent pH (e.g., use of soda ash, Na_2CO_3) and adsorption to suspended particles associated with TSS concentrations (Appendix B). Higher concentrations of some of these parameters (e.g., metals) may have also reflected changes in water chemistry sourcing from the waste rock stockpile in association with upgrades to the waste management infrastructure over the 2016 – 2017 winter period. Final effluent at MS-06 met MMER authorized pH limits and grab-sample concentration limits for the single discharge event in September 2016 (Appendix Table D.6).

Final effluent at MS-08 was consistently non-lethal to rainbow trout (*Oncorhynchus mykiss*) and *Daphnia magna* from July 2015 to July 2017 (n = 6 for both test species; Table 3.1; Appendix Table D.5). However, acutely lethal test results occurred for both test organisms using effluent samples collected August 1st, and for *D. magna* using an effluent sample collected September 5th, in 2017 (Appendix Table D.5). Review of effluent chemistry data for the 2017 samples resulting in acute toxicity suggested a potential causal link with low pH and/or one or more of the parameters indicated above that were shown to be elevated in August and September 2017 (Table 3.1).

3.2 Effluent Sublethal Toxicity

Sublethal toxicity tests conducted using MS-08 final effluent samples over the Phase 1 EEM period showed no adverse effects on survival or growth of fathead minnow (*Pimephales promelas*), or on growth of the green alga, *Pseudokirchneriella subcapitata* (Table 3.2). Survival and reproduction of *Ceriodaphnia dubia* was generally not affected in tests conducted from 2015 through July 2017 (Table 3.2). However, *C. dubia* survival and reproduction was affected at effluent effect concentrations of 20% and 6.5%, respectively, for the effluent sample collected in August 2017. Effluent iron and nickel concentrations were notably higher in the August 2017

Table 3.1: Summary of Routine MMER and Effluent Characterization Data (Station MS-08)[a] for the Mary River Project Phase 1 EEM period, 2015 to 2017

	Analyte	Units	MMER Monthly Mean Limit [d]	2015		2016		2017		
				July	August	July	August	July	August	September
Routine Monitoring [b]	pH (lab)	pH units	6.0 - 9.5	7.51	7.61	7.38	7.05	6.93	6.25	5.75
	Total Suspended Solids	mg/L	15	11.0	7.2	7.3	5.4	3.9	16.8	13.2
	Arsenic (As)	mg/L	0.5	0.0004	0.0001	0.0001	0.0001	0.0001	0.0010	0.0010
	Copper (Cu)	mg/L	0.3	0.0012	0.0013	0.0045	0.0023	0.0048	0.0163	0.0100
	Lead (Pb)	mg/L	0.2	0.0006	0.0002	0.0005	0.0002	0.0004	0.0030	0.0005
	Nickel (Ni)	mg/L	0.5	0.0116	0.0226	0.0118	0.0638	0.0275	0.2643	0.3980
	Zinc (Zn)	mg/L	0.5	0.0037	0.0033	0.0104	0.0070	0.0084	0.0340	0.0320
	Radium-226	Bq/L	0.37	0.010	0.013	0.010	0.015	0.011	0.023	-
Acute Toxicity	Rainbow trout [e]	Pass/Fail	NL	NL (n=1)	NL (n=1)	NL (n=1)	NL (n=2)	NL (n=1)	L (n=1), NL (n=1)	NL (n=1)
	Daphnia magna [e]	Pass/Fail	-	NL (n=1)	NL (n=1)	NL (n=1)	NL (n=2)	NL (n=1)	L (n=2), NL (n=1)	L (n=1)
Effluent Characterization [c]	Specific Conductance (lab)	µS/cm	-	948	1,320	63	1,270	656	3,330	-
	Hardness	mg/L	-	465	724	25	701	318	1,990	-
	Alkalinity	mg/L	-	31.7	44.0	11.0	18.5	10.0	82.0	-
	Ammonia (NH_3)	mg/L	-	0.40	0.47	0.02	0.71	0.43	1.67	-
	Nitrate (NO_3)	mg/L	-	3.8	4.9	0.2	5.1	2.5	8.0	-
	Aluminum (Al)	mg/L	-	0.3120	0.1165	0.6600	0.0385	0.0363	0.0500	-
	Cadmium (Cd)	mg/L	-	0.000070	0.000161	0.000010	0.000182	0.000057	0.000380	-
	Iron (Fe)	mg/L	-	0.47	0.33	0.77	0.30	0.48	7.10	-
	Mercury (Hg)	mg/L	0.0001	0.000010	0.000010	0.000010	0.000010	-	0.000010	-
	Molybdenum (Mo)	mg/L	-	0.0002	0.0003	0.0005	0.0001	0.0001	0.0005	-
	Selenium (Se)	mg/L	-	0.0014	0.0026	0.0001	0.0020	0.0012	0.0047	-

(grey shading) Indicates monthly mean value above applicable limit for deleterious substances, mercury concentration above fish usability assessment trigger value *or* acute toxicity test failure based on individual test result.

[a] In cases where analyte concentrations were less than Method Detection Limits (MDL), the MDL was used for calculation of mean values. Appendix C provides raw data.

[b] Deleterious substances and pH as defined under Schedule 4 of the MMER (Government of Canada 2017).

[c] Required effluent characterization and site-specific parameters as defined under Schedule 5 of the MMER (Government of Canada 2017).

[d] Limits indicated refer to maximum authorized monthly mean concentrations as per MMER except mercury, where the limit provided is the grab concentration trigger for conducting a fish tissue survey for EEM.

[e] Indicates that all acute toxicity tests must 'pass' test criteria (i.e., an effluent at 100% concentration that kills less than 50% of test organisms over a 96-hour [rainbow trout] or 48-hour [*D. magna*] period when tested in accordance with Environment Canada protocols). "NL" refers to a non-lethal 'pass' test result, "L" refers to a lethal 'failure' test result.

Table 3.2: Sublethal Toxicity Test Effluent Effect Concentration Results (% effluent)[a] using Mary River Project Final Effluent (Station MS-08), 2015 - 2017

Study Period	Sample Date	Fathead Minnow		*Ceriodaphnia dubia*		*Lemna minor*		*Pseudokirchneriella subcapitata*
		Survival LC_{50}	Growth IC_{25}	Survival LC_{50} [a]	Reproduction IC_{25} [a]	Dry Weight IC_{25}	Frond Increase IC_{25}	Growth IC_{25}
EEM Phase 1	11-Aug-15	>100	> 100	> 100	> 100	2.6 (1.3 - 4.2)	8.5 (6.0 - 11.7)	> 91
	19-Jul-16	>100	> 100	> 100	91 (60 - 97)	> 97	> 97	> 91 [b]
	30-Aug-16	>100	> 100	> 100	> 100	21.5 (6.9 - 75)	7.9 (5.5 - 9.7)	> 91 [b]
	25-Jul-17	>100	> 100	> 100	> 100	56.2 (33 - 89)	22.8 (16 - 28)	> 91
	24-Aug-17	>100	> 100	20 (9.0 - 100)	6.5 (3.4 - 10)	3.9 (1.7 - 6.1)	1.7 (0.8 - 4.3)	> 91
	Geometric mean	**100**	**100**	**72**	**57**	**16**	**12**	**> 91**

[a] LC_{50} is the effluent concentration causing 50% mortality among tested organisms; IC_{25} is the effluent concentration causing a 25% inhibition/reduction in endpoint compared to the control group for the organism tested.

[b] Significant stimulation of *P. subcapitata* growth was exhibited for tests conducted using final effluent in 2016.

sample compared to effluent used in all previous sublethal toxicity tests, suggesting a causal link. Because cladoceran invertebrates can be sensitive to high dissolved solids concentrations (Mount et al. 1997; Soucek and Kennedy 2005), greater major ion concentrations (e.g., hardness) in the August 2017 effluent sample potentially also contributed to greater sublethal toxicity to this test species than during previous testing. Duckweed (*Lemna minor*) growth inhibition was observed in most tests using the MS-08 effluent, with reduced frond weight and frond production occurring at effluent effect concentrations ranging from approximately 3% to 56% and 2% to 23%, respectively, in all tests conducted except the July 2016 sample in which no toxicity occurred (Table 3.2).

Maximum concentrations of MS-08 effluent at Mary River Tributary-F and Mary River were previously estimated as 1.7% and 0.04%, respectively, based on extrapolation of effluent discharge volumes and watershed hydrology data collected in 2015 (Minnow 2016a). Because the minimum effluent effect concentration for *C. dubia* (i.e., 6.5%) was well above the concentration of effluent expected in Mary River Tributary-F, no toxicity to representative planktonic invertebrates was likely in the MS-08 effluent receiving environment. However, the lowest effluent effect concentrations shown for duckweed were similar to maximum effluent concentrations estimated for Mary River Tributary-F immediately downstream of the MS-08 channel confluence in two of the five tests[8] conducted over the Phase 1 EEM period (Table 3.2). The latter suggested a low potential for effects on growth of a representative aquatic plant species within the immediate Mary River Tributary-F receiving environment. Notably, no aquatic vascular plants were observed at effluent-exposed and reference areas of both Mary River Tributary-F and Mary River during the EEM field study (Appendix C).

[8] This statement takes the 95% confidence limits of the sublethal toxicity test results into account.

4 WATER QUALITY

4.1 Mary River Tributary-F

In situ water temperature was significantly lower at the effluent-exposed area than at the reference area of Mary River Tributary-F at the time of the August 2017 EEM biological field study (Figure 4.1), likely reflecting natural influences of warming ambient air temperature between morning effluent-exposed area and afternoon reference area sampling, respectively, on the day of sampling. Dissolved oxygen (DO) concentrations did not differ significantly between the Mary River Tributary-F effluent-exposed and reference study areas, and were well above the WQG[9] lowest acceptable concentration for sensitive, early life stages of cold water biota (i.e., 9.5 mg/L) at both study areas (Figure 4.1). Although pH was significantly higher at the effluent-exposed area than at the reference area of Mary River Tributary-F, the mean incremental difference in pH between areas was very small (i.e., 0.012 units) and pH values were well within the WQG acceptable range for the protection of aquatic life (Figure 4.1). As a result, the difference in pH between the Mary River Tributary-F effluent-exposed and reference areas was not likely to be ecologically meaningful.

Specific conductance was significantly higher at the effluent-exposed area than at the reference area of Mary River Tributary-F at the time of the August 2017 EEM field study, with the small incremental difference between study areas (i.e., approximately 4 µS/cm) suggesting a slight effluent-related influence on water quality of the tributary (Figure 4.1). Notably, a substantial step increase in specific conductance was observed approximately 1.9 km downstream of the MS-08 effluent channel confluence on Mary River Tributary-F at the time of the August 2017 field study (Appendix Figure D.1). Specific conductance also became elevated at the same location in Mary River Tributary-F (relative to upstream) during reconnaissance sampling in August 2015. The higher specific conductance at this location and farther downstream in Mary River Tributary-F was attributed to the receipt of surface runoff from areas at which chloride salts (e.g., $CaCl_2$) were used to assist with exploratory/operational drilling through material exhibiting subsurface permafrost and/or natural variation in geological properties.

Extrapolation of field measured specific conductance at the benthic invertebrate community effluent-exposed and reference areas and daily average specific conductance of the MS-08 effluent discharge from August 30th to September 5th, 2017 (i.e., 2,658 µS/cm) was used to provide an estimate of effluent concentration in the immediate receiving environment. The corresponding

[9] Canadian Environmental Quality Guidelines (CCME 1999, 2017) were used as the primary source for WQG. For parameters in which no CCME guideline was available, Ontario Provincial Water Quality Objectives (OMOEE 1994) or British Columbia Water Quality Guidelines (BCMOE 2017) were used as WQG.

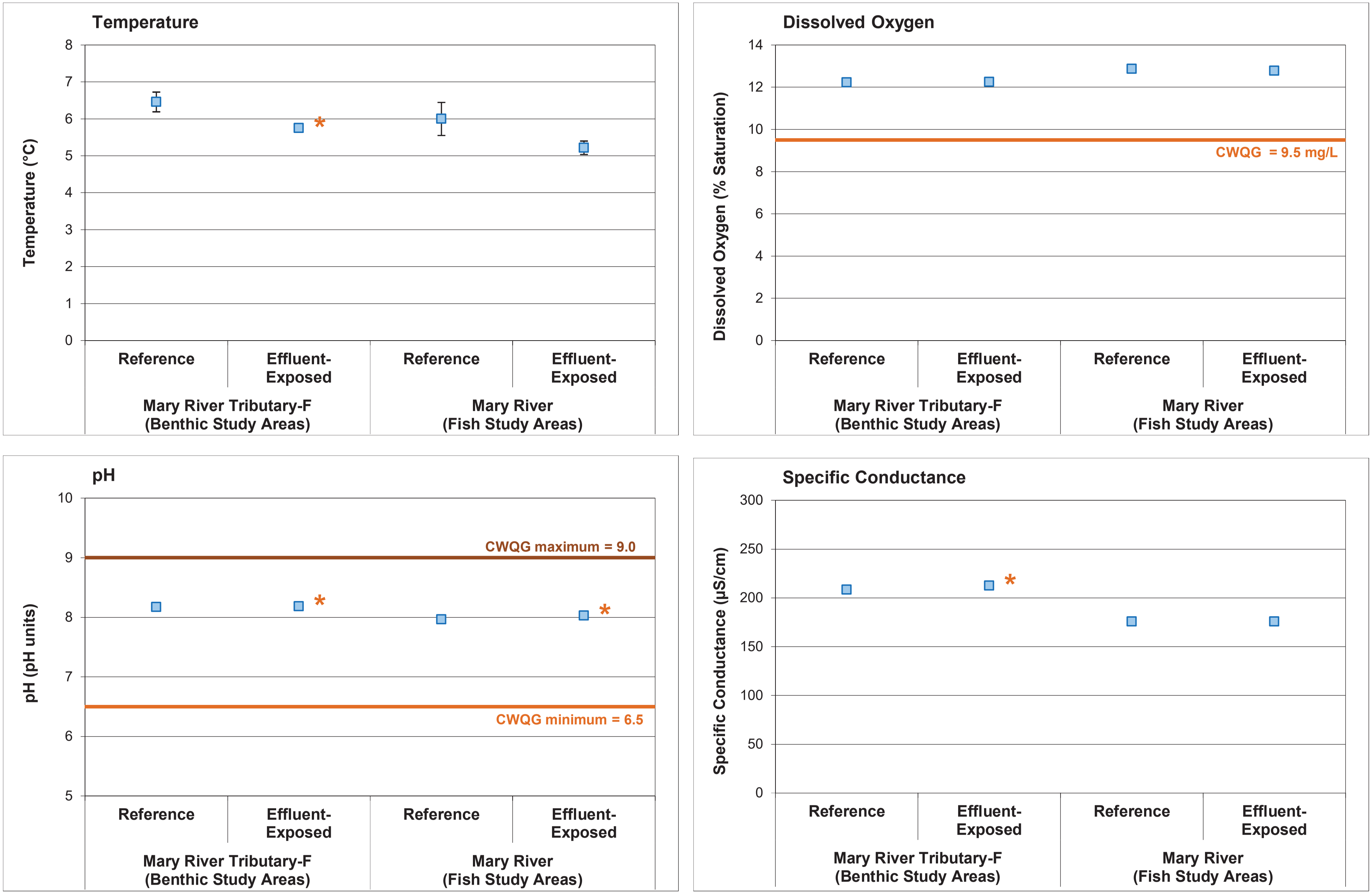


Figure 4.1: Comparison of *In Situ* Water Quality Variables (mean ± SE; n = 5) Measured at Mary River Tributary-F Benthic Stations and Mary River Fish Population Study Areas, Mary River Project Phase 1 EEM, August 2017

Note: An asterisk (*) next to effluent-exposed area data point indicates that the mean value differed significantly from that of the applicable reference area.

proportion of effluent at the Mary River Tributary-F effluent-exposed area immediately below the effluent channel confluence was estimated as 0.17%. Notably, the average daily effluent volume released from MS-08 on August 24th and 25th (i.e., 373 m^3/day) from which this effluent proportion at Mary River Tributary-F was estimated was approximately one-fifth the maximum MS-08 effluent discharge over the EEM Phase 1 period (Appendix Table D.1). The effluent concentration of 0.17% was within the effluent concentration range of 0.03 and 1.3% estimated by Minnow (2016a) for the immediate mine receiving environment using watershed discharge rates pro-rated from six Mary River Project mine site stream gauging stations and average volume of MS-08 discharged in 2015. Although a hydrological station was established within Mary River Tributary-F in 2017, a data logger malfunction resulted in the collection of flow data from June 27th to July 30th, of which only three days overlapped with that of the MS-08 effluent discharge. Using the same extrapolation approach used by Minnow (2016a), the effluent concentration estimated at Mary River Tributary-F immediately downstream of the MS-08 channel confluence ranged from 0.34% to 0.89% over a period of three days in late June 2017. Therefore, these data corroborated previous estimates that suggest effluent concentrations generally remain below 1% in Mary River Tributary-F.

Water quality monitoring conducted to meet regulatory requirements outside of EEM indicated that, on average, only ammonia, nitrate and/or sulphate concentrations were slightly elevated (i.e., three- to five-fold higher) at Mary River Tributary-F (Stations MRTF-1 and F0-01) compared to Mary River upstream reference conditions during periods of effluent discharge in 2016 and 2017 (Appendix Tables D.11 and D.12). However, concentrations of these parameters were consistently well below applicable WQG at Mary River Tributary-F (Appendix Tables D.11 and D.12). Although total concentrations of aluminum and iron were occasionally above respective WQG at effluent-exposed stations within Mary River Tributary-F in 2016 and 2017, similar or higher concentrations of these metals were observed at the Mary River upstream reference stations during any given sampling event (Appendix Tables D.11 and D.12), indicating natural elevation of total aluminum and iron concentrations in regional watercourses. Overall, the MS-08 effluent discharge resulted in only a marginal elevation in ammonia, nitrate and/or sulphate concentrations at Mary River Tributary-F.

4.2 Mary River

In situ water temperature and DO concentrations at the Mary River effluent-exposed area did not differ significantly from those measured at the Mary River reference area at the time of the August 2017 EEM fish population field study (Figure 4.1). In addition, DO concentrations at each of these study areas were well above the WQG lowest acceptable concentration for early life stages of cold water biota (i.e., 9.5 mg/L; Figure 4.1). Similar to differences between the Mary River

Tributary-F benthic study areas, pH was significantly higher at the Mary River fish population survey effluent-exposed area than at the reference area, but the mean incremental difference in pH between areas was very small (i.e., 0.06 units). The effluent-exposed area pH was also well within the WQG range considered protective of aquatic life (Figure 4.1). Thus, the difference in pH between the Mary River fish population survey effluent-exposed and reference study areas was not likely to be ecologically meaningful. No significant difference in specific conductance was indicated between the Mary River fish population survey effluent-exposed and reference study areas at the time of the EEM biological field study (Figure 4.1). The occurrence of highly comparable specific conductance between the Mary River study areas was consistent with previous estimates of effluent concentrations in Mary River, which indicated that effluent was likely to constitute less than 0.1% of flow in Mary River (Minnow 2016a).

Water quality monitoring at Mary River EEM stations indicated very similar annual average water chemistry upstream and downstream of the Mary River Tributary-F confluence over the Phase 1 EEM period (i.e., 2015 – 2017; Table 4.1). Although annual average concentrations of aluminum and iron were higher at the Mary River EEM effluent-exposed water quality station than at the upstream reference station in 2016, the magnitude of this difference was less than 1.5 times higher and a similar elevation was not observed in either 2015 or 2017 (Table 4.1). On average, total concentrations of aluminum and iron were above respective WQG at the Mary River effluent-exposed station from 2015 to 2017, but similar annual average concentrations of these metals were observed at the Mary River upstream reference station during any given sampling event (Table 4.1), indicating natural elevation of aluminum and iron concentrations in Mary River. Notably, of those parameters shown to be elevated at Mary River Tributary-F, only average concentrations of nitrate were elevated at the Mary River EEM effluent-exposed station compared to the respective reference station, and only in 2017 (Table 4.1; Appendix Tables D.10 – D.12). However, nitrate concentrations were consistently well below WQG at the Mary River effluent-exposed station, suggesting that the slight elevation in 2017 was not ecologically meaningful. Within the Mary River effluent-exposed area, water chemistry was consistently very similar between the EEM water quality station (i.e., MS-08-DS) and farther downstream at the fish population survey study area (i.e., Station E0-21[10]) during periods of effluent discharge in 2016 and 2017 (Appendix Tables D.11 and D.12). This suggested similar mine effluent exposure to fish inhabiting the Mary River EEM fish population survey effluent-exposed area and those inhabiting the effluent-exposed area closer to the Mary River Tributary-F confluence validating the use of the former area as a safe alternative sampling location.

[10] Water chemistry is monitored at Station EO-21 to meet Baffinland Core Receiving Environment Monitoring Program (CREMP) requirements, outside of sampling required by Baffinland to meet the MMER.

Table 4.1: Annual Average Water Chemistry at Mary River EEM Stations during Periods of Effluent Discharge, 2015 to 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	Mary River Upstream (MS-08-US)			Mary River Downstream (MS-08-DS)		
				2015	2016	2017	2015	2016	2017
Conventionals	Conductivity (lab)	umho/cm	-	75	130	93	78	133	97
	pH (lab)	pH	6.5 - 9.0	8.07	7.99	8.35	7.96	8.09	8.15
	Hardness (as $CaCO_3$)	mg/L	-	52	56	42	55	57	44
	Total Suspended Solids (TSS)	mg/L	-	2.0	2.9	2.7	2.0	4.4	2.8
	Total Dissolved Solids (TDS)	mg/L	-	78		76	80		43
	Alkalinity (as $CaCO_3$)	mg/L	-	51	53	41	52	56	43
Nutrients and Anions	Total Ammonia	mg/L	variable[c]	0.05	0.02	0.02	0.05	0.02	0.02
	Nitrate	mg/L	13	0.02	0.02	0.02	0.02	0.02	0.05
	Total Organic Carbon	mg/L	-	1.0		1.4	1.0		1.5
	Total Phosphorus	mg/L	0.020^{α}	0.0058		0.0046	0.0051		0.0053
	Chloride (Cl)	mg/L	120	3.81		3.86	3.72		3.87
	Sulphate (SO_4)	mg/L	218^{β}	3.26		2.44	3.19		2.97
Total Metals	Aluminum (Al)	mg/L	0.100	0.312	0.343	0.122	0.305	0.440	0.122
	Antimony (Sb)	mg/L	0.020^{α}	0.0001		0.0001	0.0001		0.0001
	Arsenic (As)	mg/L	0.005	0.00010	0.00011	0.00010	0.00010	0.00012	0.00010
	Barium (Ba)	mg/L	-	0.00758		0.00907	0.00755		0.00949
	Cadmium (Cd)	mg/L	0.00012	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
	Calcium (Ca)	mg/L	-	11.3		13.1	11.3		13.2
	Chromium (Cr)	mg/L	0.0089	0.0005		0.0005	0.0005		0.0005
	Cobalt (Co)	mg/L	0.0009^{α}	0.0001		0.0001	0.0001		0.0001
	Copper (Cu)	mg/L	0.002	0.0010	0.0013	0.0010	0.0010	0.0013	0.0010
	Iron (Fe)	mg/L	0.30	0.184	0.271	0.102	0.166	0.368	0.097
	Lead (Pb)	mg/L	0.001	0.00018	0.00024	0.00011	0.00016	0.00030	0.00009
	Lithium (Li)	mg/L	-	0.001		0.001	0.001		0.001
	Magnesium (Mg)	mg/L	-	6.3		6.9	6.4		7.3
	Manganese (Mn)	mg/L	0.935^{β}	0.0019		0.0019	0.0020		0.0011
	Mercury (Hg)	mg/L	0.000026	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
	Molybdenum (Mo)	mg/L	0.073	0.00035	0.00032	0.00020	0.00035	0.00032	0.00020
	Nickel (Ni)	mg/L	0.025	0.0008	0.0006	0.0006	0.0008	0.0008	0.0005
	Potassium (K)	mg/L	-	1.02		1.04	1.02		1.06
	Selenium (Se)	mg/L	0.001	0.00053	0.00005	0.00005	0.00053	0.00005	0.00005
	Silicon (Si)	mg/L	-	1.4		0.99	1.39		1.02
	Silver (Ag)	mg/L	0.00025	0.00001		0.00005	0.00001		0.00005
	Sodium (Na)	mg/L	-	1.8		2.2	1.8		2.1
	Strontium (Sr)	mg/L	-	0.0077		0.0125	0.0077		0.0133
	Thallium (Tl)	mg/L	0.0008	0.00006		0.00001	0.00006		0.00001
	Titanium (Ti)	mg/L	-	0.012		0.006	0.011		0.005
	Uranium (U)	mg/L	0.015	0.0020		0.0023	0.0019		0.0024
	Vanadium (V)	mg/L	0.006^{α}	0.001		0.0005	0.001		0.0005
	Zinc (Zn)	mg/L	0.030	0.003	0.003	0.003	0.003	0.003	0.003

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 2017) except those indicated by α (Ontario Provincial Water Quality Objective; OMOEE 1994) and β (British Columbia Water Quality Guideline; BCMOE 2017).

Indicates parameter concentration above applicable Water Quality Guideline.

5 BENTHIC INVERTEBRATE COMMUNITY SURVEY

Benthic invertebrate density, richness, Simpson's Evenness and Bray-Curtis Index[11] did not differ significantly between the Mary River Tributary-F effluent-exposed and reference study areas during the August 2017 survey (Figure 5.1; Table 5.1). Direct comparison of dominant benthic invertebrate community groups[12] indicated a subtle difference in community composition between the effluent-exposed and reference areas of Mary River Tributary-F that was driven entirely by significantly greater density of Simuliidae (blackflies) at the effluent-exposed study area (Figure 5.2; Table 5.1). Because blackflies exhibit a filter-feeding, clinging mode of existence in aquatic habitats (Merritt et al. 2008), differences in filterer FFG and clinger HPG densities between the Mary River Tributary-F effluent-exposed and reference study areas (Figure 5.2; Table 5.1) reflected the difference in blackfly densities shown between areas. Notably, with the removal of Simuliidae from the data set, no significant differences in any of the primary EEM benthic invertebrate community metrics of density, richness, Simpson's Evenness and Bray-Curtis Index, calculated at family-level and lowest-practical-level taxonomy, were indicated between the effluent-exposed and reference areas (Appendix Table E.7). In addition, no significant differences in any of the supporting taxonomic group, FFG and HPG metrics except the proportion of collector-gatherer FFG, were indicated between Mary River Tributary-F effluent-exposed and reference study areas with the removal of Simuliidae from the data set (Appendix Table E.7).

Higher densities of blackflies generally occur at the outlets of tributaries and in larger-sized streams (Carlsson 1967; Grillet and Barrera 1997; Pramul and Wongpakum 2010), possibly due to greater inputs of suspended organic matter, the predominant food source for blackflies, at these habitats (Carlsson et al. 1977). Therefore, a greater density of blackflies downstream of the MS-08 effluent channel confluence on Mary River Tributary-F may have reflected increased food resources originating from the effluent-channel. Notably, blackfly larval densities do not appear to be strongly influenced by plankton abundance (Carlsson 1967), suggesting that non-living organic matter received from runoff potentially accounted for higher densities of blackflies at the effluent-exposed area. No significant differences in densities of metal-sensitive chironomids were indicated between the Mary River Tributary-F effluent-exposed and reference study areas, suggesting that between-area differences in metal concentrations did not affect the composition of the benthic invertebrate community at the effluent-exposed area. In addition, no significant differences in sample replicate water velocity, substrate size, or substrate embeddedness were

[11] Unless otherwise indicated, primary EEM benthic invertebrate community metrics of richness, Simpson's Evenness and Bray-Curtis Index discussed in this section were calculated using family-level (FL) taxonomy.

[12] Dominant groups included taxonomic, functional feeding, or habitat preference groups representing ≥10% of the community at any one station, and/or an average ≥5% of the community at any one study area (Appendix Table E.5).

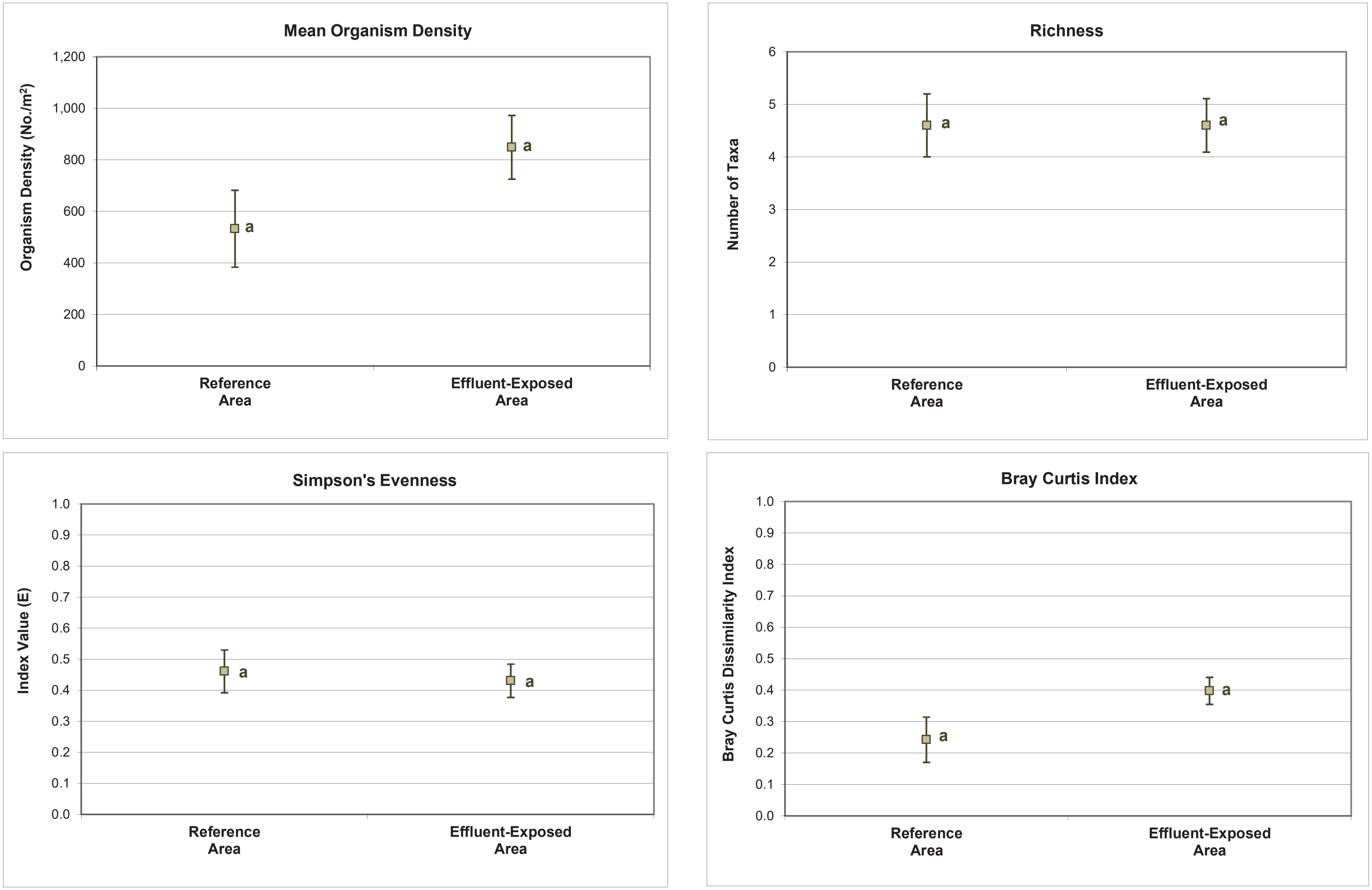


Figure 5.1: Comparison of Benthic Invertebrate Community Primary EEM Endpoints (mean ± SE, n = 5; calculated using Family Level taxonomy) for Mary River Tributary-F Effluent-Exposed and Reference Study Areas

Note: Data points with the same letter do not differ significantly.

Table 5.1: Benthic Invertebrate Community Statistical Comparison Results between Mary River Tributary-F Effluent-Exposed and Reference Study Areas Calculated for Primary EEM Metrics (Family Level Taxonomy) and Dominant Taxa, FFG and HPG

Metric	Two-Sample Comparison					Summary Statistics						
	Significant Difference Among Areas?	Trans-formation	Test	p-value	Magnitude of Difference [a] (No. of SD)	Area	Median	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Density (Individuals/m^2)	NO	fourth root	ANOVA	0.1238	~	Reference	474	533	334	149	188	1,058
						Effluent-Exposed	855	849	276	123	448	1,175
Richness (Number of Taxa)	NO	fourth root	ANOVA	0.9727	~	Reference	4.0	4.6	1.3	0.6	3.0	6.0
						Effluent-Exposed	5.0	4.6	1.1	0.5	3.0	6.0
Simpson's Evenness	NO	log_{10}	ANOVA	0.7872	~	Reference	0.430	0.461	0.154	0.069	0.297	0.689
						Effluent-Exposed	0.379	0.430	0.120	0.054	0.338	0.637
Bray-Curtis Index	NO	none	ANOVA	0.1006	~	Reference	0.204	0.242	0.161	0.072	0.069	0.439
						Effluent-Exposed	0.423	0.398	0.096	0.043	0.291	0.491
Chironomidae (No. per m^2)	NO	none	ANOVA	0.8030	~	Reference	241	309	170	76	102	531
						Effluent-Exposed	284	283	139	62	133	426
Metal Sensitive Chironomidae	NO	none	ANOVA	0.8397	~	Reference	107	121	59	27	40	199
						Effluent-Exposed	112	114	34	15	70	155
Simuliidae (No. per m^2)	YES	none	ANOVA	0.0137	2.0	Reference	161	205	169	75	75	487
						Effluent-Exposed	552	540	169	75	297	706
Collector-gatherers (No. per m^2)	NO	none	ANOVA	0.7417	~	Reference	240	310	173	77	102	532
						Effluent-Exposed	277	277	132	59	133	416
Filterers (No. per m^2)	YES	none	ANOVA	0.0137	2.0	Reference	161	205	169	75	75	487
						Effluent-Exposed	552	540	169	75	297	706
Clingers (No. per m^2)	YES	none	ANOVA	0.0151	2.0	Reference	165	212	175	78	79	505
						Effluent-Exposed	563	558	179	80	308	763
Sprawlers (No. per m^2)	NO	none	ANOVA	0.7510	~	Reference	240	305	166	74	102	517
						Effluent-Exposed	277	274	130	58	133	412

[a] Magnitude calculated by comparing the difference between the reference area and effluent-exposed area means divided by the reference area standard deviation.

Highlighted values indicates significant difference between study areas based on a p-value less than 0.10.

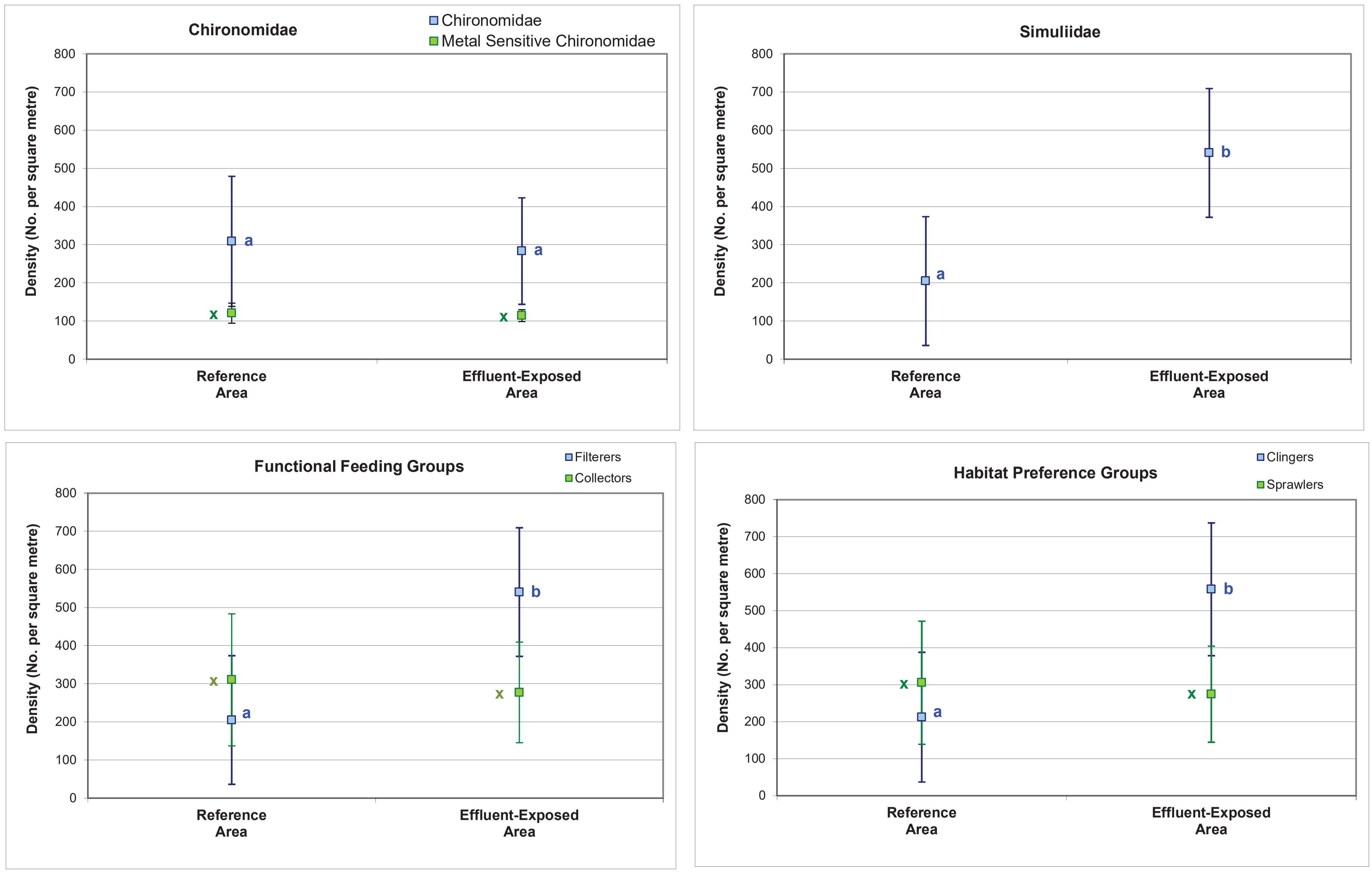


Figure 5.2: Comparison of Dominant Benthic Invertebrate Community Compositional Groups (density in m^2) between Mary River Tributary-F EEM Study Areas (mean ± SE, n = 5), Mary River Project Phase 1 EEM, August 2017

Note: Data points with the same, like-coloured letters do not differ significantly.

indicated between the Mary River Tributary-F effluent-exposed and reference study areas (Appendix Table E.3), suggesting that the difference in blackfly density between these areas was unrelated to these variables.

Overall, statistical similarity in primary EEM metrics of density, richness, Simpson's Evenness and Bray-Curtis Index between effluent-exposed and reference areas of Mary River Tributary-F indicated no effluent-related effects on the benthic invertebrate community in the receiving environment downstream of the MS-08 effluent discharge.

6 FISH POPULATION SURVEY

6.1 Fish Community

No fish were captured within Mary River Tributary-F either downstream or upstream of the MS-08 effluent discharge channel during the August 2017 fish population survey (Table 6.1; Appendix Table F.1). Fish sampling was conducted at reaches extending from the outlet to upstream of the effluent discharge (Figure 2.3), and therefore the lack of fish captures indicated that fish were naturally absent through the entire Mary River Tributary-F system. The natural absence of fish from Mary River Tributary-F presumably reflected the combination of complete freezing overwinter and an inability of fish to colonize the tributary due to relatively high stream gradient and the presence of natural in-stream barriers. An average gradient of 12% was documented through the lower 750 m of Mary River Tributary-F during the EEM fish population survey. In addition, an approximately 1.75 m high step-drop over large boulder habitat occurred approximately 50 m upstream of Mary River on Mary River Tributary-F (Appendix Photo Plate C.1), representing an impassable barrier for upstream migration by fish under the flow conditions observed at the time of the EEM fish population survey.

Table 6.1: Summary of Fish Catches at Mary River Project Phase 1 EEM Fish Population Study Areas, August 2017

Study Area	Total Effort		Summary Statistic Endpoint	Fish Species			Catch Summary	
	Distance Sampled (m)	Electrofishing Seconds		Arctic Charr		Ninespine Stickleback	Totals	Total No. Species
				YOY [b]	Non-YOY [b]			
Mary River Tributary-F Efffluent-Exposed	678	4,157	Total No. Caught	0	0	0	**0**	**0**
			CPUE[a]	0.0	0.0	0.0	**0.0**	
Mary River Effluent-Exposed	388	4,587	Total No. Caught	0	100	0	**100**	**1**
			CPUE[a]	0	1.30	0	**1.30**	
Mary River Reference	708	8,340	Total No. Caught	2	103	3	**108**	**2**
			CPUE[a]	0.01	0.75	0.02	**0.78**	

[a] Electrofishing catch-per-unit-effort (CPUE) represents number of fish captured per minute of electrofishing.

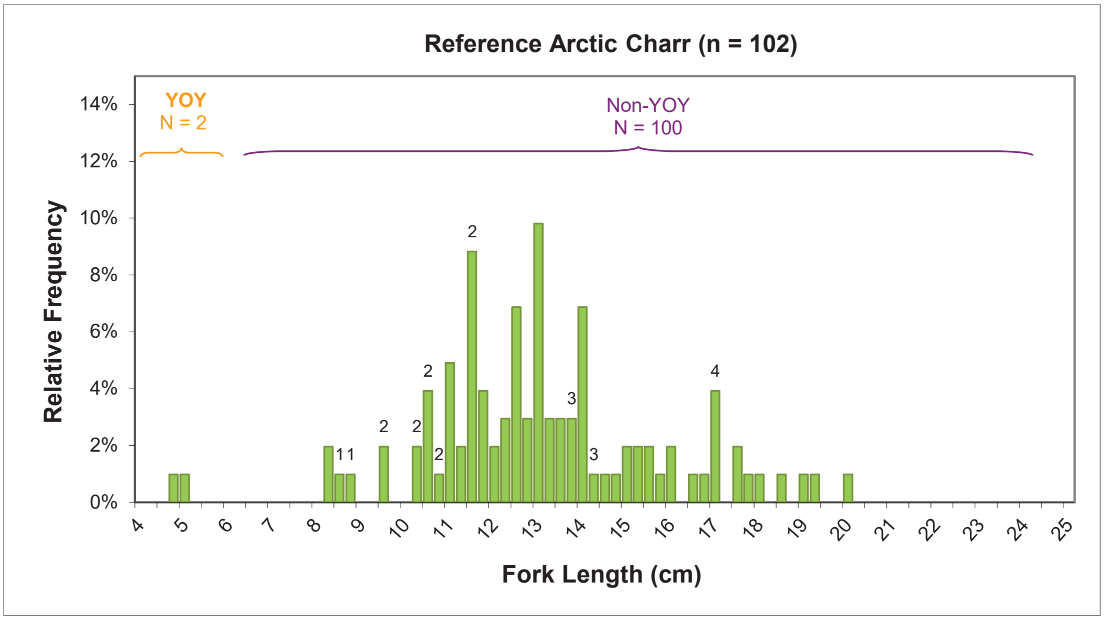
[b] Young-of-the-year (YOY).

The fish community at the effluent-exposed area of Mary River was represented only by arctic charr (*Salvelinus alpinus*), which differed slightly from that of the Mary River reference area where low numbers of ninespine stickleback (*Pungitius pungitius*) were captured in addition to arctic charr (Table 6.1; Appendix Table F.1). Arctic charr catch-per-unit-effort (CPUE) was substantially higher at the effluent-exposed area than at the reference area (Table 6.1), suggesting greater abundance of arctic charr at the effluent-exposed area. The between-area difference in arctic charr abundance may have reflected natural differences in the type of habitat sampled between the effluent-exposed and reference areas. At the effluent-exposed area, the predominant habitat consists of side and braided channels characterized by variable water velocity and large, loosely embedded cobble substrate, whereas at the reference area, habitat is dominated by a single main channel characterized by relatively deep, fast flowing water over highly embedded boulder substrate (Appendix Table C.4; Appendix Photo Plate C.2). These habitat features allowed fish sampling to be conducted throughout side-channels at the effluent-exposed area, but limited the sampling to shoreline areas at the reference area as a result of improved fish catch efficiencies potentially related to the field study team sampling mobility and commensurate safety concerns. Overall, no effluent-related influences on fish community composition and arctic charr abundance were apparent within the Mary River receiving environment.

6.2 Arctic Charr Population Evaluation

Non-lethal measurements of length and weight were collected from 102 and 100 arctic charr at Mary River effluent-exposed and reference study areas, respectively, for the assessment of EEM fish population endpoints (Appendix Tables F.2 and F.3). Arctic charr YOY were distinguishable from non-YOY individuals at a fork length of 50 mm based on evaluation of length-frequency distributions coupled with supporting age determinations (Figure 6.1). Based on this cut-off value, no YOY were captured at the effluent-exposed area, and only two YOY were captured at the reference area (i.e., approximately 2% of arctic charr population). As a result, the arctic charr population assessment focused on non-YOY individuals.

Arctic charr length-frequency distributions did not differ significantly between the effluent-exposed and reference areas of Mary River, regardless of whether YOY were included or excluded from the data set (Table 6.2; Figure 6.1; Appendix Figure F.1). Because the inclusion of YOY did not change the outcome of the length-frequency distribution statistical comparison, no difference in the proportion of YOY was indicated between the effluent-exposed and reference study areas (Table 6.2). Among non-YOY arctic charr, no separation of age (i.e., cohorts) was possible for either study area using the length-frequency distribution and confirmatory aging results (Figure 6.1). Nevertheless, visual evaluation of the plotted data suggested a similar arctic charr length-at-age relationship between the effluent-exposed and reference areas (Figure 6.1). Fork



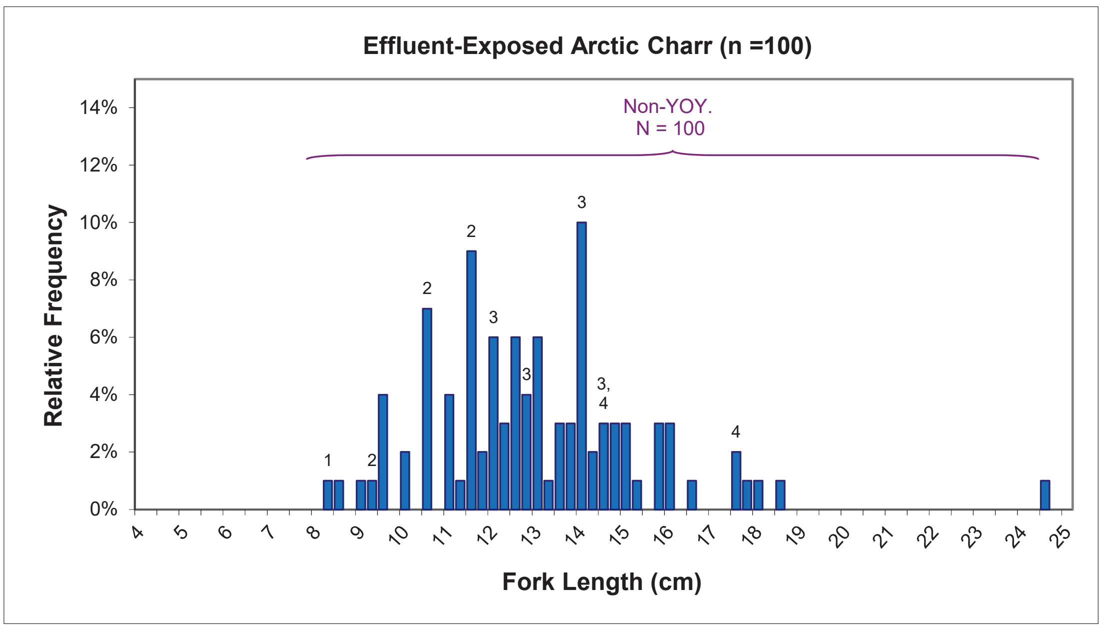


Figure 6.1: Length-frequency Distributions for Arctic Charr Collected at Mary River Project Phase 1 EEM Effluent-Exposed and Reference Study Areas, August 2017

Note: Numbers above bars represent individual fish ages, where available.

length and body weight of non-YOY arctic charr captured at the effluent-exposed area did not differ significantly from those captured at the reference area (Table 6.2; Appendix Figures F.2 and F.3). Although condition (i.e., weight-at-length relationship) of non-YOY individuals was significantly lower at the Mary River effluent-exposed area than at the reference area, the magnitude of this difference was within applicable CES (i.e., ±10%; Table 6.2; Figure 6.2; Appendix Table F.4) suggesting that this difference was not ecologically meaningful. No externally-visible abnormalities or parasitic infections were observed on any arctic charr captured at the Mary River effluent-exposed area (Appendix Table F.3). Overall, no significant, ecologically meaningful differences in arctic charr non-YOY health endpoints were indicated between the effluent-exposed and reference areas, suggesting limited influence of the MS-08 effluent on the health of this species at Mary River in 2017.

Table 6.2: Summary of Arctic Charr Population Statistical Comparison Results between Effluent-Exposed and Reference Areas of Mary River, August 2017

Endpoint		Significant Difference		Magnitude of Difference (%)
		Yes/No	p-value	
Survival – Length Frequency Distribution	All Fish	No	0.936	-
	Non-YOY only	No	0.906	-
Growth	Non-YOY length	No	0.523	-
	Non-YOY weight	No	0.200	-
Energy Storage	Non-YOY condition	Yes	<0.001	-4.5
Reproduction	YOY Proportion	No		

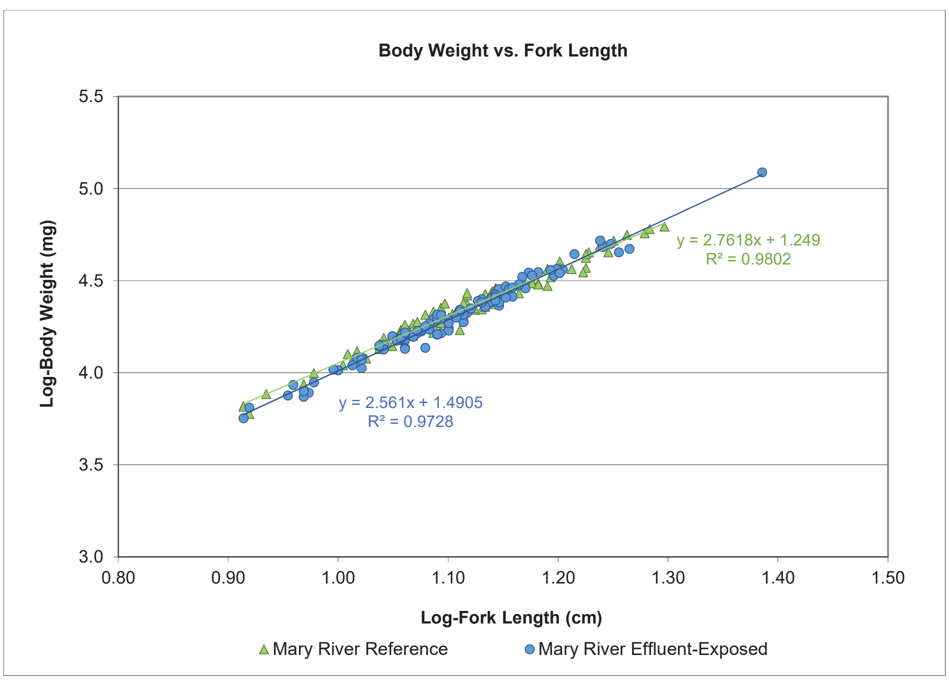


Figure 6.2: Comparison of Condition (Weight-at-Fork Length Relationship) for Arctic Charr Non-Young-of-the-Year (Non-YOY) Collected at Mary River Effluent-Exposed and Reference Areas, August 2017

7 CONCLUSIONS

The objective of the Mary River Project Phase 1 EEM biological study was to provide an initial evaluation of the influence of mine effluent on biota of the mine receiver. To meet this objective, effluent quality, receiving environment water quality, and habitat characterization data were used to support the interpretation of benthic invertebrate community and fish population survey data collected at effluent-exposed areas and respective reference areas of Mary River Tributary-F and Mary River. The principal conclusions from the Phase 1 EEM study are:

- Effluent from the Mary River Project primary discharge (MS-08) met all MMER limits during normal mine operations in 2015, 2016 and, with the exception of the discharge of effluent with low pH in some grab samples collected in August and September, and elevated mean monthly TSS concentrations in August, also met MMER limits in 2017. Mine effluent was non-acutely lethal to rainbow trout and *Daphnia magna* in 2015 and 2016, but was acutely lethal to one or both test species during individual tests conducted on August 1st and September 5th, 2017. Baffinland reported these non-compliances through the appropriate stakeholders and regulatory bodies and implemented corrective actions to mitigate effects and prevent future occurrences. Sublethal toxicity tests conducted using final effluent samples showed no effects on survival or growth of fathead minnow or on growth of green algae over the Phase 1 EEM period. Occasional effects on survival and/or reproduction of *Ceriodaphnia dubia* planktonic invertebrates and more consistent growth inhibition to duckweed were shown in effluent sublethal toxicity tests conducted from 2015 to 2017. However, effects to these test organisms were generally observed at effluent concentrations higher than those typically expected within the mine receiving environment, suggesting limited potential for similar sublethal toxicity effects within the immediate Mary River Tributary-F effluent-exposed area.
- Effluent concentrations estimated for the immediate receiving waters of Mary River Tributary-F were less than 1% based on extrapolation of field specific conductance measures (0.17% in August) and hydrological gauging station data (0.34% – 0.89% in late July) in 2017. The 2017 effluent concentration estimates were consistent with previous estimates for Mary River Tributary-F, which suggested that effluent concentrations range from 0.03% to 1.3% within the watercourse.
- Water chemistry at effluent-exposed areas of Mary River Tributary-F showed slightly elevated ammonia, nitrate and/or sulphate concentrations compared to reference conditions during periods of effluent discharge in 2016 and 2017, but concentrations of these parameters were consistently well below applicable WQG within the watercourse.

Within the effluent-exposed area of Mary River, average nitrate concentrations were slightly elevated compared to the applicable reference area, but only in 2017 and concentrations remained well below WQG, suggesting that the elevation in nitrate concentration was not ecologically meaningful.

- The benthic invertebrate community survey indicated no significant differences in primary EEM endpoints of density, richness, Simpson's Evenness and Bray-Curtis Index between effluent-exposed and reference areas of Mary River Tributary-F. In turn, this suggested no adverse influences to the benthic invertebrate community of Mary River Tributary-F associated with exposure to mine effluent.
- The fish population survey indicated no substantial differences in community species composition between the effluent-exposed and reference areas of Mary River, but potentially higher abundance of fish at the effluent-exposed area due to natural habitat factors. The Mary River arctic charr population showed no significant difference in size (length-frequency) structure, and no significant difference in proportion of YOY individuals between the effluent-exposed and reference areas. In addition, length and weight of non-YOY arctic charr did not differ significantly between populations sampled at the effluent-exposed and reference areas of Mary River. Although non-YOY arctic charr captured at the effluent-exposed area had significantly lower condition (length-at-weight relationship) than those captured at the reference area, the magnitude of this difference was small (i.e., -4.5%) and within the applicable fish condition Critical Effect Size of ±10% used for EEM studies, suggesting that this difference was not ecologically meaningful.

Overall, the Mary River Project Phase 1 EEM indicated very low effluent concentrations within the immediate Mary River Tributary-F receiving environment and commensurately, only minor effluent-related influences on water quality of this watercourse and farther downstream at Mary River during periods of effluent discharge. Although Mary River non-YOY arctic charr had lower condition at the effluent-exposed area than at the reference area, concentrations of mine-related parameters well below WQG and no effluent-related influences on primary EEM benthic invertebrate community endpoints closer to the effluent discharge at Mary River Tributary-F. In turn, this suggested that factors other than mine-effluent accounted for the difference in non-YOY arctic charr condition between the effluent-exposed and reference areas of Mary River.

Based on the prescribed EEM frequency under the MMER, the Study Design for the next Mary River Project EEM biological study must be submitted to Environment and Climate Change Canada (ECCC) no later than six months prior to implementing field collections in 2020. Using the EEM framework, the next phase of biological monitoring (Phase 2) will require an effects assessment, in part, to determine whether the occurrence of significantly lower arctic charr condition shown in the current EEM is consistent over study phases. The corresponding Phase 2 EEM Interpretive Report must be submitted to ECCC by January 10th, 2021.

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APPENDIX A

STUDY DESIGN APPROVAL CORRESPONDENCE

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Prairie & Northern Region
Environmental Protection Operations Directorate
9250 – 49th Street NW
Edmonton, AB T6B 1K5

February 28, 2017

via email to: jim.millard@baffinland.com

James Millard
Environmental Manager
Baffinland Iron Mines
2275 Upper Middle Road East, Suite 300
Oakville,ON L6H 0C3

Dear Mr. Millard:

Subject: Metal Mining Effluent Regulations – Evaluation of 1st Environmental Effects Monitoring Study Design, Mary River Project, NU

This letter is to advise you that Environment and Climate Change Canada has reviewed your Environmental Effects Monitoring (EEM) biological study design report entitled "Mary River Project Environmental Effects Monitoring Phase 1 Study Design", received July 8, 2016. The review of study design reports takes into account information requirements in the *Metal Mining Effluent Regulations (MMER)* of the *Fisheries Act* and also offers comments on the study based on the EEM Technical Guidance Document and generally accepted standards of good scientific practice.

The compiled review comments and recommendations are attached. Comments in bold indicate where further information is required to meet regulatory requirements and should be addressed for the review of the report to be completed.

Should you have any questions or concerns regarding the EEM program or wish to discuss the review of the study design, please do not hesitate to contact me at (780) 717-4884 or at erik.allen@canada.ca.

Sincerely,

Erik Allen
Environmental Effects Monitoring Coordinator

cc:	Susanne Forbrich	Environment and Climate Change Canada, Edmonton
	Cristina Ruiu	Environment and Climate Change Canada, Regina
	Paula Siwik	Environment and Climate Change Canada, Edmonton
	Curtis Didham	Environment and Climate Change Canada, Iqaluit

Canada

Attachment: Review Comments and Recommendations on ‘Mary River Project Environmental Effects Monitoring Phase 1 Study Design’, July 2016 submission

Review Comments and Recommendations on 'Mary River Project Environmental Effects Monitoring Phase 1 Study Design', submitted July 2016

The following comments and recommendations are based on the review of the report by a Technical Advisory Panel (TAP) consisting of representatives from Environment and Climate Change Canada (ECCC), Nunavut Water Board (NWB) and Indigenous and Northern Affairs Canada (INAC).

Action items

1. p. 1, Section 1.1. The NWB currently has on file a copy of Baffinland Iron Mines Corporation's (BIMC) Aquatic Effect Monitoring Plan (AEMP) (Rev 2), which includes a Draft EEM Cycle Study Design as a subset of the AEMP. As the NWB is currently in the process of considering BIMC's AEMP for Approval, confirmation is required from BIMC on the extent to which changes included in the current EEM Study Design, which superseded the Draft EEM study design, may impact the NWB's ability to potentially approve the current version of the AEMP.
2. p. 7. The study design includes a description of how effluent mixes in the exposure area, based on extrapolated stream discharge volumes for Tributary-F. It would appear that daily effluent discharge was compared to a stream flow estimate based on annual average flows from nearby streams, however the methods were unclear. Please provide further details on how the stream discharge and effluent concentrations were estimated.
    a. Were extrapolated values based on the average flows from similarly-sized watersheds listed in Table A2? Were the watersheds similar to Tributary-F in elevation, gradient, and aspect?
    b. Was the extrapolated discharge for Tributary F based on 2015 data only?
    c. Were monthly and annual variations in streamflow considered in the estimates of effluent concentration?
    d. Where along Tributary-F do the estimates of effluent concentration apply (e.g., at the confluence with the effluent stream, or downstream at the confluence with Mary River)?
3. p. 12. The proponent is recommended to verify effluent concentrations with in-stream conductivity measurements during effluent discharge periods in 2017. Please provide details on an approach to assess effluent concentrations based on effluent and stream conductivity in the receiving environment, including sampling locations and calculations (refer to the Metal Mining EEM Guidance Technical Document (TGD), Sections 2.2.1.1 and 2.2.1.2).
4. p. 12, Section 2.3.4. It is recommended that the proponent provide details regarding measures implemented and monitoring that may be conducted to determine whether or not the effluent discharged from MS-08 may have any negative impact on the receiving environment, preceding the final discharge point.
5. Figure 2.4. The legend in Figure 2.4 indicates that 2015 data were used to estimate monthly discharge for the Mary River and Tributary-F. Table A-2 presents monthly discharge data for several stations from 2006 to 2014, but there are no 2015 data. Please provide the missing data.

6. p. 18. The study design did not describe methods for the collection of sediment samples for particle size and total organic carbon analyses, which are required if the study is conducted in an area where it is possible to sample sediment (MMER, Sched. 5, s. 16(a)(iii)). The description of the sampling areas (erosional habitat with gravel/cobble substrate) would suggest that sediment sampling will not be possible; please confirm or provide the missing information.
7. **p. 21. The study design suggests that low effluent concentration in the Mary River would exempt the proponent from the requirement to conduct a fish study, should no fish be collected from Tributary-F. The MMER require a fish population study if the effluent concentration in the exposure area is greater than 1% in the area located within 250 m of the final discharge point (FDP) (Sched. 5, s. 9(b)). Based on the information provided, the fish survey exemption does not apply to the proposed study. The fish survey should be initially conducted in Tributary-F as proposed, and if fish are determined to be absent or in low abundance, field crews should sample progressively downstream into the Mary River, where fish may be more abundant. Please provide information on potential reference sites for the Mary River exposure area. Given concerns over low fish abundance, the proponent is recommend to identify several reference site options for the Tributary-F and Mary River exposure areas.**
8. p. 21. The report indicates that mine effluent represented 0.02% - 0.035% of flow in the Mary River. On p.7, the effluent percentage of flow in the Mary River was given as 0.03% and 0.065%; please clarify.
9. p. 25. The study design indicates that stream velocity and channel dimensions will be measured, will discharge volumes be calculated?
10. p. 26. Please briefly describe field preservation and shipping protocols for water samples to ensure laboratory sample hold times are met, given the remote location of the study area.
11. p. 14. Section 3.5.6 It is recommended that the proponent provide details regarding further or continued monitoring and/or analyses that may be conducted to determine the extent to which mining activities may be contributing to the differences, over time, in results observed in the water quality parameters measured at Tributary F and the Mary River Up-stream Reference Station.
12. p. 26. Section 3.5. It is recommended that details regarding the exposure and reference areas to be monitored be confirmed in the EEM Study Design in the context of BIMC's recommended discontinuation of monitoring for several stations potentially related to exposure and/or reference areas, based on the correspondence accompanying the AEMP (Rev 2).
13. **The proponent previously notified the authorization officer of the addition of a second FDP (MS-06) for the Mary River Project (letter from J. Millard to S. Forbrich, June 18, 2016). The MS-06 FDP was not described in the current study design. The MMER require a description of the manner in which the effluent mixes within the exposure area for each final discharge point (MMER, Sched. 5, s. 11(a)). Please provide any available information regarding effluent mixing from MS-06, and a description of plume delineation methods to be implemented in 2017 (as requested for MS-08; see comment #3).**

For mines with multiple effluent discharges, it is recommended that biological monitoring be conducted on the discharge with the greatest potential to have an adverse effect on the receiving environment, based on mass loading of deleterious substances, effluent mixing, and sensitivity of the receiving environment (TGD, Section 2.2.2.1). Potential confounding factors should also be considered. Based on the information provided to date, the TAP would support biological monitoring of the MS-08 FDP as proposed; however, additional information and rationale should be provided to demonstrate that MS-08 is most suitable for biological monitoring.

Please note that MMER requirements for annual effluent characterization and water quality monitoring apply to all FDPs (Sched. 5, s. 4, 7). Requirements for sublethal toxicity testing apply to the FDP with potentially the most adverse environmental impact on the environment, taking into the account the mass loadings of deleterious substances and the manner in which effluent mixes in the exposure area (Sched. 5, s. 5).

14. The MS-06 FDP will discharge to the Mary River through a treated sewage pipeline; will mine effluent and treated sewage be discharged concurrently?
15. Appendix A, Table A.4. Please indicate the location of stream sampling sites listed in Table A.4. Was there a noticeable difference in water chemistry between upstream and downstream sites on Tributary-F?

Other items

16. Fig. 2-4. The figure caption should refer to mean monthly stream discharge, not effluent discharge; please confirm.
17. p. 14. The proponent is recommended to conduct annual water quality monitoring in Tributary F near the confluence with the effluent discharge, and a comparable reference stream, in addition to proposed monitoring in the Mary River.
18. p. 15. The report states that ninespine stickleback have been captured in low abundance in the Mary River area, but later states that arctic charr are the only species captured in Mary River. Have ninespine stickleback been located in any of the streams identified for the biological monitoring study?
19. p. 22. The proponent is advised to plan for up to 7 days of sampling per area to meet sample size targets for the fish survey.
20. p. 23. Please be advised that the TGD recommends independent confirmation of fish ageing for 10% of samples.
21. Table 3.2. The table indicates no statistical analysis for the reproduction endpoint. Please note that the non-lethal reproduction endpoint (relative abundance of YOY) can be analyzed by comparing exposure and reference length frequency distributions with the Kolmogorov-Smirnov test, with and without YOY. If the inclusion of YOY changes the outcome of statistical comparison, the proportion of YOY is considered to be different between sampling areas (TGD, Section 3.4.2.2).
22. p. 25. Please ensure collection of trip and field blanks for water chemistry QA/QC, as recommended by the TGD (Section 5.8.4).
23. An overview document outlining the amendments proposed for the MMER was shared with stakeholders in December 2016. If you have not received this

document and would like a copy, please contact Erik Allen. The proposed amendments are expected to be published in Canada Gazette, Part 1 in spring of 2017. Canada Gazette, Part II publication would likely occur 12 to 18 months following Canada Gazette Part 1 publication.

Minor comments and errata

p.1. The report refers to “Surface (contour strip) mining at the Mary River Project”. Please note that strip mining is not used at Mary River Project.

Figure 1.1. Baffinland Iron Mines Corporation, Mary River Project Location Map. For future reports, labelling Mary River Tributary-F (as in Figures 2.1 and 3.1) would help highlight the tributary and its flow direction.

p.3. The report states: “This mine closure EEM site characterization summarizes …”. It is unclear why EEM site characterization is referred to as ‘mine closure’.

p.4, 9. “The Mary River Project area (is situated/lies) within the Committee Belt” – this should refer to Committee Bay Belt.

p.9. “The belt … is divided into five main assemblages: the Archean, the Mary River Group, the Piling Group, the Bylot Supergroup, and the Turner Cliffs-Ship Formation (Aker Kvaerner 2008).” Please note that the Archean is not an assemblage but a geological eon. Suggest replacing with the Penrhyn Group, or some other assemblage found at/near the Project site.

August 10th, 2017

Mr. Erik Allen
Environmental Effects Monitoring Coordinator
Prairie and Northern Region
Environmental Protection Operations Directorate
9250 – 49th Street NW
Edmonton, Alberta T6B 1K5

Dear Mr. Allen,

Re: <u>Response to ECCC Action Items and Comments on the Mary River Project 1st Environmental Effects Monitoring Study Design</u>

Environment and Climate Change Canada (ECCC) reviewed the Mary River Project First Environmental Effects Monitoring (EEM) Study Design report submitted by Baffinland Iron Mines Corporation (Baffinland) and provided specific action items and comments applicable to the study as outlined in their letter dated February 28th, 2017. Baffinland has prepared this detailed response to address the fifteen action items and eight 'other items' provided by ECCC stemming from their review of the study design. As follow-up to this response, it is suggested that resolution to any potential outstanding issues can be achieved either through a teleconference arranged between ECCC and Baffinland prior to implementation of the field study (August 2017), or during the ECCC site visit to the Mary River Project from August 15th – 17th, 2017.

Sincerely,
Baffinland Iron Mines Corporation

Laura Taylor
Environmental Superintendent

Cc: William Bowden, Environmental Superintendent, Baffinland
Paul LePage, Minnow Environmental Inc.

Baffinland Iron Mines Corporation: Response to ECCC Comments on the Mary River Project 1st Environmental Effects Monitoring Study Design

PART A - Action Items

Action Item 1: "*p. 1, Section 1.1. The NWB currently has on file a copy of Baffinland Iron Mines Corporation's (BIMC) Aquatic Effect Monitoring Plan (AEMP) (Rev 2), which includes a Draft EEM Cycle Study Design as a subset of the AEMP. As the NWB is currently in the process of considering BIMC's AEMP for Approval, confirmation is required from BIMC on the extent to which changes included in the current EEM Study Design, which superseded the Draft EEM study design, may impact the NWB's ability to potentially approve the current version of the AEMP.*"

Response: The (2014) EEM study design presented as part of the Rev 2 AEMP had assumed a total of four Final Discharge Points (FDP) operating under full capacity of the Mary River Project as described in the Baffinland (2012) Final Environmental Impact Assessment. Currently, only two FDP are intermittently active (MS-08 East Pond, MS-06 Ore Stockpile Runoff). In addition, to date, annual effluent discharge rates from each of these FDP have been much lower than the discharge rates estimated in the Rev 2 AEMP EEM study design (i.e., 2,217 m^3 in 2015 versus 3,133,000 m^3/year estimated in the Rev 2 EEM study design for Station MS-08; 86 m^3 in 2016 versus 110,000 m^3/year estimated in the Rev 2 EEM study design for Station MS-06).

The current (2016) EEM study design better reflects conditions of existing mine operations, focusing on those watercourses that currently receive mine effluent under the more limited effluent flow rates. Specifically, biological sampling will focus on Mary River Tributary-F under the current (2016) EEM study design. Under the (2014) Rev 2 AEMP EEM Study Design, sampling areas were concentrated on Mary River and Camp Lake Tributary 1. However, intensive sampling, similar to that conducted for the EEM program, is currently conducted at both Mary River and Camp Lake Tributary 1 under Baffinland's Core Receiving Environment Monitoring Program (CREMP), which has been conducted annually following the commencement of mine operations. For instance, three and two mine-exposed biological monitoring areas have been established/ sampled on Mary River and Camp Lake Tributary 1, respectively, in addition to comparable reference areas. These same areas were proposed for sampling under the former (2014) Rev 2 AEMP EEM Study Design. The benthic invertebrate community survey and fish population survey approaches were very similar between the former (2014) Rev 2 AEMP EEM study design and the current (2016) EEM study design.

Therefore, through the additional focus on the watercourse most likely to be influenced by mine effluent (i.e., Mary River Tributary-F), the current (2016) EEM study design enhances the overall spatial coverage of environmental monitoring at the Mary River Project relative to the former (2014) Rev 2 AEMP EEM study design. Moreover, because the current CREMP included biological sampling at those areas proposed for monitoring under the former (2014) Rev 2 AEMP EEM study design, the changes between the 2014 and 2016 EEM study designs will not detract from the overall objectives of the AEMP (e.g., to evaluate short- and long-term effects of the Mary River Project on aquatic ecosystems) and will actually enhance the overall program (i.e., through the addition of Mary River Tributary-F as a sampling area).

Action Item 2: "*p. 7. The study design includes a description of how effluent mixes in the exposure area, based on extrapolated stream discharge volumes for Tributary-F. It would appear that daily effluent discharge was compared to a stream flow estimate based on annual average flows from nearby streams, however the methods were unclear. Please provide further details on how the stream discharge and effluent concentrations were estimated.*

a. Were extrapolated values based on the average flows from similarly-sized watersheds listed in Table A2? Were the watersheds similar to Tributary-F in elevation, gradient, and aspect?

b. Was the extrapolated discharge for Tributary F based on 2015 data only?

c. Were monthly and annual variations in streamflow considered in the estimates of effluent concentration?

***d. Where along Tributary-F do the estimates of effluent concentration apply (e.g., at the confluence with the effluent stream, or downstream at the confluence with Mary River)?*"**

Response: Streamflow of Tributary-F was estimated using average per unit watershed area flow data (m^3/day/km^2) from six nearby watercourses for the months of July and August collected in 2015. These average flow data were multiplied by the watershed area of Tributary F (in this case, 6.8 km^2 at the confluence with the effluent discharge) to determine the percent effluent following complete mixing using the average and maximum effluent discharge rate (148 and 293 m^3/day, respectively) over the period of effluent discharge in July/August 2015. The formula used to determine the percentage of effluent at the Tributary F/ effluent discharge confluence was as follows:

- effluent discharge (m^3/day) / [stream flow (m^3/day for the 6.8 km^2 area) + effluent discharge (m^3/day)]

This value was calculated separately for July and August, and then averaged to arrive at an extrapolated average effluent concentration during the period of mine effluent discharge. The same method was used to determine the percentage of effluent at the Mary River confluence with Tributary F (watershed area of 232.6 km^2).

a. Extrapolated values were taken from the six watershed sizes indicated in Appendix Table A.2, which ranged from 3.6 – 250 km^2. As indicated above, the average discharge per unit area (m^3/day/km^2) for these six watercourses was used to extrapolate the percentage of effluent at Tributary F and Mary River. In general, watercourses with smaller watershed sizes (i.e., under 10 km^2) more closely mirrored the elevation, gradient and aspect of Tributary F than watercourses with larger watersheds at the Baffinland hydrological monitoring stations.

b. Stream discharge data from 2015 became available for incorporation into the Study Design document in the later stages of preparation. Unfortunately, changes applicable to some of the text in the effluent dilution (Section 2.2.4) and fish population survey (Section 3.2.1) portions of the report were not consistently updated/adjusted to reflect the addition of the 2015 data. Text from the first paragraph of Section 2.2.4 should have read as follows (in bold):

Estimates of effluent dilution in the mine receiving environment were conducted using the 2015 final effluent discharge data together with watershed discharge rates pro-rated using data from six Mary River Project mine site stream gauging stations over the 2015 open-water period. Based on estimated annual average flow by watershed and average daily effluent discharge (i.e., 148 m^3/day during periods of discharge; see Section 2.2.2), the MS-08 effluent was estimated to constitute an average of 1.3% and 0.03% of flow during periods of effluent discharge in 2015 (i.e., July and August) at the effluent stream confluence with Mary River Tributary-F and Mary River, respectively (Figure 2.3). Assuming the maximum daily effluent volume discharged in 2015 (i.e., 293 m^3 on July 12, 2015), the MS-08 effluent was estimated to constitute approximately 2.5% and 0.065% of flow at the effluent stream confluence with Mary River Tributary-F and Mary River, respectively, during the July-August period of discharge in 2015, assuming average regional monthly flow conditions on the day of maximum discharge (Figure 2.3).

c. Based on the monthly 2015 streamflow data, average and maximum effluent concentrations were 1.3 ± 0.5% and 2.5 ± 0.9%, respectively, for the months of July/August at the Tributary-F confluence with the effluent channel based on the streamflow data from all six watercourses. Similarly, average and maximum effluent concentrations were 0.033 ± 0.019% and 0.065 ± 0.038%, respectively, for the months of July/August at the Mary River confluence with Tributary-F based on the 2015 streamflow data from the Mary River gauging station.

d. Effluent concentrations on Tributary F that were indicated on p. 7 applied to the confluence with the effluent stream (i.e., the initial mixing zone).

Action Item 3: "*p. 12. The proponent is recommended to verify effluent concentrations with in-stream conductivity measurements during effluent discharge periods in 2017. Please provide details on an approach to assess effluent concentrations based on effluent and stream conductivity in the receiving environment, including sampling locations and calculations (refer to the Metal Mining EEM Guidance Technical Document (TGD), Sections 2.2.1.1 and 2.2.1.2)*"

Response: Effluent concentrations within Tributary F and Mary River will be determined at the time of biological sampling in August 2017 using the approach suggested in the Metal Mining EEM TGD. Together with effluent specific conductance measured at the time of biological sampling, specific conductance measurements at reference and effluent-exposed benthic invertebrate community/fish monitoring stations will be used as the basis for determination of effluent concentrations at Tributary F and Mary River, as applicable. During site reconnaissance conducted by Minnow in 2015, a specific conductance survey conducted to estimate effluent concentrations along Tributary-F was confounded by runoff received from areas subject to drilling and/or hauling activity which resulted in higher aqueous specific conductivity in Tributary-F. Notably, calcium chloride ($CaCl_2$) is used to aid with drilling through permafrost at Baffinland, which was believed to result in elevated specific conductance in runoff feeding into Tributary-F at the time of the 2015 specific conductance survey.

Action Item 4: "*p. 12, Section 2.3.4. It is recommended that the proponent provide details regarding measures implemented and monitoring that may be conducted to determine whether or not the effluent discharged from MS-08 may have any negative impact on the receiving environment, preceding the final discharge point*"

Response: It is unclear as to the recommended location referred to in this Action Item (i.e, "preceding the final discharge point"). If referring to the lower 740 m length of channel that drains into Tributary-F, no monitoring is proposed for this portion of the system, with the exception of *in situ* water quality measurements conducted at the time of biological monitoring in August 2017. Flow in this intermittent section of the channel is likely to be represented entirely by effluent in August, and we believe there is very low likelihood that benthic invertebrate communities become well established in watersheds of this small size, confounding the ability to assess biological influences of the mine effluent on biota. The photograph below illustrates the portion of the channel just upstream of Tributary-F in August 2016 during effluent discharge. In this photo, the channel width is approximately 30 cm and water depths reach a maximum of approximately 5 cm.

Action Item 5: "*Figure 2.4. The legend in Figure 2.4 indicates that 2015 data were used to estimate monthly discharge for the Mary River and Tributary-F. Table A-2 presents monthly discharge data for several stations from 2006 to 2014, but there are no 2015 data. Please provide the missing data.*"

Response: As indicated in the response to Action Item 2, stream discharge data from 2015 became available for incorporation into the Study Design document in the later stages of preparation. Appendix Table A.2 has been updated to include the 2015 data and is presented at the end of this response.

Action Item 6: "*p. 18. The study design did not describe methods for the collection of sediment samples for particle size and total organic carbon analyses, which are required if the study is conducted in an area where it is possible to sample sediment (MMER, Sched. 5, s. 16(a)(iii)). The description of the sampling areas (erosional habitat with gravel/cobble substrate) would suggest that sediment sampling will not be possible; please confirm or provide the missing information.*"

Response: Correct. Sediment sampling will not be collected concurrent with benthic invertebrate community samples given the presence of only erosional habitat (boulder with interspersed gravel/cobble) in Tributary-F. The photo below illustrates habitat typical of Tributary-F.

Action Item 7: "*p. 21. The study design suggests that low effluent concentration in the Mary River would exempt the proponent from the requirement to conduct a fish study, should no fish be collected from Tributary-F. The MMER require a fish population study if the effluent concentration in the exposure area is greater than 1% in the area located within 250 m of the final discharge point (FDP) (Sched. 5, s. 9(b)). Based on the information provided, the fish survey exemption does not apply to the proposed study. The fish survey should be initially conducted in Tributary-F as proposed, and if fish are determined to be absent or in low abundance, field crews should sample progressively downstream into the Mary River, where fish may be more abundant. Please provide information on potential reference sites for the Mary River exposure area. Given concerns over low fish abundance, the proponent is recommend to identify several reference site options for the Tributary-F and Mary River exposure areas.*"

Response: From our consultant's perspective, greater clarity on the MMER definition of a "final discharge point (FDP)" is required in cases in which an overland effluent discharge point is concerned. Effluent concentrations in Tributary-F, the first 'permanent' flowing watercourse that the effluent meets during the open-water period (approximately late June to early September), appears to be approximately 1% within 250 m of the confluence with the effluent channel, on average. Extrapolation using maximum effluent flow data suggested that effluent concentrations in Tributary-F may periodically be greater than 1% within 250 m of the confluence with the effluent channel. Despite this, the ecological relevance of conducting a fish survey at Mary River, where effluent concentrations are estimated to be well less than 1% (i.e., average and maximum of 0.02% and 0.035%, respectively, based on data collected from 2006 – 2015, assuming continual effluent discharge), is questionable. Attributing potential differences in fish population endpoints between reference and effluent-exposed areas of Mary River to mine effluent exposure (the intent of the MMER) does not seem scientifically defensible in cases where the maximum effluent concentration is so low. Furthermore, the evaluation of effluent-related effects on Arctic charr populations of Mary River (and other watercourses in the Mary River Project region) is further limited by the fact that liquid water is generally present (and fish possibly present) only from early July through mid-September, and that mine effluent is only discharged intermittently (e.g., 16 days in 2015). Thus, very low effluent concentrations coupled with limited exposure period will preclude definitive assessment of mine effluent-related effects to fish populations of Mary River.

It is suggested that resolution of this Action Item occur through teleconference prior to implementation of the field study (August 2017) or during the ECCC site visit to the Mary River Project from August 15th – 17th, 2017.

Action Item 8: "*p. 21. The report indicates that mine effluent represented 0.02% - 0.035% of flow in the Mary River. On p.7, the effluent percentage of flow in the Mary River was given as 0.03% and 0.065%; please clarify.*"

Response: On page 21, average and maximum concentrations of mine effluent in Mary River were 0.02% - 0.035%, respectively, based on average streamflow at the Baffinland Mary River hydrological station over the period of 2006-2015. On page 7, average and maximum concentrations of mine effluent in Mary River were 0.03% - 0.065%, respectively, based on average streamflow at the Baffinland Mary River hydrological station only in 2015 (July/August period). Please see response to Action Item 2 for additional clarity.

Action Item 9: "*p. 25. The study design indicates that stream velocity and channel dimensions will be measured, will discharge volumes be calculated?*"

Response: No, discharge volumes will not be calculated from the stream water velocity and channel dimension data collected for EEM. These data will be collected to provide general information on habitat characteristics of each study area to assist with the interpretation of biological data. The number of monitoring points along each transect, and the in-stream transect locations, are not intended to be sufficient for accurate discharge volume calculation.

Action Item 10: "*p. 26. Please briefly describe field preservation and shipping protocols for water samples to ensure laboratory sample hold times are met, given the remote location of the study area.*"

Response: Please refer to the attached Standard Operating Procedure (SOP) developed for water sampling at the Mary River Project.

Action Item 11: "*p. 14. Section 3.5.6 It is recommended that the proponent provide details regarding further or continued monitoring and/or analyses that may be conducted to determine the extent to which mining activities may be contributing to the differences, over time, in results observed in the water quality parameters measured at Tributary F and the Mary River Up-stream Reference Station*"

Response: Baffinland will conduct water quality monitoring at established EEM and AEMP (CREMP) stations at frequencies required under each respective approved monitoring plan. The locations and frequencies of sampling appear to be sufficient for monitoring spatial differences between mine-exposed and reference areas, and temporal changes over time, in water quality of Tributary-F and Mary River.

Action Item 12: "*p. 26. Section 3.5. It is recommended that details regarding the exposure and reference areas to be monitored be confirmed in the EEM Study Design in the context of BIMC's recommended discontinuation of monitoring for several stations potentially related to exposure and/or reference areas, based on the correspondence accompanying the AEMP (Rev 2).*"

Response: Because approval for changes suggested in correspondence accompanying the AEMP (Rev 2) has not been received from regulators and other stakeholders, no changes to stations will be implemented within the time period of the first EEM study

Action Item 13: "*The proponent previously notified the authorization officer of the addition of a second FDP (MS-06) for the Mary River Project (letter from J. Millard to S. Forbrich, June 18, 2016). The MS-06 FDP was not described in the current study design. The MMER require a description of the manner in which the effluent mixes within the exposure area for each final discharge point (MMER, Sched. 5, s. 11(a)). Please provide any available information regarding effluent mixing from MS-06, and a description of plume delineation methods to be implemented in 2017 (as requested for MS-08; see comment #3).*"

Response: Discharge of effluent from the MS-06 FDP was limited to a single day (September 12) in 2016, during which 86 m^3 of effluent was released. Because the EEM study design was required to be submitted by July 10, 2016, data pertaining to the MS-06 FDP effluent release were not provided. It is anticipated that effluent release from the MS-06 FDP discharge will occur rarely, and for very brief periods of time. To the extent possible, given potential safety concerns associated with high water velocities, water depths greater than 1 m, and large boulder substrate (safe footing issues), Baffinland will conduct a specific conductance survey as indicated in the response to Action Item 3 above within the Mary River receiver at the time of effluent release to characterize mixing features. Because a hydrological station is established on Mary River, extrapolation of effluent concentrations in Mary River can also be conducted on a daily basis, as required, following download of the data at the end of the open-water season.

As suggested in the response to Action Item 1, the MS-08 FDP is likely to release greater volume of effluent than the MS-06 FDP in any given year (e.g., 2,217 m^3 was released at MS-08 in 2015, and 86 m^3 was released at MS-06 in 2016). Therefore, the MS-08 FDP will served as the focus for biological studies in the current EEM phase.

Action Item 14: "*The MS-06 FDP will discharge to the Mary River through a treated sewage pipeline; will mine effluent and treated sewage be discharged concurrently?*"

Response: Although it is unlikely that the MS-06 FDP will discharge concurrently with the discharge of treated sewage, in the event that unusually high amounts of runoff, there may be periods in which both are discharged concurrently. Please note that it is currently anticipated that discharge from the MS-06 FDP will occur very rarely (a few days per year) on an intermittent basis.

Action Item 15: "*Appendix A, Table A.4. Please indicate the location of stream sampling sites listed in Table A.4. Was there a noticeable difference in water chemistry between upstream and downstream sites on Tributary-F?*"

Response: A map showing the locations of the CREMP lotic sampling sites indicated on Appendix Table A.4 accompanies this response. No difference in water chemistry has been indicated between Mary River stations located upstream and downstream of the Tributary-F confluence.

PART B – Other Items

Comment 16: "*Fig. 2-4. The figure caption should refer to mean monthly stream discharge, not effluent discharge; please confirm.*"

Response: Correct. The caption for Figure 2.4 should refer to mean monthly stream discharge, not effluent discharge. Sorry for any confusion.

Comment 17: "*p. 14. The proponent is recommended to conduct annual water quality monitoring in Tributary F near the confluence with the effluent discharge, and a comparable reference stream, in addition to proposed monitoring in the Mary River.*"

Response: Acknowledged. Annual water quality monitoring will be conducted in Tributary-F near the confluence with the effluent discharge, and a comparable reference stream, in addition to proposed monitoring in the Mary River.

Comment 18: "*p. 15. The report states that ninespine stickleback have been captured in low abundance in the Mary River area, but later states that arctic charr are the only species captured in Mary River. Have ninespine stickleback been located in any of the streams identified for the biological monitoring study?*"

Response: To our knowledge, no ninespine stickleback have been captured in the Mary River or in any of the streams identified for the EEM biological study. However, because this species is known to inhabit streams, rivers and lakes, there is some potential for ninespine stickleback presence in streams and rivers of the Mary River Project area. It is anticipated that if present, ninespine stickleback are likely to be present in low abundance in area lotic habitats given low numbers captured in lentic habitat near the mine.

Comment 19: "*p. 22. The proponent is advised to plan for up to 7 days of sampling per area to meet sample size targets for the fish survey.*"

Response: Stream backpack electrofishing is the proposed method of fish capture for the EEM study. Given the relatively small size of Tributary-F, the determination of whether fish are present within this tributary will likely require less than a day by an experienced electrofishing team. It is proposed that, in the event that fish are determined to be absent in Tributary-F through the initial sampling, ECCC will be contacted to determine the best course of action. Continuing to conduct active sampling for a full seven days in the absence of fish is not considered practical or cost efficient. It is suggested that resolution of this item occur through teleconference prior to implementation of the field study (August 2017) or during the ECCC site visit to the Mary River Project from August 15th – 17th, 2017.

Comment 20: "*p. 23. Please be advised that the TGD recommends independent confirmation of fish ageing for 10% of samples.*"

Response: Acknowledged. Independent confirmation of fish ageing will be conducted on 10% of submitted samples.

Comment 21: "*Table 3.2. The table indicates no statistical analysis for the reproduction endpoint. Please note that the non-lethal reproduction endpoint (relative abundance of YOY) can be analyzed by comparing exposure and reference length frequency distributions with the Kolmogorov-Smirnov test, with and without YOY. If the inclusion of YOY changes the outcome of statistical comparison, the proportion of YOY is considered to be different between sampling areas (TGD, Section 3.4.2.2).*"

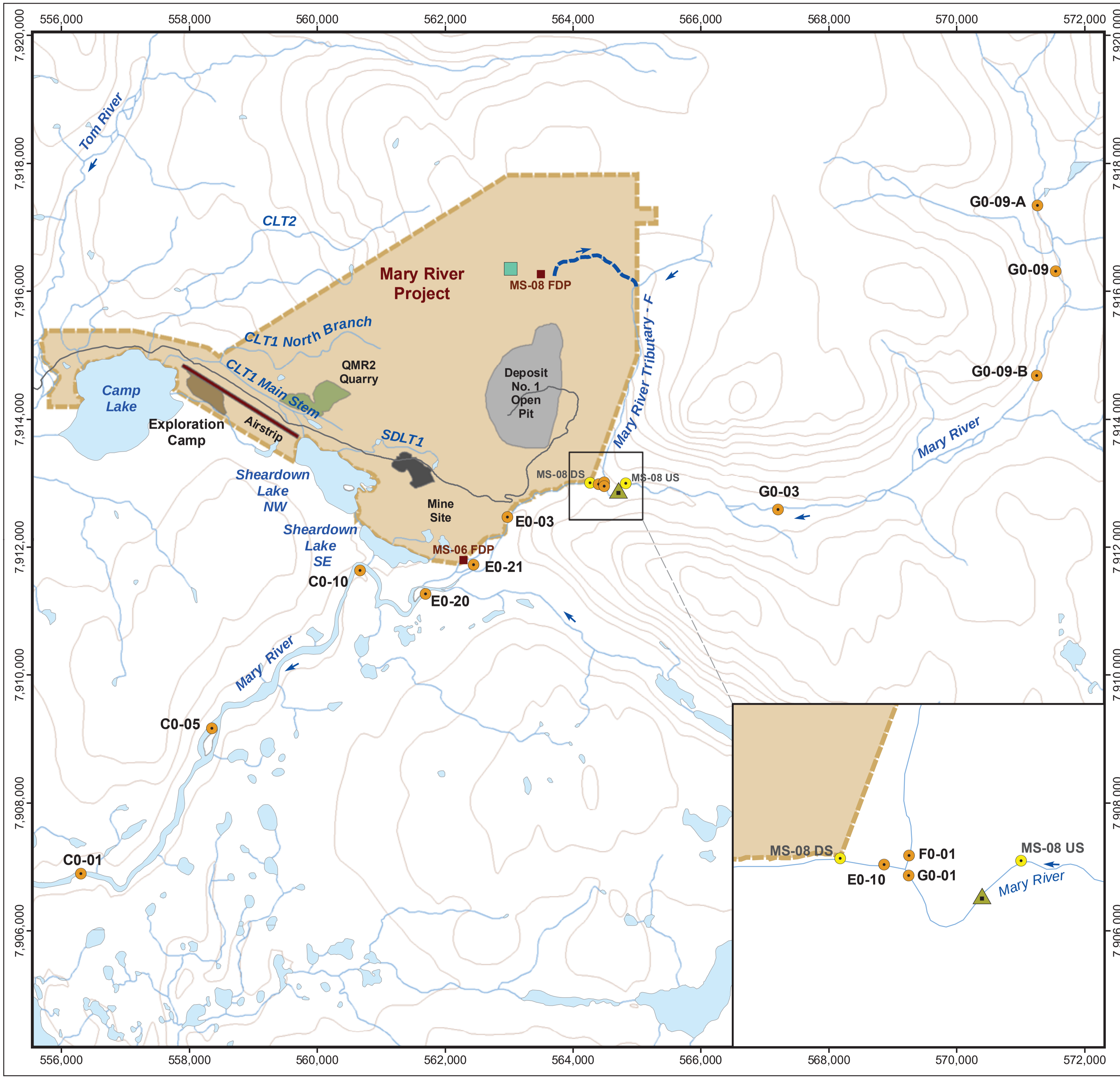
Response: Acknowledged.

Comment 22: "*p. 25. Please ensure collection of trip and field blanks for water chemistry QA/QC, as recommended by the TGD (Section 5.8.4).*"

Response: Acknowledged. Water chemistry trip and field blanks will be collected.

Comment 23: "*An overview document outlining the amendments proposed for the MMER was shared with stakeholders in December 2016. If you have not received this document and would like a copy, please contact Erik Allen. The proposed amendments are expected to be published in Canada Gazette, Part 1 in spring of 2017. Canada Gazette, Part II publication would likely occur 12 to 18 months following Canada Gazette Part 1 publication.*"

Response: Thank you for letting us know. We had received a copy of the overview document early in 2017.



LEGEND

- CREMP Water Quality Monitoring Station
- EEM Water Quality Monitoring Station
- Final Discharge Point (FDP)
- Temporary Sedimentation Pond Location
- Mary River Cascade Barrier
- Overland Effluent Path
- Mary River Project
- QMR2 Quarry
- Exploration Camp
- Mine Site
- Open Pit
- Airstrip
- Waterbody
- Watercourse
- Tote Road
- Contours (20 m)
- Water Flow Direction

0 1 2 4
Kilometers

MAP INFORMATION
Map Projection: UTM Zone 17N NAD 1983
Data Source: Reproduced under licence from Her Majesty the Queen in Rights of Canada, Department of Natural Resources Canada. All rights reserved.
Date: July 2017
Project No 2569

Figure 1 : Mary River CREMP and EEM Water Quality Monitoring Station Locations

minnow environmental inc.

Table A.2: Average monthly discharge data (m^3/s) collected from Mary River Project hydrological gauging stations, 2006 - 2015.

Year	Montth	Hydrological Station					
		H1 Phillips Creek Tributary ($250\ km^2$)	H2 Tom River ($210\ km^2$)	H4 Camp Lake Tributary2 ($8.3\ km^2$)	H5 Camp Lake Tributary1 ($5.3\ km^2$)	H6 Mary River ($250\ km^2$)	H11 Sheardown Lake Trib1 ($3.6\ km^2$)
2006	June	-	5.05	-	-	-	-
	July	14.65	19.20	0.83	0.38	26.64	-
	August	5.46	5.37	0.29	0.15	15.03	-
	September	7.42	3.07	0.29	0.17	24.01	-
2007	June	10.94	4.42	0.25	0.31		-
	July	6.93	7.78	0.21	0.10	11.68	-
	August	3.77	4.04	0.13	0.10	6.54	-
	September	1.62	1.14	0.07	0.05	4.22	-
2008	June	12.20	-	1.56	0.42	26.06	-
	July	10.31	-	0.38	0.22	16.96	-
	August	7.44	-	0.25	0.22	8.21	-
	September	5.33	-	0.17	0.12	7.06	-
2010	June	-	33.25	-	0.78	39.55	-
	July	-	14.34	-	0.19	18.76	-
	August	-	2.34	-	0.08	3.69	-
	September	-	5.42	-	0.14	7.13	-
2011	June	13.70	-	0.44	0.30	27.41	0.07
	July	3.11	-	0.07	0.05	5.29	0.02
	August	1.25	-	0.03	0.02	2.32	0.02
	September	1.56	-	0.03	0.02	1.89	0.02
2012	June	24.24	35.76	0.88	0.81	32.23	0.12
	July	7.49	13.42	0.39	0.22	11.63	0.07
	August	2.36	4.82	0.16	0.10	5.47	0.06
	September	3.90	-	0.28	0.17	8.00	0.08
2013	June	10.80	18.04	-	0.32	19.75	0.14
	July	9.74	17.95	0.09	0.25	20.98	0.12
	August	-	2.88	0.07	0.08	4.63	0.05
	September	-	-	0.05	0.06	3.07	0.06
2014	June	7.03	6.35	-	0.28	-	0.12
	July	13.42	21.28	-	0.42	31.09	0.09
	August	7.18	9.08	-	0.20	9.83	0.09
	September	2.14	1.90	-	0.05	1.88	0.04
2015	June	15.70	14.50	0.41	0.13	18.60	0.03
	July	8.80	6.00	0.20	0.06	9.20	0.04
	August	3.50	2.30	0.20	0.08	3.80	0.06
	September	-	0.90	0.03	0.03	1.10	0.03
Average	June	13.52	16.77	0.71	0.42	27.27	0.09
	July	9.31	14.28	0.31	0.21	16.91	0.07
	August	4.42	4.41	0.16	0.12	6.61	0.06
	September	3.66	2.49	0.13	0.09	6.48	0.04

Environment and Climate Change Canada | Environnement et Changement climatique Canada

Prairie & Northern Region
Environmental Protection Operations Directorate
9250 – 49th Street NW
Edmonton, AB T6B 1K5

August 22, 2017

via email to: wayne.mcphee@baffinland.com

Wayne McPhee
Director Sustainable Development
Baffinland Iron Mines Corporation
2275 Upper Middle Road East, Suite 300
Oakville, ON L6H 0C3

Dear Mr. McPhee:

Subject: Metal Mining Effluent Regulations – Evaluation of 1st Environmental Effects Monitoring Study Design, Mary River Project, NU

This letter is to advise you that Environment and Climate Change Canada has reviewed your Environmental Effects Monitoring (EEM) biological study design report entitled "Mary River Project Environmental Effects Monitoring Phase 1 Study Design", received July 8, 2016 and an addendum to the report, received August 10, 2017. The review of study design reports takes into account information requirements in the *Metal Mining Effluent Regulations (MMER)* of the *Fisheries Act* and also offers comments on the study based on the EEM Technical Guidance Document and generally accepted standards of good scientific practice.

Review comments and recommendations are attached. No further response is required.

Regulated facilities are now required to submit reports to the Environmental Effects Monitoring Electronic Reporting system (EEMER). It is no longer necessary to submit electronic or paper copies directly to the authorization officer.

Environment and Climate Change Canada looks forward to receiving your interpretive report no later than January 10, 2018. Should you have any questions or concerns regarding the EEM program or wish to discuss the review of the study design, please do not hesitate to contact Erik Allen at (780) 717-4884 or at erik.allen@canada.ca.

Sincerely,

Susanne Forbrich
Regional Director
Regional Authorization Officer

Canada

cc:	William Bowden	Baffinland Iron Mines Corporation
	Laura Taylor	Baffinland Iron Mines Corporation
	Reg Ejeckam	Environment and Climate Change Canada, Winnipeg
	Paula Siwik	Environment and Climate Change Canada, Edmonton
	Erik Allen	Environment and Climate Change Canada, Edmonton
	Curtis Didham	Environment and Climate Change Canada, Iqaluit
	Sean Joseph	Nunavut Water Board, Vancouver
	Sarah Forté	Indigenous and Northern Affairs Canada, Iqaluit

Attachment: Review Comments and Recommendations on "Response to ECCC Comments on the Mary River Project 1st Environmental Effects Monitoring Study Design" (submitted August 10, 2017)

Review Comments and Recommendations on "Response to ECCC Comments on the Mary River Project 1st Environmental Effects Monitoring Study Design" (submitted August 10, 2017)

7. Regarding the fish survey, it was agreed during a meeting with the proponent and their consultant (Aug. 16/17) that fish sampling will be attempted in the Mary River near the confluence with Tributary-F, if no fish are located in the tributary. A downstream reach of the Mary River will be sampled as a reference area to the upstream Mary River exposure area, if needed. If fish sampling in Mary River is determined to be impractical, the facility is recommended to provide supporting information in the interpretative report.

19. With respect to the level of effort for the fish survey, the response suggests that less than a day would be needed to determine if fish are present in Tributary-F. During a meeting with the proponent and consultant (Aug. 16/17), ECCC noted that 7 days is the recommended level of effort to achieve target sample sizes, but that it could take less time to determine the presence or absence of fish. The sampling crew is recommended to apply an adequate level of effort to achieve the objective of the fish survey. Supporting information should be provided in the report to justify the level of effort.

APPENDIX B

2017 MS-08 DISCHARGE
SUPPLEMENTAL INFORMATION

November 21, 2017

Curtis Didham
Enforcement Officer
Environment and Climate Change Canada
933 Mivvik Street
Iqaluit, Nunavut
X0A 0H0

Dear Mr. Didham,

Re: Investigation under subsection 36(3) of the Fisheries Act in regards to an effluent seepage and controlled discharges from the Waste Rock Stockpile Sedimentation Pond (WRSSP) located at Baffinland's Mary River Project (the Project).

Please find below a summary response prepared by Baffinland Iron Mines Corporation (Baffinland) in response to the investigation under the Fisheries Act and Metal Mining Effluent Regulations (MMER) initiated by Environment and Climate Change Canada (ECCC) on September 13, 2017.

Project Development

Baffinland proposed to develop the Project in a phased approach, and began construction for the Early Revenue Phase (ERP) in 2013, followed by the initial mining of Deposit 1 in September 2014. Prior to the development of Deposit 1, Baffinland had retained AMEC in 2012 to conduct water quality modelling of runoff and seepage originating from the Deposit 1 waste rock stockpile. The report concluded that, with the exception of total suspended solids (TSS), the water quality of runoff and seepage would meet the MMER discharge requirements. To address the estimated solids loading from the runoff and seepage and facilitate the monitoring of discharges, sedimentation ponds downstream of the waste rock stockpile(s) were proposed. In 2014, Baffinland retained AMEC to investigate the metal leaching and acid rock drainage (ML/ARD) potential of waste rock generated from ERP operations on Deposit 1. Results from AMEC's investigation were presented in a technical memo titled "Mary River Deposit 1, 5-Year Pit ML/ARD Characterization". AMEC had determined that approximately 85% of waste rock samples had neutralization potential ratios (NPR) greater than 2 pH and were classified as non-potentially acid generating and were unlikely to generate acidic drainage. Approximately 10% of the samples had NPR values of less than 1 pH, and 5% of the samples were classified as having uncertain acid generating potential (1<NPR<2). Humidity cell testing for historical samples of the Waste Rock Stockpile has stayed relatively consistent previous to 2017, indicating stable conditions in the majority of cells

Construction of the current WRSSP commenced in September 2015 and became operational in May 2016. A Construction Summary Report (CSR) produced by Hatch Ltd. (Hatch) for the current sedimentation pond, which was included in the 2016 Qikiqtani Inuit Association (QIA) and Nunavut Water Board (NWB) Annual

Report for Operations, was signed off by Baffinland in January 2017 and provided to regulators and stakeholders on March 31, 2017.

Under Part D, Item 18, of Baffinland's Type "A" Water License 2AMMRY1325 Amendment No. 1 (Water License), two annual geotechnical inspections are performed on water and waste retention structures. Barry H. Martin Consulting Engineer and Architect conducted two inspections in 2017. The Aug 1-10th bi-annual inspection did not identify integrity or containment issues concerning the WRSSP. Additionally, inspections of the facility from ECCC and Indigenous and Northern Affairs Canada (INAC) in 2016 and spring/early summer 2017 also did not identify seepage from the WRSSP or identify water quality concerns associated with the system. Internal compliance inspections are completed bi-monthly during the open water season on this facility and daily monitoring is completed during discharge which focuses on monitoring water quality in accordance with Baffinland's Water License and Schedule 4 of the MMER, as well as overall WRSSP conditions and operations. There were no issues of compliance with water quality limits in 2016 or in the first half of 2017.

The following summarizes the four incidents that occurred in August and September and remediation measures undertaken.

Spill Report 17-289

A heavy rain event was experienced over a period of several days in late July increasing the runoff into the pond and led to the requirement to de-water and maintain suitable pond freeboard. The pH results leading up to August 1st, which were measured by both YSI meter field readings and the ALS laboratory analyses, were consistently greater than 6.40. In early August low pH water was discharged to the environment on August 1st and 3rd. On August 1st, water chemistry and toxicity testing occurred. Results received indicated the pH of the water was below 6.0 which resulted in a toxicity failure for both Daphnia Magna and Rainbow Trout. No discharge to the environment occurred after receiving official ALS laboratory results.

August 10th - 24th:

- pH adjustment treatment of the WRSSP was planned with Wood Group PLC (formally AMEC Foster Wheeler) to determine the most effective treatment of the WRSSP with resources on site. On August 22-24th, batch treatment of the WRSSP was completed using sodium carbonate to effectively raise the pH from approximately 4 to 7.
- Golder Associates Ltd. (Golder) was consulted to commence work on increasing the storage capacity of the WRSSP.

Spill Report 17-312

On August 23, 2017 during an inspection of the WRSSP with ECCC and INAC, seepage was observed originating from the central toe of the WRSSP in approximately four discrete but closely clustered locations. Water quality samples were taken from the seepages occurring at the toe of the WRSSP in concert with ECCC and INAC on August 23rd and 24th during their on-site inspection and external analytical results indicated that, aside from nickel and TSS, water quality was compliant under the MMER and Water License.

August 25th:

- Construction of an emergency containment ditch downstream of the seepage.

September 1st:

- Hatch was consulted to explore options to stop the seepage from the toe of the WRSSP and identify potential remedial activities to the facility.
- Hatch recommended the placement of a till blanket upstream of the WRSSP liner key-in to allow for proper re-grading in an effort to reduce pooling on the inlet, as well as constructing two sumps to tie into the emergency containment ditch downstream of the WRSSP seepage.

September 2nd:

- Baffinland submitted a notification to regulators detailing the plan to mitigate the ongoing seepage at the WRSSP.

September 7th - 17th

- Construction of the till blanket and sumps were completed to the design specifications provided by Hatch from September 7th to 17th.

On September 26th, during an inspection of the WRSSP and down gradient seepage area, discoloured water was observed outside of the emergency containment ditch under ice and snow. Water quality sampling was conducted, which included acute toxicity testing. Analytical results showed nickel and TSS above applicable guidelines, though the acute toxicity test passed.

October 4th - 24th:

- Golder and Le Groupe Desfor (LGD) consulted to assess the situation and provide expert advice on locating the source and identifying potential remedial solutions.
- LGD Director of Civil Works concluded that the origin of the seepage could not be determined at that time under the existing conditions.
- Principal Geochemist from Golder conducted a detailed hydrological assessment and concluded that the pond design appears appropriate for its intended use.

October 19th:

- Story Environmental was contacted to provide recommendations for the utilization and implementation of using rhodamine dye to determine whether the WRSSP was the potential source of the seepage.
- Monitoring of the seepage for the presence of rhodamine occurred using a YSI meter with a rhodamine sensor. Rhodamine was detected in seepage grab samples indicating that the WRSSP liner's integrity may have been compromised. Current conditions limit the ability to confirm this to be true and further investigations into the matter are required when conditions allow.

October 21st – November 06:

- Construction of a new berm was completed around the outside perimeter of the emergency containment ditch to increase the ditch's containment capacity.
- Water was pumped from the containment ditch back to the WRSSP in order to effectively place ¾ inch rock at the base of the ditch to arrest further seepage.

Spill Report 17-328 and 17-361

On August 27th, visual observations of the turbidity of the WRSSP prompted the discharge to be shut down. Samples later confirmed that the TSS exceeded the Water License and MMER guidelines for an approximate 14-hour period. Discharge resumed again on August 28th after the pond had settled and TSS criteria was found to be below guidelines.

August 24th – 28th

- An Environment Effects Monitoring (EEM) study was performed by Minnow Environmental (Minnow). No exceedances were observed or recorded under applicable guidelines in discharge exposed Tributary F or Mary River except for aluminum. The aluminum is not exposure-related as aluminum was found to be present in the reference sites and is related to known historical turbidity-related colloidal effects in Mary River. The discharge from the WRSSP travels approximately 2.2 km from the Final Discharge Point (FDP) to where Tributary F becomes a defined channel which is non-fish bearing. The confluence with Mary River is located approximately 3 kilometers in distance from that location.

Discharging to the environment continued from August 30th to September 6th and water samples analyzed using the on-site ALS laboratory equipment run by Baffinland personnel were found to be compliant up to September 6th under the MMER and Water License discharge criteria for pH. In addition to the on-site laboratory results, samples were also shipped offsite to ALS Waterloo. The pH results received from the ALS laboratory in Waterloo from September 1st to 6th were below the MMER and Water License criteria. In consultation with the ALS Environmental Technical Director, it was determined that the initial pH measurements from the on-site laboratory taken by Baffinland Staff (within one to four hours of sampling) should be the most reliable and defensible pH measurements representing the conditions of the samples at time of sampling, rather than test results measured by ALS Waterloo which represent the pH of the sample after several days of potential acid rock drainage related redox reactions. The discharge to the environment was stopped on September 6th.

September 1st:

- Aquatic Effects Monitoring Plan (AEMP) data for stations at the confluence of the tributary, (Tributary F) that receives WRSSP effluent and the nearest fish bearing waters, were examined and did not show readily detectable influence from the discharge, exhibiting pH of approximately 8.

Additional Mitigation Measures

Additional mitigation measures were taken to address deficiencies identified with internal environmental systems, protocols and procedures:

- An Emergency Response Plan has been revised for the WRSSP in accordance with MMER requirements outlined in Section 30.
- A Working Near Water Containment Facilities Procedure has been drafted to provide a set of operational standards to ensure work is conducted in a safe and environmentally-compliant manner.

- The Site Environment team reporting structure was changed to include a Site Environmental Manager that will provide leadership and oversight to all site activities.

Additional mitigation measures that are in progress or planned are:

- Initiate a geochemical review of the waste rock dump layout and materials to develop a better understanding of low pH conditions observed on site and, if necessary, develop supplemental mitigation measures to reduce or eliminate production of acidic water from entering the WRSP.
- Review on-site equipment and consider whether additional equipment could more efficiently treat and discharge water from the WRSSP.
- Revise Waste Rock Management Plan to incorporate discharge and ARD mitigation measures
- Resource additional certified ALS Technician(s) and testing equipment during the summer season
- Evaluate and source appropriate coagulants if treatment required.
- Long Term - Design and implement fit for purpose AMD containment and treatment technology for prevention, source control and remediation.

Overall no impacts were observed in the receiving water bodies as shown through Baffinland's EEM and AEMP studies. Engineered mitigation measures to address water quality, seepage and pond capacity issues are currently being reviewed. Through the rhodamine testing early indications are that the source of the seepage is related to the integrity of the WRSSP liner, although further investigations are required to confirm these findings and upon confirmation we will immediately act upon.

Regards,

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APPENDIX C

HABITAT CHARACTERIZATION INFORMATION

APPENDIX C HABITAT CHARACTERIZATION

C.1 Introduction

Habitat characterization provides information integral to the interpretation of effluent-related influences on benthic invertebrate communities and fish populations residing within aquatic environments that receive mine discharge. At Mary River Project, effluent is released overland into an intermittent channel that meets Mary River Tributary-F approximately 2 km east-northeast of the effluent discharge point. From this confluence, Mary River Tributary-F flows south approximately 3.3 km before discharging into Mary River. Mary River Tributary-F downstream of the effluent confluence and Mary River extending approximately 2.5 km downstream of the Mary River Tributary-F confluence served as the mine effluent-exposed areas for the benthic invertebrate community survey and fish population survey, respectively (Figure 2.1). Reference areas for the 2017 EEM study included Mary River Tributary-F upstream of the effluent channel for the benthic invertebrate community survey, and Mary River just upstream of Mary Lake for the fish population survey (Figure 2.1). Aquatic habitat characterization information collected at the Mary River Project EEM study areas (Table C.1) are summarized and contrasted herein to evaluate the degree to which natural habitat influences potentially contributed to differences in biological endpoints between like effluent-exposed and reference areas.

C.2 Mary River Tributary-F

Mary River Tributary-F occurs as a seasonally-flowing, second-order stream draining a watershed of approximately 6.8 square kilometres (km^2) at the confluence with the MS-08 mine effluent channel and 11.6 km^2 near the mouth at Mary River. Mary River Tributary-F exhibits a moderate gradient through the headwaters and mid-reaches, averaging approximately 4.5% and 6.3% at EEM benthic invertebrate community study areas located upstream and downstream of the MS-08 channel confluence, respectively (Table C.2; Photo Plate C.1). High gradients of approximately 10 to 12% are exhibited within approximately 0.8 km of the outlet to Mary River on Mary River Tributary-F (Photo Plate C.1). The channel of Mary River Tributary-F is typically well defined, exhibiting a slight meander, but areas of interstitial flow and/or channel braiding are not uncommon particularly in the upper and mid-reaches of the watercourse. Stream morphology of Mary River Tributary-F consists predominantly of riffle-run sequences separated by scour pools and rapids within the upper and mid-reaches (Table C.2), whereas riffle-cascade habitat is more prevalent at high gradient areas of the lower portion of the system. The combination of complete freezing overwinter, a relatively higher stream gradient, and the presence of natural in-stream barriers including an approximately

1.75 m high step-drop over large boulder habitat about 50 m upstream of the outlet to Mary River (Photo Plate C.1) are likely key factors contributing to the naturally fishless condition of Mary River Tributary-F (see Section 6).

The wetted and bankfull width of Mary River Tributary-F were greater immediately downstream of the MS-08 channel confluence than upstream at the time of the August 2017 field study, although only bankfull width differed significantly between areas (Tables C.2 and C.3). Notably, the determination of overall wet channel features was partly confounded by the occurrence of interstitial flow through boulder and/or large cobble substrate at these study areas. On average, water depths and water velocities were greater downstream than upstream of the MS-08 effluent channel confluence during the August 2017 sampling events, but the differences between areas were not significant (Tables C.2 and C.3). Maximum water depth of riffle habitat at both these areas was less than 10 cm deep, precluding the use of a Hess sampler for the sampling of benthic invertebrates during the August 2017 field study (see Section 2.4).

The substrate of Mary River Tributary-F is composed primarily of cobble and boulder (average of 54% and 35%, respectively, of in-stream substrate; Table C.2). Pebbles (i.e., 2 – 5 cm diameter material) and gravel constituted the remainder of in-stream substrate material during the August 2017 field study. Medium to coarse sand was observed only in trace amounts, and was primarily confined to areas of quiescent flow along channel banks and/or immediately downstream of large boulders. On average, substrate diameter (intermediate axis) was slightly larger downstream than upstream of the MS-08 effluent channel confluence on Mary River Tributary-F, although the difference in substrate diameter between these areas was not significant (Tables C.2 and C.3). In-stream vegetation was limited to a thin layer of periphyton (biofilms) attached to rocks not of sandstone or conglomerate origin based on visible and/or tactile assessment. No marked differences in periphyton growth were apparent between the Mary River Tributary-F effluent-exposed and reference study areas at the time of the August 2017 EEM field study (Table C.2).

C.3 Mary River

Mary River is a moderate gradient system (i.e., average gradient of 0.9%) characterized mainly by riffle-run morphology with some rapid/cascade habitat that includes an approximately 20 m high natural cascade located approximately 400 m upstream of the confluence with Mary River Tributary-F (Figure 2.1). At the confluence with Mary River Tributary-F, the Mary River flows through a deep gorge (Photo Plate C.1). The wetted channel width of Mary River decreases from an average of approximately 47 m to 19 m from upstream to downstream of this cascade, respectively, under typical late summer flow conditions. Commensurate with these changes in wetted width, average stream depth and water velocity were lower upstream of the cascade than downstream (0.30 and 0.48 m deep, and 0.43 and 0.85 m/s water velocity, respectively), based on sampling conducted in August 2015 (Minnow 2016). At the confluence with Mary River Tributary-F, Mary River has a watershed area of approximately 233 km^2.

The area of Mary River located a short distance downstream of the gorge served as the effluent-exposed area for the EEM fish population survey (Figure 2.3). At this location, Mary River occurs as a series of well defined, braided channels. Stream morphology of the braid sampled for the fish population survey consisted almost entirely of riffle habitat, with rapids also occurring in limited amounts (Table C.4). The wetted width and depth of this Mary River braid averaged approximately 20 m and 32 cm, respectively, at the time of the August 2017 field study (Table C.4). The substrate at the Mary River fish population survey effluent-exposed area is composed primarily of cobble (88% of in-stream habitat, on average; Table C.4; Photo Plate C.2). Similar to Mary River Tributary-F, medium to coarse sand was observed in trace amounts at this area of Mary River, and was limited primarily to locations with quiescent flow such as along channel banks and/or immediately downstream of large boulders. Substrate diameter (intermediate axis) averaged approximately 12 cm at the Mary River fish population survey effluent-exposed area (Table C.4).

Lower Mary River, near the outlet to Mary Lake, served as the reference area for the EEM fish population survey (Figure 2.3). At this area, Mary River occurs as a single, well-defined channel characterized mainly by riffle habitat and a minor amount of rapid habitat (Table C.4; Photo Plate C.2). The wetted width and depth of 73 m and 47 cm, respectively, at the Mary River reference area were much greater than the effluent-exposed area, reflecting braided channel dimensions at the latter, at the time of the August 2017 field study (Table C.4). Unlike the effluent-exposed area, the substrate at the Mary River reference area is composed primarily of boulders (75% of in-stream habitat) embedded in coarse sand rather than cobble (Table C.4). On average, the substrate diameter (intermediate axis) was 56 cm at the Mary River fish population survey reference area, which was much larger than at the corresponding effluent-exposed area (Table C.4). Overall, some differences in habitat features were apparent between the Mary River effluent-exposed and reference areas used for the fish population survey, including the occurrence of shallower mean depth and smaller substrate diameter (i.e., predominance of cobble versus boulder substrate) at the effluent-exposed area than at the reference area.

1) Mary River Tributary-F Benthic Reference Area.

2) Mary River Tributary-F Benthic Effluent-Exposed Area.

3) Mary River Tributary-F step-drop cascade barrier.

4) Mary River downstream of Mary River Tributary-F confluence.

Photo Plate C.1: Photographs of Mary River Tributary-F and Mary River at Gorge Area, August 2017

1) Mary River Fish Population Effluent-Exposed Area.

2) Mary River Fish Population Effluent-Exposed Area Substrate.

3) Mary River Fish Population Reference Area.

4) Mary River Fish Population Reference Area Substrate.

Photo Plate C.2: Photographs of Mary River Fish Population Survey Effluent-Exposed and Reference Areas, August 2017

Table C.1: Coordinates of Habitat Characterization Transect Stations Used for the Mary River Project Phase 1 EEM, August 2017

Study Area	Station	Date Sampled	Latitude (dd mm ss.s)[a]	Longitude (ddd mm ss.s)[a]
Mary River Tributary-F Reference	MRTF-REF H1	24-Aug-17	N 71 20 24.606	W 79 10 18.960
	MRTF-REF H2	24-Aug-17	N 71 20 21.098	W 79 10 30.182
	MRTF-REF H3	24-Aug-17	N 71 20 18.540	W 79 10 39.399
Mary River Tributary-F Effluent-Exposed	MRTF-EXP H1	24-Aug-17	N 71 20 16.499	W 79 10 52.095
	MRTF-EXP H2	24-Aug-17	N 71 20 14.465	W 79 10 55.513
	MRTF-EXP H3	24-Aug-17	N 71 20 08.213	W 79 10 56.806
Mary River Fish Reference	MRR H1	28-Aug-17	N 71 15 22.745	W 79 24 34.144
Mary River Fish Effluent-Exposed	MRE H1	27-Aug-17	N 71 18 13.014	W 79 14 39.495
	MRE H2	27-Aug-17	N 71 18 12.677	W 79 14 48.484

[a] Coordinates presented as dd mm ss.s (d-degrees, m-minutes, s-seconds) using 1983 North American Datum (NAD 83).

Table C.2: Summary of Habitat Features at Watercourses Evaluated as part of the Mary River Project EEM Benthic Invertebrate Community Survey, August 2017

Habitat Characteristic		Mary River Tributary-F Reference			Mary River Tributary-F Effluent-Exposed		
		MRTF-REF1	MRTF-REF3	MRTF-REF5	MRTF-EXP1	MRTF-EXP3	MRTF-EXP5
Mean Width (m)	Wetted	4.2	4.1	4.7	7.7	9.6	4.4
	Bankfull	20	20	21	25	25	23
Mean Depth (cm)	Average	4.8	5.4	5.6	6.8	7.4	13.8
Mean Velocity (m/s)	Average	0.05	0.07	0.07	0.04	0.10	0.10
Stream Morphology	% Pool	10	20	10	40	10	5
	% Rapid	10	5	5	10	10	15
	% Riffle	45	25	85	15	60	50
	% Run	35	50	-	35	20	20
	% Gradient	4.5	5	6	7	5	7
Substrate (% areal coverage)		0% bedrock 55% boulder 40% cobble 5% pebble 0% gravel 0% sand	0% bedrock 35% boulder 50% cobble 10% pebble 5% gravel 0% sand	0% bedrock 25% boulder 65% cobble 10% pebble 0% gravel 0% sand	0% bedrock 30% boulder 60% cobble 10% pebble 0% gravel 0% sand	0% bedrock 20% boulder 65% cobble 10% pebble 5% gravel 0% sand	0% bedrock 45% boulder 45% cobble 10% pebble 0% gravel 0% sand
Mean Substrate Size (cm)		12.9	9.7	6.7	12.5	10.7	16.8
Aquatic Vegetation (% areal coverage)	Periphyton Description	<0.5 mm thick of attached algae/periphyton on rocks	<0.5 mm thick of attached algae/periphyton on rocks	<0.5 mm thick of attached algae/periphyton on rocks	<0.5 mm thick of attached algae/periphyton on rocks	<0.5 mm thick of attached algae/periphyton on rocks	<0.5 mm thick of attached algae/periphyton on rocks
	Macrophyte Coverage	none observed	none observed	none observed	none observed	none observed	none observed

Table C.3: Habitat Data Summary and Statistical Comparison Results between Mary River Tributary-F Effluent-Exposed and Reference Study Areas, August 2017

Channel Feature	Two-Area Comparison			Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval for Mean		Minimum	Maximum
	Significant Difference between Areas?	p-value	Statistical Test					Lower Bound	Upper Bound		
Wetted Width (m)	NO	0.1310	α	Reference	4.3	0.3	0.2	3.5	5.1	4.1	4.7
				Effluent-Exposed	7.2	2.6	1.5	0.7	13.8	4.4	9.6
Bankfull Width (m)	YES	0.0058	β , ζ	Reference	20.3	0.6	0.3	18.9	21.8	20.0	21.0
				Effluent-Exposed	24.3	1.2	0.7	21.5	27.2	23.0	25.0
Water Depth (cm)	NO	0.1427	α , η	Reference	5.3	0.4	0.2	4.2	6.3	4.8	5.6
				Effluent-Exposed	9.3	3.8	2.2	-0.2	18.9	6.8	13.8
Water Velocity (m/s)	NO	0.4191	α , η	Reference	0.06	0.01	0.01	0.04	0.08	0.05	0.07
				Effluent-Exposed	0.08	0.03	0.02	0.00	0.16	0.04	0.10
Stream Gradient (% slope)	NO	0.1145	β , ζ	Reference	4.8	0.6	0.3	3.4	6.3	4.5	5.5
				Effluent-Exposed	6.3	1.2	0.7	3.5	9.2	5.0	7.0
Substrate Size (cm)	NO	0.2359	α	Reference	9.8	3.1	1.8	2.1	17.4	6.7	12.9
				Effluent-Exposed	13.3	3.2	1.8	5.5	21.2	10.7	16.8

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.05.

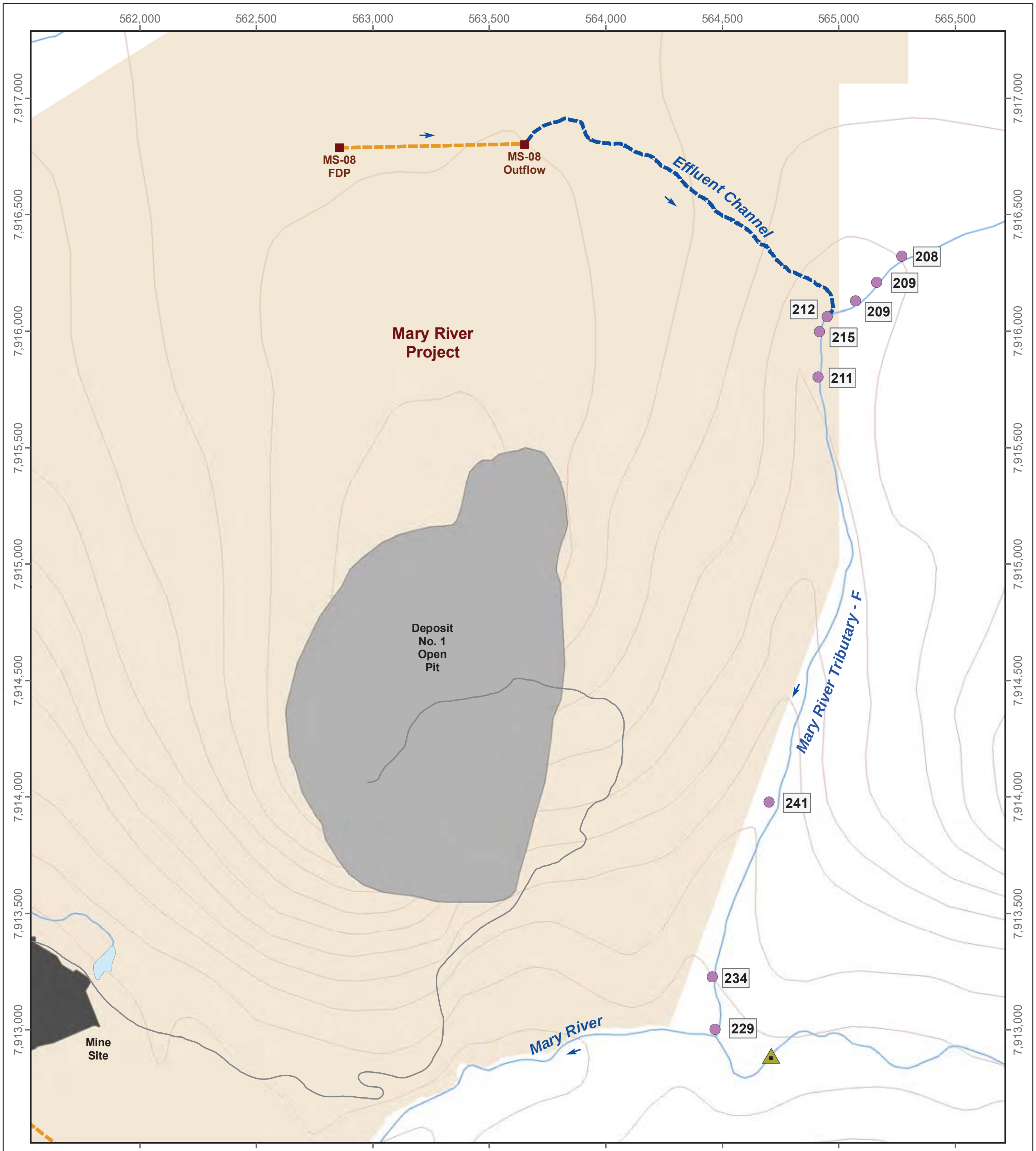
[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance.

Table C.4: Summary of Habitat Features at Mary River Study Areas Used as part of the Mary River Project EEM Fish Population Survey, August 2017

Habitat Characteristic		Mary River Reference	Mary River Effluent-Exposed	
		Transect 1	Transect 1	Transect 2
Mean Width (m)	Wetted	72.9	14.8	25.8
Mean Depth (cm)	Average	47.7	29.7	35.1
Mean Velocity (m/s)	Average	0.30	-	-
Stream Morphology	% Pool	0	0	0
	% Rapid	10	20	0
	% Riffle	90	80	100
	% Run	0	0	0
Substrate (% areal coverage)		0% bedrock 75% boulder 15% cobble 5% pebble 0% gravel 5% sand	0% bedrock 5% boulder 85% cobble 10% pebble 0% gravel 0% sand	0% bedrock 5% boulder 90% cobble 5% pebble 0% gravel 0% sand
Mean Substrate Size (cm)		55.9	10.3	13.5
Aquatic Vegetation (% areal coverage)	Periphyton Description	<0.5 mm thick of attached algae/periphyton on rocks	<0.5 mm thick of attached algae/periphyton on rocks	<0.5 mm thick of attached algae/periphyton on rocks
	Macrophyte Coverage	none observed	none observed	none observed

APPENDIX D

EFFLUENT AND WATER QUALITY DATA



LEGEND

- Sampling Location
- Final Discharge Point (FDP)
- Mary River Cascade Barrier
- Discharge Line
- Overland Effluent Channel
- 229 Specific Conductance (uS/cm)

Specific Conductance Data for Mary River Tributary-F During the EEM Field Study

0 0.25 0.5 1 km

Map Projection: UTM Zone 17N NAD 1983
Data Source: Reproduced under licence from Her Majesty the Queen in Rights of Canada, Department of Natural Resources Canada. All rights reserved.

Date: January 2018
Project 177202.0033

minnow environmental inc.

Figure D.1

Document Path: S:\Projects\177202\177202.0033 - Baffinland 2017\2 - Mapping\Interpretive Report\17-33 Fig D.1 Specific Conductance Data.mxd

Table D.1: **Station MS-08 Effluent Daily Discharge Volumes, 2015 - 2017**

Year	Date	Volume Discharged (m^3)
2015	9-Jul-15	47
	10-Jul-15	64
	11-Jul-15	196
	12-Jul-15	293
	13-Jul-15	0.4
	20-Jul-15	80
	21-Jul-15	59
	27-Jul-15	203
	30-Jul-15	144
	5-Aug-15	124
	6-Aug-15	257
	7-Aug-15	149
	9-Aug-15	150
	10-Aug-15	150
	20-Aug-15	150
2016	20-Jul-16	135
	21-Jul-16	253
	22-Jul-16	129
	6-Aug-16	309
	7-Aug-16	656
	8-Aug-16	303
	17-Aug-16	84
	18-Aug-16	567
	19-Aug-16	767
	29-Aug-16	567
	30-Aug-16	232
	31-Aug-16	286
	1-Sep-16	585
	2-Sep-16	687
2017	2-Jul-17	1,716
	3-Jul-17	936
	8-Jul-17	12
	17-Jul-17	767
	18-Jul-17	20
	19-Jul-17	1,339
	20-Jul-17	249
	21-Jul-17	826
	29-Jul-17	335
	30-Jul-17	882
	31-Jul-17	346
	1-Aug-17	466
	3-Aug-17	369
	24-Aug-17	369
	25-Aug-17	376
	26-Aug-17	874
	27-Aug-17	523
	28-Aug-17	235
	29-Aug-17	604
	30-Aug-17	1,230
	31-Aug-17	1,008
	1-Sep-17	754
	2-Sep-17	437
	3-Sep-17	1,186
	4-Sep-17	794
	5-Sep-17	977
	6-Sep-17	864

Table D.2: Effluent Quality Monitoring Data for Mary River Project Station MS-08, 2015

	Variable	Units	MMER Grab Limit [a]	July			August	
				9-Jul-15	20-Jul-15	30-Jul-15	6-Aug-15	11-Aug-15
Routine Monitoring [b]	Volume	m^3/day	-	47	80	144	257	150
	pH	pH units	-	7.13	7.51	7.90	7.44	7.77
	TSS	mg/L	30	27	4	2	12	2
	Arsenic (As)	mg/L	1.00	0.0002	<0.00010	<0.0010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.60	0.0020	0.0005	<0.0010	0.0014	0.0011
	Lead (Pb)	mg/L	0.40	0.00082	0.00044	<0.00050	0.00023	0.00015
	Nickel (Ni)	mg/L	1.00	0.010	0.012	0.013	0.025	0.021
	Zinc (Zn)	mg/L	1.00	0.0051	<0.0030	<0.0030	0.0035	0.0031
	Radium-226	Bq/L	1.11	-	<0.0100	<0.0100	<0.0100	0.0160
Effluent Characterization [c]	Conductivity	µS/cm	-	-	948	-	1,320	-
	Hardness	mg/L (as $CaCO_3$)	-	223	495	678	667	780
	Alkalinity	mg/L (as $CaCO_3$)	-	18	32	45	-	44
	Ammonia (NH_4^+)	mg/L	-	0.36	0.44	0.38	-	0.47
	Nitrate (NO_3)	mg/L	-	1.9	4.0	5.5	-	4.9
	Aluminum (Al)	mg/L	-	0.804	0.065	0.067	0.115	0.118
	Cadmium (Cd)	mg/L	-	0.00005	0.00007	<0.000090	0.00018	0.00014
	Iron (Fe)	mg/L	-	1.120	0.164	0.138	0.479	0.178
	Mercury (Hg)	mg/L	0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010
	Molybdenum (Mo)	mg/L	-	0.0001	0.0001	<0.00050	0.0002	<0.00050
	Selenium (Se)	mg/L	-	0.0007	0.0014	0.0021	0.0025	0.0027

Indicates grab sample concentration above applicable limit for deleterious substances *or* grab sample mercury concentration that exceeded fish usability assessment trigger value.

[a] Limits indicated refer to maximum authorized grab sample concentrations as per Schedule 4 of the MMER (Government of Canada 2016) except the limit for mercury, which has been included as a fish usability assessment trigger limit based on a grab sample concentration of 0.0001 mg/L.

[b] Deleterious substances and pH as defined under Schedule 4 of the MMER (Government of Canada 2016).

[c] Required effluent characterization and site-specific parameters as defined under Schedule 5 of the MMER (Government of Canada 2016).

Table D.3: Effluent Quality Monitoring Data for Mary River Project Station MS-08, 2016

	Variable	Units	MMER Grab Limit [a]	July		August				
				19-Jul-16	26-Jul-16	8-Aug-16	9-Aug-16	16-Aug-16	22-Aug-16	30-Aug-16
Routine Monitoring [b]	Volume	m^3/day	-	-	-	303	-	-	-	232
	pH	pH units	-	7.31	7.45	7.19	6.92	7.03	6.89	7.21
	TSS	mg/L	30	10	4	18	2	2	2	3
	Arsenic (As)	mg/L	1.0	0.00011.	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Copper (Cu)	mg/L	0.6	0.0053	0.0036	0.0018	0.0047	0.0022	0.0016	0.0010
	Lead (Pb)	mg/L	0.4	0.00061	0.00030	0.00044	0.00010	0.00010	0.00010	0.00010
	Nickel (Ni)	mg/L	1.0	0.002	0.021	0.034	0.071	0.074	0.073	0.067
	Zinc (Zn)	mg/L	1.0	0.0050	0.0157	0.0052	0.0079	0.0078	0.0069	0.0070
	Radium-226	Bq/L	1.11	0.0100	0.0100	0.0100	0.0280	0.0140	0.0100	0.0110
Effluent Characterization [c]	Conductivity	µS/cm	-	63	-	-	-	1,240	-	1,300
	Hardness	mg/L (as $CaCO_3$)	-	25	-	-	-	683	-	718
	Alkalinity	mg/L (as $CaCO_3$)	-	11	-	-	-	21	-	16
	Ammonia (NH_4^+)	mg/L	-	0.02	-	-	-	0.69	-	0.72
	Nitrate (NO_3)	mg/L	-	0.2	-	-	-	5.0	-	5.2
	Aluminum (Al)	mg/L	-	0.660	-	-	-	0.020	-	0.057
	Cadmium (Cd)	mg/L	-	0.00001	-	-	-	0.00019	-	0.00017
	Iron (Fe)	mg/L	-	0.774	-	-	-	0.333	-	0.268
	Mercury (Hg)	mg/L	0.000010	0.00001	-	-	-	0.00001	-	0.00001
	Molybdenum (Mo)	mg/L	-	0.0005	-	-	-	0.0001	-	0.0001
	Selenium (Se)	mg/L	-	0.0001	-	-	-	-	-	0.0020

Indicates grab sample concentration above applicable limit for deleterious substances *or* grab sample mercury concentration that exceeded fish usability assessment trigger value.

[a] Limits indicated refer to maximum authorized grab sample concentrations as per Schedule 4 of the MMER (Government of Canada 2016) except the limit for mercury, which has been included as a fish usability assessment trigger limit based on a grab sample concentration of 0.0001 mg/L.

[b] Deleterious substances and pH as defined under Schedule 4 of the MMER (Government of Canada 2017).

[c] Required effluent characterization and site-specific parameters as defined under Schedule 5 of the MMER (Government of Canada 2017).

Table D.4: Effluent Quality Monitoring Data for Mary River Project Station MS-08, 2017

Variable		Units	MMER Grab Limit [a]	July		August			September
				18-Jul-17	21-Jul-17	1-Aug-17	24-Aug-17	30-Aug-17	4-Sep-17
Routine Monitoring [b]	Volume	m^3/day	-	20	826	466	369	1,230	794
	pH	pH units	6.0 - 9.5	6.93	6.92	5.25	6.99	6.50	5.75
	TSS	mg/L	30	6	<2.0	11	13	26	13
	Arsenic (As)	mg/L	1.00	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010
	Copper (Cu)	mg/L	0.60	0.0026	0.0070	0.0290	<0.010	<0.010	<0.010
	Lead (Pb)	mg/L	0.40	0.00033	0.00049	0.00764	<0.00050	0.00080	<0.00050
	Nickel (Ni)	mg/L	1.00	0.027	0.028	0.215	0.317	0.261	0.398
	Zinc (Zn)	mg/L	1.00	0.0067	0.0100	0.0420	<0.030	<0.030	0.0320
	Radium-226	Bq/L	1.11	0.0120	0.0100	0.0150	0.0300	-	-
Effluent Characterization [c]	Conductivity	µS/cm	-	-	656	-	3,330	-	-
	Hardness	mg/L (as $CaCO_3$)	-	-	318	-	1,990	-	-
	Alkalinity	mg/L (as $CaCO_3$)	-	-	10	-	82	-	-
	Ammonia (NH_4^+)	mg/L	-	-	0.43	-	1.67	-	-
	Nitrate (NO_3)	mg/L	-	-	2.5	-	8.0	-	-
	Aluminum (Al)	mg/L	-	-	0.036	-	<0.050	-	-
	Cadmium (Cd)	mg/L	-	-	0.00006	-	0.00038	-	-
	Iron (Fe)	mg/L	-	-	0.477	-	7.100	-	-
	Mercury (Hg)	mg/L	0.000010	-	-	-	<0.000010	-	-
	Molybdenum (Mo)	mg/L	-	-	<0.000050	-	<0.00050	-	-
	Selenium (Se)	mg/L	-	-	0.0012	-	0.0047	-	-

Indicates grab sample concentration above applicable limit for deleterious substances *or* grab sample mercury concentration that exceeded fish usability assessment trigger value.

[a] Limits indicated refer to maximum authorized grab sample concentrations as per Schedule 4 of the MMER (Government of Canada 2017) except the limit for mercury, which has been included as a fish usability assessment trigger limit based on a grab sample concentration of 0.0001 mg/L.

[b] Deleterious substances and pH as defined under Schedule 4 of the MMER (Government of Canada 2017).

[c] Required effluent characterization and site-specific parameters as defined under Schedule 5 of the MMER (Government of Canada 2017).

Table D.5: Mary River Project Effluent (Station MS-09) Acute Lethality Results for Tests Conducted on Rainbow Trout and *Daphnia magna*, 2015 - 2017

Year	Date Sample Collected	Rainbow Trout (percent mortality in 100% effluent)	*Daphnia magna* (percent mortality in 100% effluent)
2015	-	0	0
	11-Aug-15	0	0
2016	19-Jul-16	0	0
	16-Aug-16	10	0
	30-Aug-16	0	0
2017	27-Jun-17	0	0
	11-Jul-17	0	0
	1-Aug-17	100	100
	24-Aug-17	0	6.7
	5-Sep-17	30	100

Table D.6: Effluent Quality Monitoring Data for Mary River Project Station MS-06, 2016

	Variable	Units	MMER Grab Limit [a]	MS-06
				12-Sep-16
Routine Monitoring [b]	Volume	m^3/day	-	86
	pH	pH units	-	7.98
	TSS	mg/L	30	4
	Arsenic (As)	mg/L	1.00	0.00014
	Copper (Cu)	mg/L	0.60	<0.0010
	Lead (Pb)	mg/L	0.40	0.00013
	Nickel (Ni)	mg/L	1.00	<0.00050
	Zinc (Zn)	mg/L	1.00	<0.0030
	Radium-226	Bq/L	1.11	0.0150
Effluent Characterization [c]	Conductivity	µS/cm	-	318
	Hardness	mg/L (as $CaCO_3$)	-	133
	Alkalinity	mg/L (as $CaCO_3$)	-	57
	Ammonia (NH_4^+)	mg/L	-	<0.020
	Nitrate (NO_3)	mg/L	-	0.7
	Aluminum (Al)	mg/L	-	0.078
	Cadmium (Cd)	mg/L	-	<0.000010
	Iron (Fe)	mg/L	-	0.110
	Mercury (Hg)	mg/L	0.000010	<0.000010
	Molybdenum (Mo)	mg/L	-	0.0039
	Selenium (Se)	mg/L	-	0.0001
Other Parameters	Total Dissolved Solids	mg/L	-	183
	Turbidity	NTU	-	7.5
	Chloride (Cl)	mg/L	-	9.9
	Fluoride (F)	mg/L	-	0.0880
	Total Kjeldahl Nitrogen	mg/L	-	0.4
	Phosphorus, Total	mg/L	-	0.0099
	Sulfate (SO4)	mg/L	-	78.4
	Dissolved Organic Carbon	mg/L	-	4.7
	Total Organic Carbon	mg/L	-	4.5
	Calcium (Ca)	mg/L	-	25.4
	Magnesium (Mg)	mg/L	-	16.9
	Manganese (Mn)	mg/L	-	0.0066
	Potassium (K)	mg/L	-	9.4
	Sodium (Na)	mg/L	-	4.0
	Thallium (Tl)	mg/L	-	0.000017
	Uranium (U)	mg/L	-	0.0037

Indicates grab sample concentration above applicable limit for deleterious substances *or* mercury concentration that exceeded fish usability trigger value.

[a] Limits indicated refer to maximum authorized grab sample concentrations as per Schedule 4 of the MMER (Government of Canada 2017) except the limit for mercury, which has been included as a fish usability assessment trigger limit based on a grab sample concentration of 0.0001 mg/L.

[b] Deleterious substances and pH as defined under Schedule 4 of the MMER (Government of Canada 2017).

[c] Required effluent characterization and site-specific parameters as defined under Schedule 5 of the MMER (Government of Canada 2017).

Table D.7: ***In Situ*** **Water Quality Measurements Collected at Benthic Invertebrate Community Stations and Fish Population Study Areas for the Mary River Project EEM, August 2017**

Study Area		Station	Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	pH (pH units)	Specific Conductance (µS/cm)
Mary River Tributary-F	Reference	MRTF-REF1	25-Aug-17	7.1	11.94	98.7	8.19	209
		MRTF-REF2	25-Aug-17	6.9	12.20	100.4	8.18	207
		MRTF-REF3	25-Aug-17	6.6	12.12	98.9	8.17	208
		MRTF-REF4	25-Aug-17	6.0	12.34	99.3	8.16	209
		MRTF-REF5	25-Aug-17	5.7	12.52	99.0	8.16	209
	Mine-exposed	MRTF-EXP1	25-Aug-17	5.8	12.23	97.9	8.19	212
		MRTF-EXP2	25-Aug-17	5.7	12.30	98.1	8.18	211
		MRTF-EXP3	25-Aug-17	5.8	12.28	98.0	8.18	215
		MRTF-EXP4	25-Aug-17	5.6	12.25	98.2	8.19	214
		MRTF-EXP5	25-Aug-17	5.9	12.22	97.9	8.18	211
Mary River	Reference	EF-REF-1	28-Aug-17	7.0	13.60	103.9	7.98	173
		EF-REF-2	28-Aug-17	7.1	12.50	102.7	7.99	172
		EF-REF-3	28-Aug-17	5.7	12.80	102.1	7.97	167
		EF-REF-4	28-Aug-17	5.3	12.71	100.4	7.94	184
		EF-REF-4	28-Aug-17	4.9	12.72	99.4	7.94	182
	Mine-exposed	EF-EXP-1	27-Aug-17	5.6	12.75	101.4	8.07	176
		EF-EXP-2	27-Aug-17	5.7	12.61	100.4	8.02	173
		EF-EXP-3	27-Aug-17	5.1	12.84	100.9	8.07	190
		EF-EXP-4	27-Aug-17	4.9	12.88	100.5	8.00	174
		EF-EXP-5	27-Aug-17	4.8	12.80	99.8	7.98	165

Table D.8: *In Situ* Water Quality Data Summary and Statistical Comparison Results between Mary River Tributary-F Effluent-Exposed and Reference Benthic Study Areas, August 2017

Metric	Two-Sample Comparison			Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval for Mean		Minimum	Maximum
	Significant Difference between Areas?	p-value	Statistical Test					Lower Bound	Upper Bound		
Water Temperature (°C)	YES	0.0304	α , η	Reference	6.5	0.6	0.3	5.7	7.2	5.7	7.1
				Effluent-Exposed	5.8	0.1	0.1	5.6	5.9	5.6	5.9
Dissolved Oxygen (mg/L)	NO	0.7558	α , η	Reference	12.22	0.22	0.10	11.95	12.50	11.94	12.52
				Effluent-Exposed	12.26	0.03	0.02	12.21	12.30	12.22	12.30
Dissolved Oxygen (% saturation)	YES	0.0037	α	Reference	99.26	0.67	0.30	98.42	100.10	98.70	100.40
				Effluent-Exposed	98.02	0.13	0.06	97.86	98.18	97.90	98.20
pH (units)	YES	0.0804	α	Reference	8.17	0.01	0.01	8.16	8.19	8.16	8.19
				Effluent-Exposed	8.18	0.01	0.00	8.18	8.19	8.18	8.19
Specific Conductance (µS/cm)	YES	0.0017	α , η	Reference	208	1	0	207	210	207	209
				Effluent-Exposed	213	2	1	210	215	211	215

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance.

Table D.9: *In Situ* Water Quality Data Summary and Statistical Comparison Results between Mary River Effluent-Exposed and Reference Fish Population Study Areas, August 2017

Metric	Two-Sample Comparison			Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval for Mean		Minimum	Maximum
	Significant Difference between Areas?	p-value	Statistical Test					Lower Bound	Upper Bound		
Water Temperature (°C)	NO	0.1451	α , η	Reference	6.0	1.0	0.4	4.8	7.2	4.9	7.1
				Effluent-Exposed	5.2	0.4	0.2	4.7	5.7	4.8	5.7
Dissolved Oxygen (mg/L)	NO	0.6579	α	Reference	12.87	0.43	0.19	12.34	13.39	12.50	13.60
				Effluent-Exposed	12.78	0.10	0.05	12.65	12.91	12.61	12.88
Dissolved Oxygen (% saturation)	NO	0.2310	α , η	Reference	101.70	1.80	0.81	99.46	103.94	99.40	103.90
				Effluent-Exposed	100.60	0.60	0.27	99.86	101.34	99.80	101.40
pH (units)	YES	0.0158	α	Reference	7.96	0.02	0.01	7.94	7.99	7.94	7.99
				Effluent-Exposed	8.03	0.04	0.02	7.98	8.08	7.98	8.07
Specific Conductance (µS/cm)	NO	1.0000	α	Reference	176	7	3	167	184	167	184
				Effluent-Exposed	176	9	4	164	187	165	190

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance.

Table D.10: Water Chemistry at Mary River Tributary-F and Mary River Stations during Periods of Effluent Discharge in 2015

	Variable	Units	CWQG [a]	MS-08-US Mary River Reference		MS-08-DS Mary River Effluent-Exposed	
				20-Jul-15	11-Aug-15	20-Jul-15	11-Aug-15
Routine Monitoring [b]	pH	pH units	6.0 - 9.5	7.98	8.16	7.97	7.95
	TSS	mg/L	-	<2.0	<2.0	<2.0	<2.0
	Arsenic (As)	mg/L	0.005	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0008	0.0011	0.0008	0.0011
	Lead (Pb)	mg/L	0.001	0.00022	0.00014	0.00019	0.00013
	Nickel (Ni)	mg/L	0.025	<0.00050	<0.0010	<0.00050	<0.0010
	Zinc (Zn)	mg/L	0.030	<0.0030	<0.0030	<0.0030	<0.0030
	Radium-226	Bq/L	-	<0.0100	<0.0100	<0.0100	<0.0100
Effluent Characterization [c]	Conductivity	µS/cm	-	75	-	78	-
	Hardness	mg/L (as $CaCO_3$)	-	36	68	38	71
	Alkalinity	mg/L (as $CaCO_3$)	-	36	65	38	66
	Ammonia (NH_4^+)	mg/L	-	<0.050	<0.050	<0.050	<0.050
	Nitrate (NO_3)	mg/L	13	<0.020	<0.020	<0.020	<0.020
	Aluminum (Al)	mg/L	0.100	0.390	0.233	0.383	0.227
	Cadmium (Cd)	mg/L	0.00012	<0.000010	<0.000010	<0.000010	<0.000010
	Iron (Fe)	mg/L	0.3	0.208	0.159	0.187	0.144
	Mercury (Hg)	mg/L	0.000026	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	0.0002	<0.00050	0.0002	<0.00050
	Selenium (Se)	mg/L	0.001	<0.0010	<0.000050	<0.0010	<0.000050
Other Parameters	Turbidity	NTU	-	-	4.4	-	2.0
	Total Dissolved Solids	mg/L	-	-	78	-	80
	Dissolved Organic Carbon	mg/L	-	-	<1.0	-	<1.0
	Total Organic Carbon	mg/L	-	-	<1.0	-	<1.0
	Total Kjeldahl Nitrogen	mg/L	-	-	0.21	-	<0.15
	Total Phosphorus	mg/L	0.02	-	0.0058	-	0.0051
	Fluoride (F)	mg/L	-	-	0.025	-	0.024
	Chloride (Cl)	mg/L	120	-	3.81	-	3.72
	Sulfate (SO4)	mg/L	218	-	3.26	-	3.19
	Antimony (Sb)-Total	mg/L	0.02	<0.00010	-	<0.00010	-
	Barium (Ba)-Total	mg/L	-	0.0076	-	0.0076	-
	Beryllium (Be)-Total	mg/L	0.011	<0.00050	-	<0.00050	-
	Bismuth (Bi)-Total	mg/L	-	<0.00050	-	<0.00050	-
	Boron (B)-Total	mg/L	-	<0.010	-	<0.010	-
	Calcium (Ca)-Total	mg/L	-	7.5	15.1	7.9	14.8
	Chromium (Cr)-Total	mg/L	0.0089	<0.00050	-	<0.00050	-
	Cobalt (Co)-Total	mg/L	-	<0.00010	-	<0.00010	-
	Lithium (Li)-Total	mg/L	-	<0.0010	-	<0.0010	-
	Magnesium (Mg)-Total	mg/L	-	4.23	8.38	4.44	8.44
	Manganese (Mn)-Total	mg/L	0.935	0.0019	0.0020	0.0022	0.0018
	Potassium (K)-Total	mg/L	-	0.93	1.11	0.94	1.10
	Silicon (Si)-Total	mg/L	-	1.40	-	1.39	-
	Silver (Ag)-Total	mg/L	0.00025	<0.000010	-	<0.000010	-
	Sodium (Na)-Total	mg/L	-	1.11	2.46	1.11	2.43
	Strontium (Sr)-Total	mg/L	-	0.0077	-	0.0077	-
	Thallium (Tl)-Total	mg/L	0.0008	<0.00010	<0.000010	<0.00010	<0.000010
	Titanium (Ti)-Total	mg/L	0.00010	0.012	-	0.011	-
	Uranium (U)-Total	mg/L	0.015	0.0008	0.0032	0.0008	0.0031
	Vanadium (V)-Total	mg/L	0.006	<0.0010	-	<0.0010	-

Indicates value above applicable Canadian Water Quality Guideline for the protection of aquatic life.

[a] Canadian Water Quality Guideline for the protection of aquatic life (CWQG; CCME 1999, 2016).

[b] Deleterious substances and pH as defined under Schedule 4 of the MMER (Government of Canada 2016) applicable to effluent quality

[c] Required effluent characterization and site-specific parameters as defined under Schedule 5 of the MMER (Government of Canada 2016) applicable to effluent quality.

Table D.11: Water Chemistry at Mary River Tributary-F and Mary River Stations during Periods of Effluent Discharge in 2016

Parameters		Units	Water Quality Guideline (WQG)[a]	Mary River Tributary-F	Mary River Upstream			Mary River Downstream				
				FO-01	MS-08-US	MS-08-US	G0-01	E0-10	MS-08-DS	MS-08-DS	EO-21	CO-01
				20-Aug-2016	20-Jul-2016	29-Aug-2016	20-Aug-2016	20-Aug-2016	20-Jul-2016	29-Aug-2016	19-Aug-2016	19-Aug-2016
Conventionals	Conductivity (lab)	umho/cm	-	261	70.5	189	174	186	73.5	193	172	170
	pH (lab)	pH	6.5 - 9.0	8.28	7.81	8.16	8.14	8.14	8	8.18	8.17	8.15
	Hardness (as $CaCO_3$)	mg/L	-	131	32	80	79	84	32	82	80	79
	Total Suspended Solids (TSS)	mg/L	-	3	<2.0	3.8	2.5	2.9	<2.0	6.8	3.4	2.5
	Total Dissolved Solids (TDS)	mg/L	-	141			69	102			86	89
	Alkalinity (as $CaCO_3$)	mg/L	-	118	33	72	75	82	37	75	68	72
Nutrients and Anions	Total Ammonia	mg/L	variable[c]	<0.020	0.02	0.02	<0.020	<0.020	0.02	0.02	0.026	0.022
	Nitrate	mg/L	13	0.096	0.02	0.02	<0.020	<0.020	0.02	0.022	<0.020	<0.020
	Total Organic Carbon	mg/L	-	1.4			1.5	2.3			1.5	1.6
	Total Phosphorus	mg/L	0.020[α]	0.0112			0.0098	0.0117			0.0157	0.0102
	Chloride (Cl)	mg/L	120	5.57			6.92	6.74			6.08	6.1
	Sulphate (SO_4)	mg/L	218[β]	14.3			4.59	5.01			4.19	4.03
Total Metals	Aluminum (Al)	mg/L	0.100	0.251	0.211	0.475	0.484	0.418	0.308	0.572	0.431	0.32
	Antimony (Sb)	mg/L	0.020[α]	<0.00010			<0.00010	<0.00010			<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.00015	<0.00010	0.00012	0.00013	0.00014	<0.00010	0.00013	0.00014	0.00013
	Barium (Ba)	mg/L	-	0.0148			0.0142	0.0143			0.0143	0.0129
	Beryllium (Be)	mg/L	0.011[α]	<0.00010			<0.00010	<0.00010			<0.00010	<0.00010
	Bismuth (Bi)	mg/L	-	<0.000050			<0.000050	<0.000050			<0.000050	<0.000050
	Boron (B)	mg/L	1.5	<0.010			<0.010	<0.010			<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	<0.000010	0.00001	0.00001	<0.000010	<0.000010	0.00001	0.00001	<0.000010	<0.000010
	Calcium (Ca)	mg/L	-	27			16.9	17.5			16.9	15.8
	Chromium (Cr)	mg/L	0.0089	0.00108			0.0011	0.00112			0.00108	0.00086
	Cobalt (Co)	mg/L	0.0009[α]	0.00024			0.00023	0.00022			0.00022	0.00018
	Copper (Cu)	mg/L	0.002	0.0019	<0.0010	0.0015	0.0016	0.0016	<0.0010	0.0015	0.0016	0.0017
	Iron (Fe)	mg/L	0.30	0.325	0.170	0.372	0.471	0.437	0.251	0.484	0.442	0.356
	Lead (Pb)	mg/L	0.001	0.00042	0.00016	0.00032	0.00041	0.0004	0.00019	0.0004	0.00039	0.00033
	Lithium (Li)	mg/L	-	0.0011			0.0011	<0.0010			<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	15.9			9.18	10.2			9.4	9.17
	Manganese (Mn)	mg/L	0.935[β]	0.00498			0.00547	0.00531			0.00541	0.00526
	Mercury (Hg)	mg/L	0.000026	<0.000010	0.00001	0.00001	<0.000010	<0.000010	0.00001	0.00001	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	0.000337	0.000172	0.000471	0.000457	0.000425	0.000174	0.000465	0.000534	0.000463
	Nickel (Ni)	mg/L	0.025	0.00148	<0.00050	0.00076	0.00102	0.00111	<0.00050	0.00104	0.00117	0.00114
	Potassium (K)	mg/L	-	1.46			1.42	1.44			1.4	1.38
	Selenium (Se)	mg/L	0.001	0.000052	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)	mg/L	-	1.25			1.73	1.56			1.66	1.41
	Silver (Ag)	mg/L	0.00025	<0.000050			<0.000050	<0.000050			<0.000050	<0.000050
	Sodium (Na)	mg/L	-	2.2			3.69	3.54			3.35	3.33
	Strontium (Sr)	mg/L	-	0.0197			0.0184	0.0188			0.0179	0.0165
	Thallium (Tl)	mg/L	0.0008	0.000013			0.000014	0.000015			0.000015	0.000013
	Tin (Sn)	mg/L	-	<0.00010			<0.00010	<0.00010			<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	0.0156			0.0271	0.0245			0.0248	0.0185
	Uranium (U)	mg/L	0.015	0.00353			0.00468	0.0043			0.00406	0.00364
	Vanadium (V)	mg/L	0.006[α]	0.00078			0.00104	0.00101			0.00098	0.00082
	Zinc (Zn)	mg/L	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0034	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013).

Indicates parameter concentration above applicable Water Quality Guideline.

Table D.12: Water Chemistry at Mary River Tributary-F and Mary River Stations during Periods of Effluent Discharge in 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	Mary River Tributary-F			Mary River Upstream				Mary River Downstream						
				MRTF-1	FO-01	FO-01	MS-08-US	MS-08-US	GO-01	G0-01	E0-10	MS-08-DS	MS-08-DS	EO-21	E0-21	CO-01	CO-01
				24-Aug-2017	8-Jul-2017	1-Sep-2017	21-Jul-2017	24-Aug-2017	8-Jul-2017	1-Sep-2017	1-Sep-2017	21-Jul-2017	24-Aug-2017	8-Jul-2017	1-Sep-2017	8-Jul-2017	27-Aug-2017
Conventionals	Conductivity (lab)	umho/cm	-	196	51.4	266	49.8	136	29.8	151	157.5	52.9	141	30.1	164	32.2	143
	pH (lab)	pH	6.5 - 9.0	8.12	7.57	8.22	7.62	8.06	7.22	8.08	8.095	7.63	8.04	7.32	8.04	7.44	8.01
	Hardness (as $CaCO_3$)	mg/L	-	96	27	134	22	61	13	70	74	24	63	13	78	14	72
	Total Suspended Solids (TSS)	mg/L	-	<2.0	7.3	5.2	3.4	<2.0	3.9	<2.0	<2.0	3.6	<2.0	<2.0	<2.0	3.4	3.3
	Total Dissolved Solids (TDS)	mg/L	-	106	35	136	-	76	19	74	76	-	43	17	79	25	71
	Alkalinity (as $CaCO_3$)	mg/L	-	97	22	107	24	58	11	66	69	24	61	10	69	14	63
Nutrients and Anions	Total Ammonia	mg/L	variable[c]	0.177	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	0.116	<0.020	0.134	<0.020	<0.020	<0.020	<0.020	0.035	0.075	<0.020	<0.020	0.058	<0.020	0.07
	Total Organic Carbon	mg/L	-	<1.0	0.95	1	<1.0	1.4	1.25	1.1	1.15	<1.0	1.5	1.46	1.1	1.24	1.3
	Total Phosphorus	mg/L	0.020^{α}	<0.0030	0.0112	0.0067	0.0065	0.0046	0.0078	0.0036	0.0038	0.011	0.0053	0.0088	0.0037	0.0103	0.0066
	Chloride (Cl)	mg/L	120	1.26	<0.50	5.37	1.05	3.86	0.73	4.61	4.65	1.52	3.87	0.75	4.7	0.73	4.1
	Sulphate (SO_4)	mg/L	218^{β}	2.8	1.23	25.3	0.62	2.44	0.32	2.93	4.34	0.73	2.97	0.39	7.53	0.61	3.79
Total Metals	Aluminum (Al)	mg/L	0.100	0.0573	0.133	0.187	0.0908	0.154	0.0986	0.0586	0.07085	0.0948	0.150	0.101	0.0704	0.123	0.219
	Antimony (Sb)	mg/L	0.020^{α}	0.00043	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	0.0076	0.00355	0.0138	0.00386	0.00907	0.00299	0.00895	0.009345	0.00367	0.00949	0.0028	0.00973	0.003	0.0101
	Beryllium (Be)	mg/L	0.011^{α}	<0.00010	<0.00050	<0.00050	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00010
	Bismuth (Bi)	mg/L	-	<0.000050	<0.00050	<0.00050	<0.000050	<0.000050	<0.00050	<0.00050	<0.00050	<0.000050	<0.000050	<0.00050	<0.00050	<0.00050	<0.000050
	Boron (B)	mg/L	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	-	20.7	5.11	26.5	4.58	13.1	2.76	13.7	14.9	4.78	13.2	2.81	15.7	2.98	13.9
	Chromium (Cr)	mg/L	0.0089	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009^{α}	<0.00010	0.00011	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013
	Copper (Cu)	mg/L	0.002	<0.0010	0.00061	0.00096	<0.0010	0.001	0.00052	0.00084	0.00081	<0.0010	<0.0010	0.00053	0.00085	0.00053	0.0011
	Iron (Fe)	mg/L	0.30	<0.050	0.189	0.237	0.09	0.114	0.071	0.043	0.0525	0.102	0.091	0.083	0.053	0.09	0.237
	Lead (Pb)	mg/L	0.001	0.000051	0.000225	0.000253	0.000112	0.000103	0.000087	<0.000050	0.0000565	0.000095	0.000089	0.000087	0.000073	0.000109	0.000175
	Lithium (Li)	mg/L	-	<0.0010	<0.0010	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	11.5	3.21	16.4	2.67	6.9	1.56	8.01	8.87	2.96	7.34	1.65	8.94	1.78	8.17
	Manganese (Mn)	mg/L	0.935^{β}	0.00052	0.00333	0.00675	0.00164	0.00186	0.00177	0.000579	0.000985	0.00163	0.00105	0.00173	0.0051	0.00205	0.00536
	Mercury (Hg)	mg/L	0.000026	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	0.000186	<0.000050	0.000255	0.000089	0.00031	<0.000050	0.00027	0.000255	0.000089	0.000315	0.00005	0.000556	0.000051	0.000323
	Nickel (Ni)	mg/L	0.025	<0.00050	0.00051	0.00068	0.0006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0005	<0.00050	0.0005	<0.00050	0.00078
	Potassium (K)	mg/L	-	0.902	0.37	1.38	0.469	1.04	0.35	0.92	0.965	0.455	1.06	0.35	0.98	0.37	1.11
	Selenium (Se)	mg/L	0.001	<0.000050	<0.0010	<0.0010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0010	<0.000050
	Silicon (Si)	mg/L	-	0.88	0.5	1.23	0.64	0.99	0.5	0.99	1.02	0.64	1.02	0.57	1.01	0.56	1.11
	Silver (Ag)	mg/L	0.00025	<0.000050	<0.000010	<0.000010	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000050
	Sodium (Na)	mg/L	-	0.9	0.254	1.76	0.68	2.23	0.458	2.32	2.28	0.62	2.07	0.43	2.26	0.455	2.38
	Strontium (Sr)	mg/L	-	0.0108	0.00286	0.0191	0.0045	0.0125	0.00261	0.0132	0.0134	0.0044	0.0133	0.00259	0.0156	0.00265	0.0129
	Thallium (Tl)	mg/L	0.0008	<0.000010	<0.00010	<0.00010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.000010
	Tin (Sn)	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	<0.00030	<0.010	0.014	0.00504	0.00572	<0.010	<0.010	<0.010	0.00538	0.00503	<0.010	<0.010	<0.010	0.0113
	Uranium (U)	mg/L	0.015	0.00251	0.000198	0.00261	0.000275	0.00231	0.000137	0.00278	0.00276	0.000269	0.00237	0.000142	0.00266	0.000154	0.00208
	Vanadium (V)	mg/L	0.006^{α}	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	0.00055
	Zinc (Zn)	mg/L	0.030	0.0038	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013).

Indicates parameter concentration above applicable Water Quality Guideline.

APPENDIX E

BENTHIC INVERTEBRATE COMMUNITY DATA

Table E.1: Coordinates of Benthic Invertebrate Community Sampling Stations Used for the Mary River Project Phase 1 EEM, August 2017

Study Area	Station	Date Sampled	Latitude (dd mm ss.s)[a]	Longitude (ddd mm ss.s)[a]
Mary River Tributary-F Reference	MRTF-REF1	25-Aug-17	N 71 20 24.606	W 79 10 18.960
	MRTF-REF2	25-Aug-17	N 71 20 22.656	W 79 10 24.287
	MRTF-REF3	25-Aug-17	N 71 20 21.098	W 79 10 30.182
	MRTF-REF4	25-Aug-17	N 71 20 19.717	W 79 10 34.246
	MRTF-REF5	25-Aug-17	N 71 20 18.540	W 79 10 39.399
Mary River Tributary-F Effluent-Exposed	MRTF-EXP1	25-Aug-17	N 71 20 16.499	W 79 10 52.095
	MRTF-EXP2	25-Aug-17	N 71 20 15.709	W 79 10 53.884
	MRTF-EXP3	25-Aug-17	N 71 20 14.465	W 79 10 55.513
	MRTF-EXP4	25-Aug-17	N 71 20 11.597	W 79 10 56.085
	MRTF-EXP5	25-Aug-17	N 71 20 08.213	W 79 10 56.806

[a] Coordinates presented as dd mm ss.s (d-degrees, m-minutes, s-seconds) using 1983 North American Datum (NAD 83).

Table E.2: Replicate Habitat Measurements Collected at Benthic Invertebrate Community Stations, Mary River Project Phase 1 EEM, August 2017

Study Area	Station	Water Depth (cm)			Water Velocity (m/s)			Substrate Size[a] (cm)			Embeddedness		
		Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3
Mary River Tributary-F Reference	MRTF-REF1	6	7	6	0.27	0.25	0.26	6.6	6.4	6.8	0%	38%	13%
	MRTF-REF2	4	4	4	0.28	0.14	0.18	6.6	6.1	6.8	25%	13%	38%
	MRTF-REF3	3	3	3	0.19	0.14	0.15	6.7	6.1	4.9	13%	0%	13%
	MRTF-REF4	4	5	6	0.12	0.19	0.15	6.7	4.1	8.0	0%	25%	25%
	MRTF-REF5	4	4	4	0.13	0.11	0.29	6.2	5.5	5.0	25%	25%	38%
Mary River Tributary-F Effluent-Exposed	MRTF-EXP1	4	4	4	0.11	0.18	0.26	5.6	6.1	4.7	13%	25%	13%
	MRTF-EXP2	6	6	6	0.17	0.23	0.22	5.2	5.7	6.5	0%	25%	50%
	MRTF-EXP3	6	7	7	0.29	0.17	0.13	7.0	6.9	7.0	13%	13%	13%
	MRTF-EXP4	7	7	6	0.30	0.14	0.19	7.8	6.4	6.8	13%	38%	0%
	MRTF-EXP5	8	9	6	0.29	0.23	0.17	6.7	5.9	7.2	13%	25%	25%

[a] Substrate measurements taken on the intermediate axis of each individual particle observed within the Surber sampler area as viewed from the surface prior to sampling. Sample size ranged from 6 - 8 measurements per replicate grab, with a mean of 6.2 for the entire 2017 stream sampling program.

Table E.3: Replicate Station Habitat Feature Summary and Statistical Comparison Results between Mary River Tributary-F Effluent-Exposed and Reference Study Areas, August 2017

Channel Feature	Two-Area Comparison			Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval for Mean		Minimum	Maximum
	Significant Difference between Areas?	p-value	Statistical Test					Lower Bound	Upper Bound		
Water Depth (cm)	YES	0.0706	α	Reference	4.5	1.3	0.6	2.9	6.0	3.0	6.3
				Effluent-Exposed	6.2	1.4	0.6	4.5	7.9	4.0	7.7
Water Velocity (cm/s)	NO	0.4811	α	Reference	19.0	4.3	1.9	13.7	24.3	15.3	26.0
				Effluent-Exposed	20.5	1.7	0.8	18.4	22.7	18.3	23.0
Substrate Size (cm)	NO	0.6103	α	Reference	6.2	0.4	0.2	5.6	6.7	5.6	6.6
				Effluent-Exposed	6.4	0.7	0.3	5.5	7.2	5.5	7.0
Substrate Embeddedness (%)	NO	0.8480	α	Reference	19.2	8.1	3.6	9.1	29.3	8.3	29.2
				Effluent-Exposed	18.3	4.8	2.1	12.4	24.2	12.5	25.0

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.1.

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance.

Table E.4: Benthic Invertebrate Community Data (Densities Expressed in Number of Organisms per Square Metre) for Mary River Tributary-F Study Areas, August 2017

Taxa	Reference Area 1	2	3	4	5	Effluent-Exposed Area 1	2	3	4	5
ROUNDWORMS										
P. Nemata	7	-	-	-	-	-	-	4	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	4	-	-	4	-	-	-	-	7	4
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
F. Sperchonidae										
Sperchon	-	7	-	7	4	7	-	4	18	-
INSECTS										
Cl. Insecta										
MAYFLIES										
O. Ephemeroptera										
F. Baetidae										
immature	-	-	-	4	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	18	4	-	14	14	-	4	4	4	-
S.F. Diamesinae										
Diamesa	75	29	22	86	36	22	50	100	133	97
Pseudokiefferiella	57	-	11	68	36	14	4	-	7	11
S.F. Orthocladiinae										
Chaetocladius	14	-	-	14	-	7	-	4	-	-
Corynoneura	-	-	7	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	4	-	7	-	-	7	7	32	-
Diplocladius	11	-	4	4	-	7	4	4	7	-
Eukiefferiella	208	104	47	280	100	39	168	247	222	43
Krenosmittia	14	75	7	39	29	32	39	39	14	4
Limnophyes	18	7	-	4	-	4	-	-	-	-
Metriocnemus	-	-	-	7	-	-	-	-	-	-
Parakiefferiella	-	11	-	-	-	-	-	-	-	-
Paraphaenocladius	4	-	-	-	-	-	-	-	-	-
Tokunagaia	11	7	4	-	25	4	4	14	7	-
Tvetenia	-	-	-	-	-	-	4	-	-	-
Vivacricotopus	-	-	-	4	-	-	-	-	-	-
indeterminate	-	-	-	4	-	4	-	-	-	-
F. Empididae										
Clinocera	-	-	-	-	-	4	-	-	7	-
pupae	4	-	-	-	-	-	-	-	-	-
F. Simuliidae										
Gymnopais	161	219	82	480	75	297	462	552	706	685
Prosimulium/Helodon	-	-	-	7	-	-	-	-	-	-
F. Tipulidae										
Tipula	7	7	4	25	11	7	4	36	11	11
Density (No. organisms per m^2)	613	474	188	1,058	330	448	750	1,015	1,175	855
Richness[a]	6	4	3	6	4	5	3	5	6	4
Simpson's Evenness (E)[a]	0.297	0.529	0.689	0.359	0.430	0.379	0.637	0.428	0.338	0.370
Bray-Curtis Index[a]	0.204	0.069	0.378	0.439	0.121	0.291	0.302	0.423	0.481	0.491

[a] Metrics calculated using Family Level (FL) taxonomy.

Table E.5: Supporting Benthic Invertebrate Community Metrics for Mary River Tributary-F Effluent-Exposed and Reference Study Area Replicate Stations, Mary River Project Phase 1 EEM, August 2017

Supportng Metric	Reference Area					Effluent-Exposed Area				
	1	2	3	4	5	1	2	3	4	5
Family Level Taxonomy										
Simpson's Diversity (FL) [a]	0.439	0.528	0.516	0.536	0.418	0.472	0.477	0.533	0.507	0.324
Shannon-Wiener Diversity (FL)[a]	1.108	1.191	1.121	1.251	1.061	1.162	1.001	1.239	1.216	0.818
Lowest Practical Level Taxonomy										
Richness (LPL) [b]	14	10	9	16	8	12	10	11	12	7
Simpson's Evenness (LPL)[b]	0.319	0.339	0.406	0.211	0.626	0.182	0.228	0.246	0.202	0.217
Bray-Curtis Index (LPL) [b]	0.249	0.200	0.385	0.460	0.160	0.312	0.387	0.493	0.557	0.580
Simpson's Diversity (LPL) [b]	0.776	0.705	0.726	0.704	0.800	0.542	0.561	0.631	0.588	0.342
Shannon-Wiener Diversity (LPL)[b]	2.655	2.213	2.332	2.322	2.581	1.918	1.667	1.919	1.849	1.063
Dominant Taxa Groups										
% Chironomidae	70.1%	50.8%	54.3%	50.2%	72.7%	29.7%	37.9%	41.3%	36.3%	18.1%
% Metal Sensitive Chironomidae	24.8%	22.2%	21.3%	18.8%	32.4%	15.6%	12.5%	13.8%	13.2%	13.1%
% Simuliidae	26.3%	46.2%	43.6%	46.0%	22.7%	66.3%	61.6%	54.4%	60.1%	80.1%
% Tipulidae	1.1%	1.5%	2.1%	2.4%	3.3%	1.6%	0.5%	3.5%	0.9%	1.3%
Functional Feeding Groups										
% Collector Gatherers	71.9%	50.0%	54.3%	50.3%	72.7%	29.7%	36.9%	41.0%	34.1%	18.6%
% Filterers	26.3%	46.2%	43.6%	46.0%	22.7%	66.3%	61.6%	54.4%	60.1%	80.1%
% Shredders	1.1%	2.3%	2.1%	3.0%	3.3%	1.6%	1.5%	4.2%	3.7%	1.3%
Habitat Preference Groups										
% Clingers	26.9%	48.5%	43.6%	47.7%	23.9%	68.8%	62.5%	55.5%	64.9%	80.1%
% Sprawlers	70.1%	50.0%	54.3%	48.9%	72.7%	29.7%	36.9%	40.6%	33.5%	18.1%
% Burrowers	2.9%	1.5%	2.1%	3.4%	3.3%	1.6%	0.5%	3.9%	1.5%	1.8%
Dominant Taxa Groups										
Density Chironomidae	430	241	102	531	240	133	284	419	426	155
Density Metal Sensitive Chironomidae	152	105	40	199	107	70	94	140	155	112
Density Simuliidae	161	219	82	487	75	297	462	552	706	685
Density Tipulidae	7	7	4	25	11	7	4	36	11	11
Functional Feeding Groups										
Density Collector Gatherers	441	237	102	532	240	133	277	416	401	159
Density Filterers	161	219	82	487	75	297	462	552	706	685
Density Shredders	7	11	4	32	11	7	11	43	43	11
Habitat Preference Groups										
Density Clingers	165	230	82	505	79	308	469	563	763	685
Density Sprawlers	430	237	102	517	240	133	277	412	394	155
Density Burrowers	18	7	4	36	11	7	4	40	18	15

[a] Metrics calculated using Family Level (FL) taxonomy.

[b] Metrics calculated using Lowest Practical Level (LPL) taxonomy.

Table E.6: Benthic Invertebrate Community Statistical Comparison Results between Mary River Tributary-F Effluent-Exposed and Reference Study Areas Calculated for EEM Metrics Calculated at Lowest Practical Level Taxonomy and Relative Abundance of Dominant Taxa, FFG and HPG

Metric	Two-Sample Comparison					Summary Statistics						
	Significant Difference Among Areas?	Trans-formation	Test	p-value	Magnitude of Difference [a] (No. of SD)	Area	Median	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Richness (LPL Taxa)	NO	$\log_{10}$	ANOVA	0.6633	~	Reference	10	11.4	3.4	1.5	8.0	16.0
						Effluent-Exposed	11	10.4	2.1	0.9	7.0	12.0
Simpson's Evenness LPL	YES	$\log_{10}$	ANOVA	0.0238	-1.1	Reference	0.339	0.380	0.154	0.069	0.211	0.626
						Effluent-Exposed	0.217	0.215	0.024	0.011	0.182	0.246
Bray-Curtis Index (LPL)	YES	$\log_{10}$	ANOVA	0.0525	1.4	Reference	0.249	0.291	0.127	0.057	0.160	0.460
						Effluent-Exposed	0.493	0.466	0.114	0.051	0.312	0.580
Chironomidae (% of community)	YES	none	ANOVA	0.0029	-2.5	Reference	54.3	59.6	10.9	4.9	50.2	72.7
						Effluent-Exposed	36.3	32.7	9.2	4.1	18.1	41.3
Metal-Sensitive Chironomidae (%)	YES	$\log_{10}$	ANOVA	<0.001	-2.0	Reference	22.2	23.9	5.2	2.3	18.8	32.4
						Effluent-Exposed	13.2	13.6	1.2	0.5	12.5	15.6
Simuliidae (% of community)	YES	none	ANOVA	0.0035	2.4	Reference	43.6	37.0	11.5	5.1	22.7	46.2
						Effluent-Exposed	61.6	64.5	9.7	4.3	54.4	80.1
Collector-gatherers (% of community)	YES	none	ANOVA	0.0025	-2.4	Reference	54.3	59.8	11.5	5.1	50.0	72.7
						Effluent-Exposed	34.1	32.1	8.6	3.8	18.6	41.0
Filterers (% of community)	YES	none	ANOVA	0.0035	2.4	Reference	43.6	37.0	11.5	5.1	22.7	46.2
						Effluent-Exposed	61.6	64.5	9.7	4.3	54.4	80.1
Clingers (% of community)	YES	none	ANOVA	0.0029	2.4	Reference	43.6	38.1	11.8	5.3	23.9	48.5
						Effluent-Exposed	64.9	66.4	9.1	4.1	55.5	80.1
Sprawlers (% of community)	YES	none	ANOVA	0.0026	-1.8	Reference	54.3	59.2	11.4	5.1	48.9	72.7
						Effluent-Exposed	33.5	31.8	8.6	3.9	18.1	40.6

[a] Magnitude calculated by comparing the difference between the reference area and effluent-exposed area means divided by the reference area standard deviation.

Highlighted values indicates significant difference between study areas based on a p-value less than 0.10.

Table E.7: Benthic Invertebrate Community Statistical Comparison Results between Mary River Tributary-F Effluent-Exposed and Reference Study Areas Upon Removal of Simuliidae from the Data Set

Metric	Two-Sample Comparison					Summary Statistics					
	Significant Difference Among Areas?	Trans-formation	Test	p-value	Magnitude of Difference [a] (No. of SD)	Area	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Density	NO	none	ANOVA	0.8590	~	Reference	327.8	183.3	82.0	106.0	571.0
						Effluent-Exposed	308.2	153.3	68.6	151.0	469.0
Richness (FL Taxa)	NO	none	ANOVA	1.0000	~	Reference	3.6	1.3	0.6	2.0	5.0
						Effluent-Exposed	3.6	1.1	0.5	2.0	5.0
Simpson's Evenness FL	NO	none	ANOVA	0.9209	~	Reference	0.348	0.131	0.058	0.221	0.540
						Effluent-Exposed	0.356	0.105	0.047	0.242	0.514
Bray-Curtis Index (FL)	NO	none	ANOVA	0.8490	~	Reference	0.223	0.202	0.090	0.006	0.414
						Effluent-Exposed	0.242	0.088	0.039	0.093	0.304
Richness (LPL Taxa)	NO	none	ANOVA	0.6454	~	Reference	10.2	3.1	1.4	7.0	14.0
						Effluent-Exposed	9.4	2.1	0.9	6.0	11.0
Simpson's Evenness LPL	NO	none	ANOVA	0.7570	~	Reference	0.389	0.143	0.064	0.231	0.577
						Effluent-Exposed	0.362	0.121	0.054	0.275	0.551
Bray-Curtis Index (LPL)	NO	none	ANOVA	0.2641	~	Reference	0.303	0.155	0.069	0.063	0.428
						Effluent-Exposed	0.401	0.096	0.043	0.273	0.498
Chironomidae (% of community)	NO	none	ANOVA	0.1760	~	Reference	94.6	1.2	0.5	93.0	96.2
						Effluent-Exposed	91.8	4.0	1.8	88.1	98.6
Metal-Sensitive Chironomidae (%)	NO	none	ANOVA	0.5999	~	Reference	37.9	3.7	1.7	33.6	42.0
						Effluent-Exposed	41.6	15.0	6.7	30.2	65.9
Collector-gatherers (% of community)	YES	none	ANOVA	0.0829	-2.1	Reference	94.8	2.0	0.9	92.9	97.6
						Effluent-Exposed	90.6	4.3	1.9	85.5	96.2
Filterers (% of community)	NO	none	ANOVA	1.0000	~	Reference	0.0	0.0	0.0	0.0	0.0
						Effluent-Exposed	0.0	0.0	0.0	0.0	0.0
Clingers (% of community)	NO	none	ANOVA	0.2503	~	Reference	2.0	1.7	0.8	0.0	4.3
						Effluent-Exposed	4.8	4.9	2.2	0.0	12.2
Sprawlers (% of community)	NO	none	ANOVA	0.1019	~	Reference	93.8	2.2	1.0	90.5	96.2
						Effluent-Exposed	89.7	4.5	2.0	84.0	96.2

[a] Magnitude calculated by comparing the difference between the reference area and effluent-exposed area means divided by the reference area standard deviation.

Highlighted values indicates significant difference between study areas based on a p-value less than 0.10.

Data Quality Review

APPENDIX E BENTHIC DATA QUALITY REVIEW

E.1 Introduction

Quality Assurance/Quality Control (QA/QC) implemented for the Mary River Project Phase 1 EEM included a Data Quality Review (DQR) of the benthic invertebrate community data to provide an evaluation of how well laboratory data quality compared to prescribed goals (i.e., Data Quality Objectives [DQO]) established *a priori*. This DQR report provides a comparison of target data quality to actual data quality, subsequently discussing the consequences of any failures to meet DQO. By completing this step, the quality of the data for the program can be effectively evaluated and demonstrated.

E.2 Quality Control Measures and DQO

During laboratory processing, all benthic invertebrate community sample material was examined in its entirety (i.e., no sub-sampling was conducted; Table E-DQR.2) and therefore only one type of QC was applied in the laboratory for the benthic invertebrate community study component:

- **Organism Recovery Check.** Organism recovery checks for benthic invertebrate community samples involve the re-processing of previously sorted material from a randomly selected sample to determine the number of invertebrates that were not recovered during the original sample processing. The reprocessing is conducted on a minimum of 10% of the samples submitted for the study by an analyst not involved during the original processing so as to reduce any bias. This check allows the determination of accuracy through assessment of recovery efficiency. The DQO for organism recovery checks was ≥90%.

E.3 Benthic Invertebrate Community Sample DQA Results

Organism recovery for the two benthic invertebrate community samples evaluated was high, averaging 99% (Table E-DQR.1) and meeting the sorting efficiency DQO of ≥ 90% recovery. Therefore, the benthic invertebrate community sample recovery was considered acceptable. Overall, the benthic invertebrate community sample data were of acceptable quality, meeting the established accuracy (percent recovery) QC criteria.

Table E-DQR.1: Organism Recovery Rates for Benthic Invertebrate Community Samples

Station	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
MRTF-REF-1	171	171	100.0%
MRTF-EXP-4	326	328	99.4%
		Average % Recovery	99.7%

Table E-DQR.2: Sample Fractions Sorted for Benthic Invertebrate Community Samples

Station	Fraction Sorted (500 um)
MRTF-REF1	Whole
MRTF-REF2	Whole
MRTF-REF3	Whole
MRTF-REF4	Whole
MRTF-REF5	Whole
MRTF-EXP1	Whole
MRTF-EXP2	Whole
MRTF-EXP3	Whole
MRTF-EXP4	Whole
MRTF-EXP5	Whole

QA/QC Notes

Pupae were not counted toward total number of taxa unless they were the sole representative of their taxa group.
Immatures were not counted toward total number of taxa unless they were the sole representative of their taxa group.

APPENDIX F

FISH POPULATION SURVEY DATA

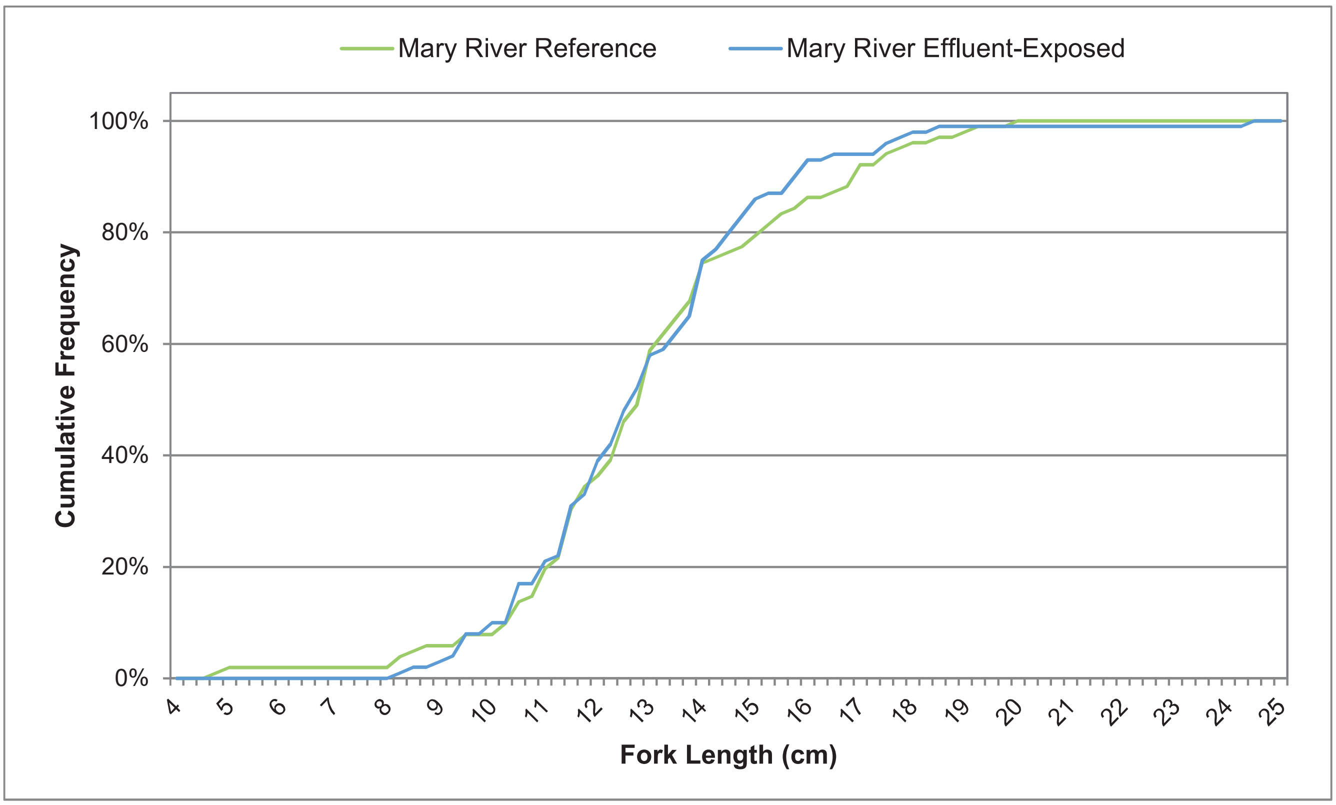


Figure F.1: Cumulative Length-frequency Distributions for Arctic Charr Captured at Mary River Project Phase 1 EEM Effluent-Exposed and Reference Study Areas, August 2017

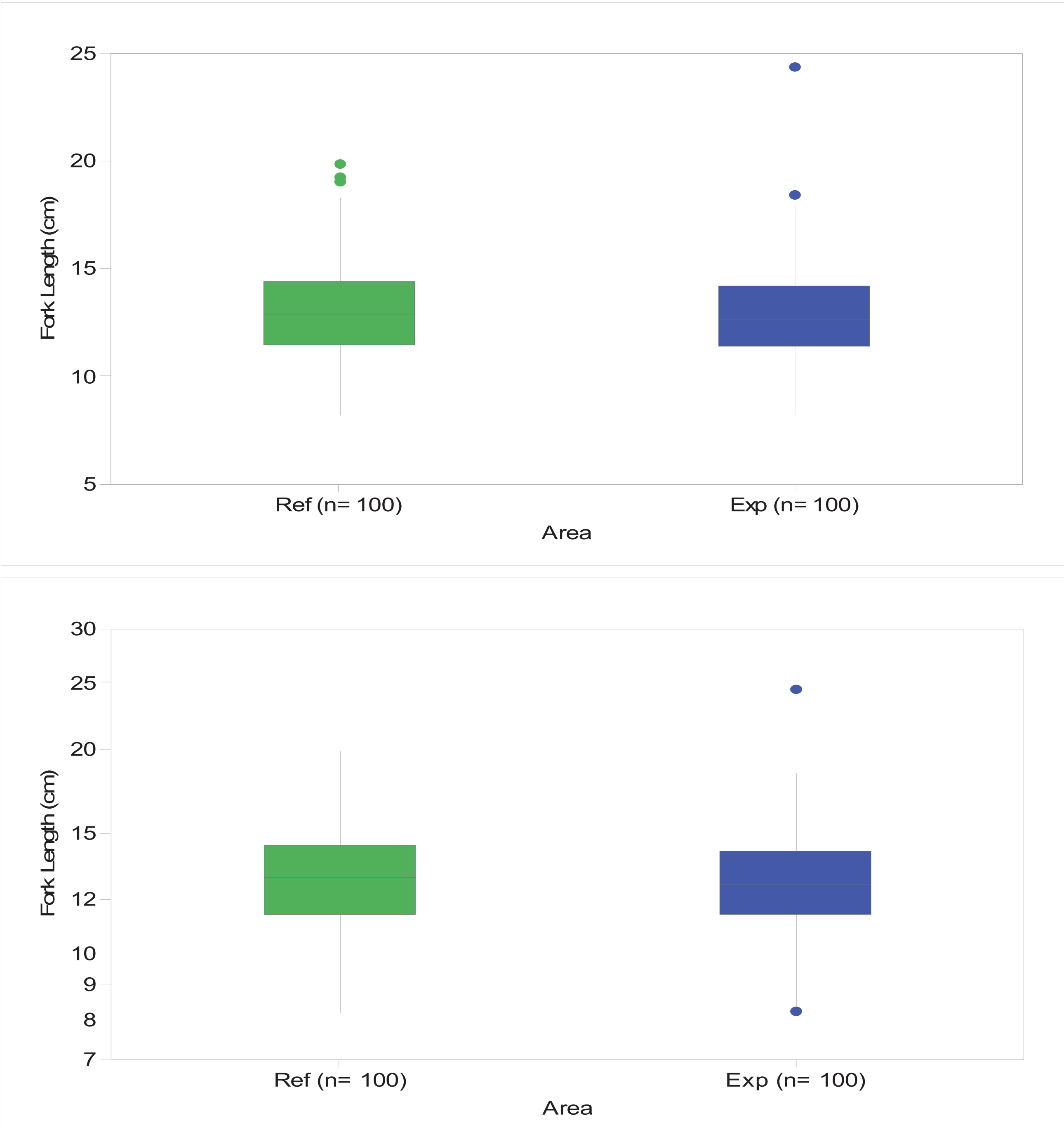


Figure F.2: Boxplot of Fork Length by Area with Unscaled and log_{10}-scaled Axes for Arctic Charr Collected at Mary River Project Phase 1 EEM Effluent-Exposed (Exp) and Reference (Ref) Study Areas, August 2017

Note: Statistical analyses were conducted on log_{10}-transformed data so boxplots are also displayed on the log_{10} scale to show the data distributions used for statistical comparisons

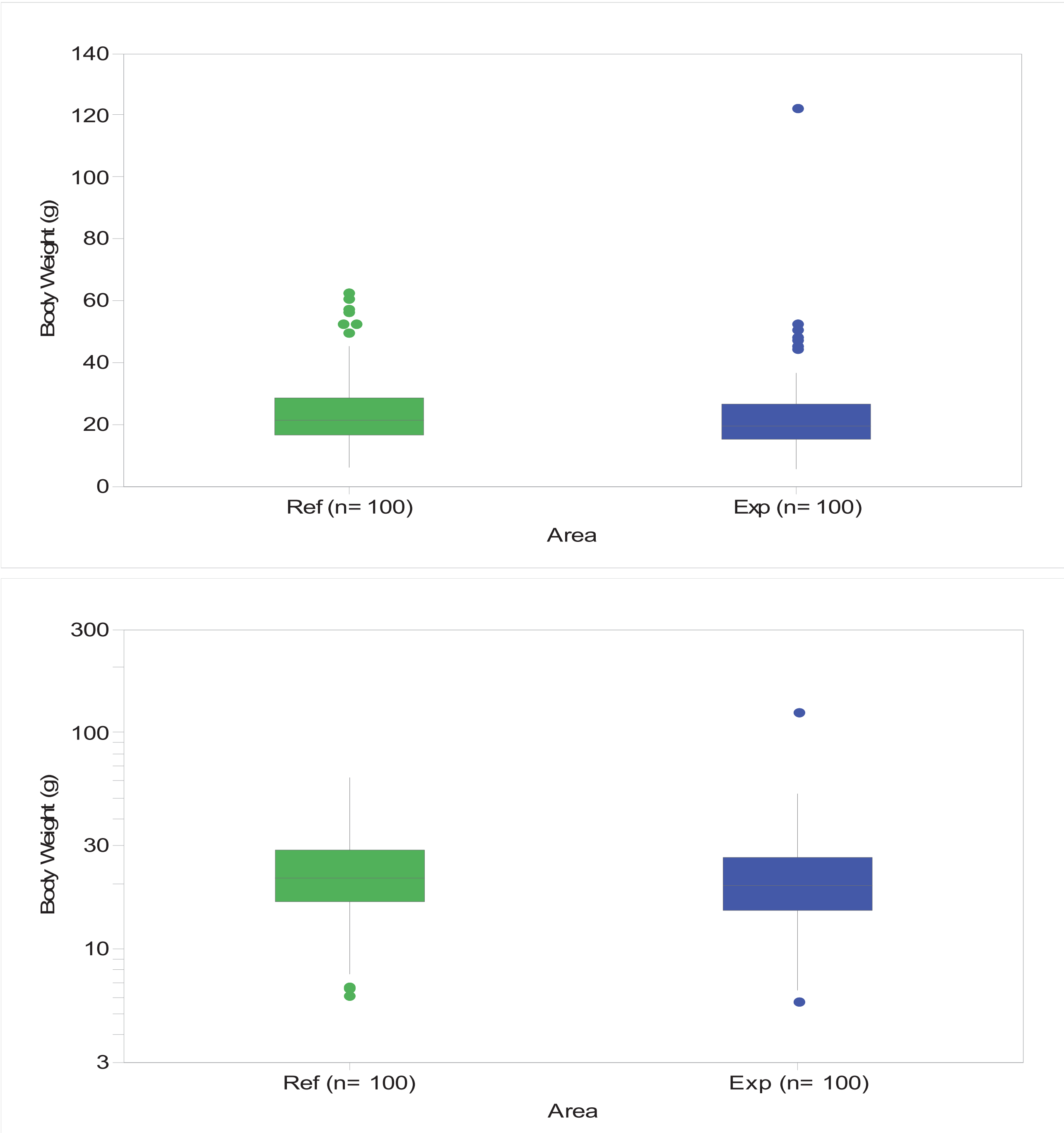


Figure F.3: Boxplot of Body Weight by Area with Unscaled and $\log_{10}$-scaled Axes for Arctic Charr Collected at Mary River Project Phase 1 EEM Effluent-Exposed (Exp) and Reference (Ref) Study Areas, August 2017

Note: Statistical analyses were conducted on $\log_{10}$-transformed data so boxplots are also displayed on the $\log_{10}$ scale to show the data distributions used for statistical comparisons

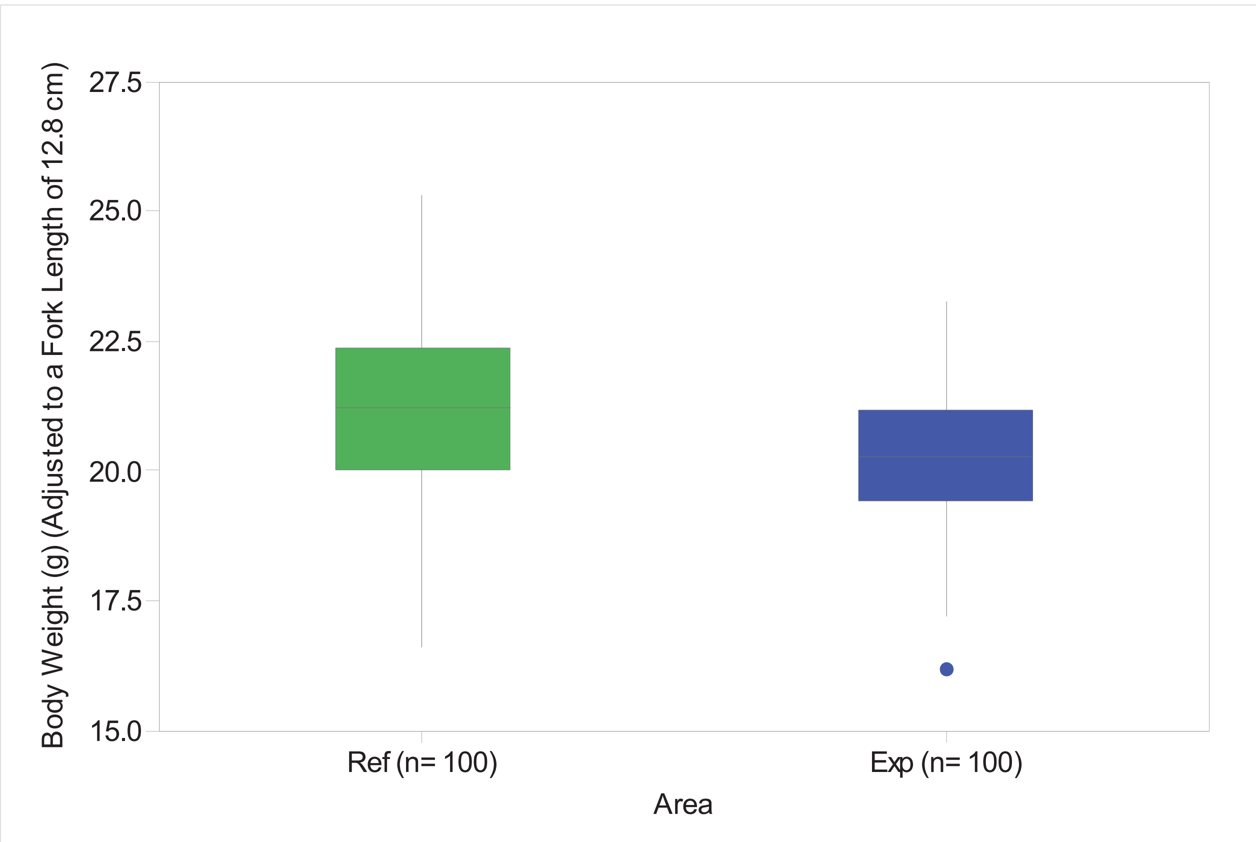


Figure F.4: Boxplot of Body Weight (Adjusted to a Fork Length of 12.8 cm Based on the Parallel Slope ANCOVA Model) by Area for Arctic Charr Collected from Mary River Project Phase 1 EEM Effluent-Exposed (Exp) and Reference (Ref) Fish Population Survey Study Areas, August 2017

Table F.1: Electrofishing Catch Record for the Mary River Project Phase 1 EEM, August 2017

Watercourse	Station ID	Date	Location			Effort (seconds)	Fish Species				Total (all species)	
			Coordinates		Station Length (m)		Arctic Charr		Ninespine Stickleback			
			Latitude	Longitude			Catch	CPUE	Catch	CPUE	Total Catch	CPUE
Mary River Tributary-F	MRTF-EXP-F1	26-Aug-17	71 20 10.212	79 10 54.129	167	1,254	0	0.00	0	0.00	0	0.00
	MRTF-EXP-F2	26-Aug-17	71 20 11.857	79 10 56.262	193	730	0	0.00	0	0.00	0	0.00
	MRTF-EXP-F3	26-Aug-17	71 18 38.276	79 11 49.646	55	355	0	0.00	0	0.00	0	0.00
	MRTF-EXP-F4	26-Aug-17	71 18 45.579	79 11 50.276	125	866	0	0.00	0	0.00	0	0.00
	MRTF-EXP-F5	26-Aug-17	71 19 09.571	79 11 23.362	138	952	0	0.00	0	0.00	0	0.00
					Total	**4,157**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**
Mary River Effluent-Exposed	MR-EXP-F1	27-Aug-17	71 17 57.136	79 15 43.125	129	2,086	40	1.15	0	0.00	40	1.15
	MR-EXP-F2	27-Aug-17	71 18 01.379	79 15 30.567	55	481	7	0.87	0	0.00	7	0.87
	MR-EXP-F3	27-Aug-17	71 18 02.390	79 15 17.695	133	1,093	26	1.43	0	0.00	26	1.43
	MR-EXP-F4	27-Aug-17	71 18 03.265	79 15 11.074	71	927	27	1.75	0	0.00	27	1.75
					Total	**4,587**	**100**	**1.30**	**0**	**0.00**	**100**	**1.30**
Mary River Reference	MR-REF-F1	28-Aug-17	71 15 22.745	79 24 34.144	159	1,754	27	0.92	0	0.00	27	0.92
	MR-REF-F2	28-Aug-17	71 15 25.935	79 24 25.750	331	2,794	22	0.47	2	0.04	24	0.52
	MR-REF-F3	28-Aug-17	71 15 23.139	79 24 38.731	218	3,792	56	0.89	1	0.02	57	0.90
					Total	**8,340**	**105**	**0.76**	**3**	**0.02**	**108**	**0.78**

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per electrofishing minute.

Table F.2: Arctic Charr Measurements from Fish Captured at the Mary River Reference Area by Electrofishing, Mary River Project Phase 1 EEM, August 2017

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
MRR-AC-01	14.5	15.7	29.707	-	0.974
MRR-AC-02	12.4	13.4	20.865	-	1.094
MRR-AC-03	15.9	17.3	40	-	0.995
MRR-AC-04	12.9	14.0	17.009	-	0.792
MRR-AC-05	19.8	21.5	62	-	0.799
MRR-AC-06	15.9	17.2	37	-	0.920
MRR-AC-07	12.5	13.6	19.920	-	1.020
MRR-AC-08	12.7	13.7	20.811	-	1.016
MRR-AC-09	13.1	14.2	26.242	-	1.167
MRR-AC-10	13.6	14.6	26.714	-	1.062
MRR-AC-11	13.8	14.9	24.405	-	0.929
MRR-AC-12	10.3	11.0	11.707	-	1.071
MRR-AC-13	13.9	15.0	25.934	-	0.966
MRR-AC-14	12.4	13.4	22.428	-	1.176
MRR-AC-15	11.5	12.4	16.697	-	1.098
MRR-AC-16	15.0	16.2	31.273	-	0.927
MRR-AC-17	12.8	14.0	21.380	-	1.019
MRR-AC-18	10.5	11.3	11.128	-	0.961
MRR-AC-19	9.3	10.0	8.654	-	1.076
MRR-AC-20	10.9	11.7	13.423	-	1.037
MRR-AC-21	11.4	12.3	17.076	-	1.153
MRR-AC-22	13.5	14.6	22.042	-	0.896
MRR-AC-23	11.7	12.7	18.479	-	1.154
MRR-AC-24	12.2	13.2	16.414	-	0.904
MRR-AC-25	11.5	12.6	17.321	-	1.139
MRR-AC-26	10.9	11.6	13.475	-	1.041
MRR-AC-27	11.3	12.2	15.022	-	1.041
MRR-AC-28	13.1	14.1	23.621	-	1.051
MRR-AC-29	12.9	14.0	20.777	-	0.968
MRR-AC-30	19.0	20.6	57	-	0.831
MRR-AC-31	11.1	12.0	14.529	-	1.062
MRR-AC-32	15.2	16.5	30.388	-	0.865
MRR-AC-33	16.9	18.4	45	-	0.932
MRR-AC-34	19.2	20.8	60	-	0.848
MRR-AC-35	11.7	12.8	15.888	-	0.992
MRR-AC-36	13.0	14.2	23.379	-	1.064
MRR-AC-37	13.8	14.8	27.605	-	1.050
MRR-AC-38	13.8	14.9	26.785	-	1.019
MRR-AC-39	14.6	15.7	26.954	-	0.866
MRR-AC-40	11.8	12.7	18.854	-	1.148
MRR-AC-41	10.4	11.2	12.919	2	1.148
MRR-AC-42	11.6	12.5	16.920	-	1.084
MRR-AC-43	12.3	13.2	18.558	-	0.997
MRR-AC-44	11.5	12.6	18.175	-	1.195
MRR-AC-45	11.4	12.4	16.587	-	1.120
MRR-AC-46	13.9	15.0	28.827	-	1.073
MRR-AC-47	11.2	12.0	13.942	-	0.992
MRR-AC-48	8.2	8.8	6.579	-	1.193
MRR-AC-49	13.0	14.0	22.087	-	1.005
MRR-AC-50	11.5	12.3	16.566	-	1.089
MRR-AC-51	12.2	13.2	17.889	-	0.985
MRR-AC-52	13.9	15.0	28.129	-	1.047
MRR-AC-53	10.9	11.9	14.052	-	1.085
MRR-AC-54	15.5	16.8	29.487	-	0.792
MRR-AC-55	15.5	16.9	36.551	-	0.982
MRR-AC-56	12.2	13.1	21.402	-	1.179
MRR-AC-57	12.6	13.6	19.925	-	0.996
MRR-AC-58	13.0	14.0	22.926	-	1.044
MRR-AC-59	15.0	16.5	30.585	-	0.906

Table F.2: Arctic Charr Measurements from Fish Captured at the Mary River Reference Area by Electrofishing, Mary River Project Phase 1 EEM, August 2017

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
MRR-AC-60		11.3	12.1	15.386	-	1.066
MRR-AC-61		12.4	13.4	22.403	-	1.175
MRR-AC-62		15.6	16.9	32.972	-	0.869
MRR-AC-63		13.0	13.9	20.955	-	0.954
MRR-AC-64		12.5	13.5	23.753	-	1.216
MRR-AC-65		13.1	14.1	27.020	-	1.202
MRR-AC-66		11.6	12.5	16.457	-	1.054
MRR-AC-67		18.3	19.8	56	-	0.914
MRR-AC-68		8.2	8.8	6.518	-	1.182
MRR-AC-69		16.3	17.7	36.480	-	0.842
MRR-AC-70		13.0	14.0	20.302	-	0.924
MRR-AC-71		10.2	11.0	12.626	-	1.190
MRR-AC-72		13.0	14.1	23.922	-	1.089
MRR-AC-73		13.7	14.8	25.515	-	0.992
MRR-AC-74		17.3	18.6	49	-	0.946
MRR-AC-75		12.4	13.3	18.645	-	0.978
MRR-AC-76		13.3	14.3	21.957	-	0.933
MRR-AC-77		13.3	14.4	22.383	-	0.951
MRR-AC-78		12.9	13.9	20.245	-	0.943
MRR-AC-79		10.4	11.2	13.070	-	1.162
MRR-AC-80		17.8	19.4	52	-	0.922
MRR-AC-81		12.0	13.0	20.633	-	1.194
MRR-AC-82		12.6	13.6	19.636	-	0.982
MRR-AC-83		17.6	19.0	45	-	0.825
MRR-AC-84		16.8	18.0	37	-	0.780
MRR-AC-85		17.4	18.9	52	-	0.987
MRR-AC-86		15.2	16.5	30.117	-	0.858
MRR-AC-87		16.7	18.1	35	-	0.751
MRR-AC-88		13.8	14.8	23.499	-	0.894
MRR-AC-89		16.8	18.5	42	-	0.886
MRR-AC-90		10.9	11.6	14.225	-	1.098
MRR-AC-91		11.0	11.8	15.461	-	1.162
MRR-AC-92		11.4	12.2	16.260	2	1.098
MRR-AC-93		10.1	10.8	10.986	2	1.066
MRR-AC-94		8.6	9.2	7.659	1	1.204
MRR-AC-95		9.5	10.2	9.949	2	1.160
MRR-AC-96		16.8	18.3	44	4	0.928
MRR-AC-97		14.1	15.3	28.108	3	1.003
MRR-AC-98		13.6	14.6	22.804	3	0.907
MRR-AC-99		10.6	11.3	11.906	2	1.000
MRR-AC-100		8.3	8.7	5.963	1	1.043
Overall Catch Summary	**total number**	**100**	**100**	**100**	**10**	**100**
	average	**13.1**	**14.2**	**24.198**	**2.2**	**1.014**
	median	**12.9**	**14.0**	**21.391**	**2.0**	**1.011**
	standard deviation	**2.5**	**2.7**	**12.116**	**0.9**	**0.114**
	standard error	**0.2**	**0.3**	**1.212**	**0.3**	**0.011**
	minimum	**8.2**	**8.7**	**5.963**	**1**	**0.751**
	maximum	**19.8**	**21.5**	**62.000**	**4**	**1.216**

Table F.3: Arctic Charr Measurements from Fish Captured at the Mary River Effluent-Exposed Area by Electrofishing, Mary River Project Phase 1 EEM, August 2017

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
MRE-AC-01	12.6	13.7	19.174	-	0.959
MRE-AC-02	12.4	13.4	16.362	-	0.858
MRE-AC-03	14.4	15.5	25.868	-	0.866
MRE-AC-04	13.0	13.9	18.810	-	0.856
MRE-AC-05	10.9	11.7	13.933	-	1.076
MRE-AC-06	11.9	12.7	16.775	-	0.995
MRE-AC-07	11.3	12.3	15.096	-	1.046
MRE-AC-08	10.5	11.5	10.572	-	0.913
MRE-AC-09	15.7	17.2	35.921	-	0.928
MRE-AC-10	10.0	10.8	10.311	-	1.031
MRE-AC-11	10.4	11.1	11.483	-	1.021
MRE-AC-12	12.6	13.9	17.439	-	0.872
MRE-AC-13	11.0	11.9	14.160	-	1.064
MRE-AC-14	13.1	14.3	21.184	-	0.942
MRE-AC-15	11.4	12.3	15.075	-	1.018
MRE-AC-16	15.7	17.0	33.560	-	0.867
MRE-AC-17	13.7	14.8	23.778	-	0.925
MRE-AC-18	11.5	12.5	14.966	-	0.984
MRE-AC-19	12.3	13.2	16.097	-	0.865
MRE-AC-20	14.7	15.9	30.004	-	0.945
MRE-AC-21	13.8	14.6	24.608	-	0.936
MRE-AC-22	9.9	10.6	10.375	-	1.069
MRE-AC-23	13.8	15.1	25.628	-	0.975
MRE-AC-24	14.9	16.2	34.875	-	1.054
MRE-AC-25	14.0	15.2	23.108	-	0.842
MRE-AC-26	17.7	19.2	50	-	0.902
MRE-AC-27	18.0	19.5	45	-	0.772
MRE-AC-28	12.2	13.2	19.444	-	1.071
MRE-AC-29	13.8	14.9	24.217	-	0.921
MRE-AC-30	13.0	14.0	20.587	-	0.937
MRE-AC-31	11.8	12.9	16.323	-	0.993
MRE-AC-32	12.3	13.3	19.558	-	1.051
MRE-AC-33	11.5	12.5	13.621	-	0.896
MRE-AC-34	8.3	8.9	6.450	-	1.128
MRE-AC-35	12.3	13.3	16.185	-	0.870
MRE-AC-36	16.4	17.9	44	-	0.998
MRE-AC-37	11.0	11.9	13.349	-	1.003
MRE-AC-38	11.7	12.5	15.999	-	0.999
MRE-AC-39	10.9	11.8	14.006	-	1.082
MRE-AC-40	9.4	10.1	7.783	-	0.937
MRE-AC-41	15.2	16.5	35.126	-	1.000
MRE-AC-42	13.5	14.6	25.016	-	1.017
MRE-AC-43	12.3	13.5	20.696	-	1.112
MRE-AC-44	14.8	16.0	28.649	-	0.884
MRE-AC-45	14.0	15.2	24.043	-	0.876
MRE-AC-46	10.5	11.3	11.822	-	1.021
MRE-AC-47	10.3	11.1	10.947	-	1.002
MRE-AC-48	13.8	14.9	22.302	-	0.849
MRE-AC-49	14.0	15.4	28.457	-	1.037
MRE-AC-50	16.0	17.4	36.283	-	0.886
MRE-AC-51	14.7	15.9	33.098	-	1.042
MRE-AC-52	15.8	17.2	36.468	-	0.925
MRE-AC-53	9.3	9.8	7.393	-	0.919
MRE-AC-54	13.9	14.7	26.469	-	0.986
MRE-AC-55	15.0	16.3	33.729	-	0.999
MRE-AC-56	11.2	12.1	15.798	-	1.124
MRE-AC-57	12.9	14.1	21.952	-	1.023
MRE-AC-58	12.1	13.1	18.452	-	1.042
MRE-AC-59	11.5	12.3	13.467	-	0.885

Table F.3: Arctic Charr Measurements from Fish Captured at the Mary River Effluent-Exposed Area by Electrofishing, Mary River Project Phase 1 EEM, August 2017

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
MRE-AC-60		18.4	19.9	47	-	0.754
MRE-AC-61		8.2	8.7	5.649	1	1.025
MRE-AC-62		13.4	14.4	24.484	-	1.018
MRE-AC-63		13.7	15.0	23.966	-	0.932
MRE-AC-64		15.9	16.9	34.709	-	0.863
MRE-AC-65		11.7	12.7	15.638	-	0.976
MRE-AC-66		9.0	9.5	7.509	-	1.030
MRE-AC-67		9.3	10.0	7.918	-	0.984
MRE-AC-68		14.2	15.3	25.522	-	0.891
MRE-AC-69		24.3	26.2	122	-	0.850
MRE-AC-70		10.4	11.2	12.021	-	1.069
MRE-AC-71		11.3	12.5	14.909	-	1.033
MRE-AC-72		12.6	13.3	16.920	-	0.846
MRE-AC-73		12.6	13.6	18.579	3	0.929
MRE-AC-74		14.2	15.5	29.376	-	1.026
MRE-AC-75		9.5	10.3	8.864	-	1.034
MRE-AC-76		13.6	14.5	22.717	-	0.903
MRE-AC-77		12.8	13.9	20.361	-	0.971
MRE-AC-78		11.9	12.9	16.975	-	1.007
MRE-AC-79		11.5	12.6	16.252	-	1.069
MRE-AC-80		12.9	14.0	21.412	-	0.997
MRE-AC-81		13.9	15.0	25.734	-	0.958
MRE-AC-82		14.6	15.8	30.065	-	0.966
MRE-AC-83		12.1	13.0	17.180	-	0.970
MRE-AC-84		17.4	18.9	48	-	0.911
MRE-AC-85		12.8	13.8	19.908	-	0.949
MRE-AC-86		13.5	14.6	24.067	-	0.978
MRE-AC-87		10.5	11.3	12.084	-	1.044
MRE-AC-88		15.6	16.9	36.058	-	0.950
MRE-AC-89		12.0	13.1	17.858	-	1.033
MRE-AC-90		12.0	12.8	13.647	3	0.790
MRE-AC-91		10.5	11.2	11.712	2	1.012
MRE-AC-92		9.1	10.0	8.578	2	1.138
MRE-AC-93		11.4	21.3	15.316	2	1.034
MRE-AC-94		17.3	18.7	52	4	1.004
MRE-AC-95		14.3	15.4	28.430	3	0.972
MRE-AC-96		13.9	15.0	24.611	3	0.916
MRE-AC-97		14.4	15.6	28.965	4	0.970
MRE-AC-98		11.5	12.5	16.483	-	1.084
MRE-AC-99		11.8	12.7	16.841	-	1.025
MRE-AC-100		12.4	13.4	20.578	-	1.079
Overall Catch Summary	**total number**	**100**	**100**	**100**	**10**	**100**
	average	**12.9**	**14.0**	**22.567**	**2.7**	**0.971**
	median	**12.6**	**13.8**	**19.501**	**3.0**	**0.981**
	standard deviation	**2.4**	**2.8**	**14.264**	**0.9**	**0.081**
	standard error	**0.2**	**0.3**	**1.426**	**0.3**	**0.008**
	minimum	**8.2**	**8.7**	**5.649**	**1**	**0.754**
	maximum	**24.3**	**26.2**	**122.000**	**4**	**1.138**

Table F.4: Non-Lethal Endpoint Statistical Comparison Results for Arctic Charr Collected from Mary River Effluent-Exposed (Exp) and Reference (Ref) Study Areas, Mary River Project Phase 1 EEM, August 2017

Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Statistics			Summary Statistics			Test *P*-value (Area)	Magnitude of Difference (%)[a]	Estimated Minimum Detectable Difference (% Relative to Reference) with α=β=0.1	
							Interaction Model	Parallel Slope Model	Covariate Value for Comparisons							
		Response	Covariate	Ref Area	Exp Area		Interaction P-value	Covariate P-value		Statistic	Ref Area	Exp Area			Decrease	Increase
Survival/ Recruitment	Length Frequency Distribution All Fish	Fork Length (cm)	n/a	102	100	K-S	-	-	-	-	-	-	0.936	-	-	-
	Length Frequency Distribution Non-YOY only	Fork Length (cm)	n/a	100	100	K-S	-	-	-	-	-	-	0.906	-	-	-
Body Size	Fork Length (Non-YOY)	$\log_{10}$[Fork Length (cm)]	n/a	100	100	t-test	-	-	-	Geometric Mean	12.9	12.7	0.523	-1.6	-7.4	8.0
	Body Weight (Non-YOY)	$\log_{10}$[Body Weight (g)]	n/a	100	100	t-test	-	-	-	Geometric Mean	21.6	19.7	0.200	-8.7	-19	23
Energy Storage	Condition (Non-YOY)	$\log_{10}$[Body Weight (g)]	$\log_{10}$[Fork Length (cm)]	100	100	ANCOVA	0.001[b]	<0.001	12.8	Adjusted Mean	21.1	20.1	<0.001	-4.5	-2.3	2.3

= P-value < 0.05 for ANCOVA interaction and covariate terms and P-value < 0.1 for overall test for area

[a] For ANCOVA: Calculated as the difference in adjusted mean between areas (effluent-exposed minus reference), expressed as a percentage of the reference area mean

[b] The R^2 of the interaction model was 0.9766 and the R^2 of the parallel slope model was 0.9753 (difference of 0.13%) so the ANCOVA proceeded under the assumption that the slopes are practically parallel, as per Environment Canada (2012) guidance.

Table F.5: Estimated Minimum Sample Sizes to Detect Various Effect Sizes for Arctic Charr Health Endpoints between Mary River Reference and Effluent-Exposed Areas Based on the Observed Variability in the Phase 1 EEM Study, 2017

Indicator	Endpoint	Variables		Sample Size		Model	S[a]	Minimum Sample Size to Detect an Effect Size (% Increase [i] or Decrease [d] Relative to Reference) with α=β=0.1							
		Response	Covariate	Ref	Exp			i=5%	i=10%	i=20%	i=25%	i=30%	i=40%	i=50%	i=100%
								d=5%	d=9%	d=17%	d=20%	d=23%	d=29%	d=33%	d=50%
Body Size	Fork Length	log_{10}[Fork Length (cm)]	n/a	100	100	t-test	0.0803	247	66	19	13	10	6	5	3
	Body Weight	log_{10}[Body Weight (g)]	n/a	100	100	t-test	0.2161	1,782	468	129	86	63	39	27	10
Energy Storage	Condition	log_{10}[Body Weight (g)]	log_{10}[Fork Length (cm)]	100	100	ANCOVA	0.0342	46	13	5	4	3	3	2	2

[a] Pooled standard deviation of the residuals.

Data Quality
Review

APPENDIX F FISH SURVEY DATA QUALITY REVIEW

F.1 Introduction

Quality Assurance/Quality Control (QA/QC) implemented for the Mary River Project Phase 1 EEM included a Data Quality Review (DQR) of the fish population survey tissue collection data to provide an evaluation of how well laboratory data quality compared to prescribed goals (i.e., Data Quality Objectives [DQO]) established *a priori*. This DQR report provides a comparison of target data quality to actual data quality, subsequently discussing the consequences of any failures to meet DQO. By completing this step, the quality of the data for the program can be effectively evaluated and demonstrated.

F.2 Quality Control Measures and DQO

A single type of QC was applied in the laboratory for the fish population survey component of the Mary River Project Phase 1 EEM:

- **Aging Precision Check**. An aging precision check involves the reprocessing of previously aged structure to ensure that the initial age determination was accurate. Aging precision checks are completed on a minimum of 10% fish age structure samples, randomly selected from the project, that had been previously subject to age determination. Using the same structure originally subject to age determination, the sample is re-evaluated by an independent analyst not involved during the original age determination to reduce any bias. The DQO for the aging precision check was ±1 year of the original age determination.

F.3 Fish Population Survey Tissue Sample DQA Results

Aging precision checks were conducted on 10 of the 20 arctic charr (*Salvelinus alpinus*) samples submitted to AEE Tech Services Inc. (La Salle, MB). Age estimates for all arctic charr met the DQO of ±1 year when separately assessed by a second, independent professional (Table F-DQR.1). Therefore, the fish population survey fish age precision was considered acceptable. Overall, the fish population survey fish age data were of acceptable quality, meeting the established QC precision criterion.

Table F-DQR.1: Laboratory Fish Aging Precision Check Results for Arctic Charr Sampled for the Mary River Project Phase 1 EEM, August 2017

Sample Identification	Structure Type	Age Assigned by Primary Ager (KM)	Age Assigned by QA Manager (MM)	Difference (years)
MRE-AC-73	Otolith	3	3	0
MRE-AC-91	Otolith	2	2	0
MRE-AC-93	Otolith	2	2	0
MRE-AC-95	Otolith	3	3	0
MRE-AC-97	Otolith	4	4	0
MRR-AC-92	Otolith	2	2	0
MRR-AC-94	Otolith	1	1	0
MRR-AC-96	Otolith	4	4	0
MRR-AC-98	Otolith	3	3	0
MRR-AC-100	Otolith	1	1	0

Indicates independent age determination was outside of the DQO of ±1 year of age.