APPENDIX P

Hydraulic Testing and Chemistry Results

Table 1 Summary of Bedrock Hydraulic Testing, Joyce Lake

Borehole	Elev (m)	Type	Zone	Material	RQD range/mean (%)	RQD Mean Core Recovery (%)	K (m/s)	Packer Zone (mbg) From (m)	To (m)	L (m)
WESA Packer Testing September-October 2014										
JGW-1	517.31	packer	RC	red chert	0-15 (3.8)	66.5	1.00E-06	37.3	48.0	10.7
JGW-1	517.31	packer	LMH/URC	Lr Massive Hematite; Upper Red Chert	4-31 (20.5)	82.8	2.20E-06	60.0	72.0	12
JGW-1	517.31	packer	LMH/URC	Lr Massive Hematite; Upper Red Chert	3-13 (6.7)	89.0	3.70E-06	88.3	96.0	7.7
JGW-1	517.31	packer	LIF/LRC	Lr. Iron Fm.; Lr. Red Chert	28-31 (29)	93.3	9.10E-08	111.0	120.0	9.0
JGW-1	517.31	packer	LIF/LRC	Lr. Iron Fm.; Lr. Red Chert	0-23 (10)	89.0	2.00E-07	131.6	140.0	8.4
JGW-1	517.31	packer	LIF/LRC	Lr. Iron Fm.; Lr. Red Chert	4-46 (21)	98.0	1.30E-06	160.3	170.5	10.2
JWG-2	532.78	packer	LMH/URC	Lr. massive Hematite; Upper Red Chert	0-43 (24)	95.2	2.00E-06	28.9	36	7.1
JWG-2	532.78	packer	LMH/URC	Lr. massive Hematite; Upper Red Chert	14-55 (25)	89.2	1.40E-06	49.9	60.6	10.7
JWG-2	532.78	packer	LIF/LRC	Lr. Iron Fm.; Lr. Red Chert	35-84 (57.2)	94.0	1.60E-06	79.9	90.6	10.7
JWG-2	532.78	packer	RS	Ruth Shale	27-86 (52.3)	60.8	2.30E-06	100.9	111.6	10.7
JWG-2	532.78	packer	Wishart	Quartzite/Sandstone	38-90 (71)	96.6	8.70E-08	121.9	141.6	19.7
JWG-2	532.78	packer	Wishart	Quartzite/Sandstone	62-91 (84.7)	98.2	1.10E-06	154.9	164.1	9.2
JWG-2	532.78	packer	Wishart	Quartzite/Sandstone	38-91 (75.1)	95.4	7.90E-07	159.9	170.6	10.7
JWG-3	517.01	packer	RC	Red Chert	7-20 (12.3)	87.0	8.40E-07	64.3	74.8	10.5
JWG-3	517.01	packer	LHM/URC	Lr Massive Hematite; Upper Red Chert	0-41 (20)	86.6	5.00E-07	75.0	99.0	24.0
JWG-3	517.01	packer	LIF/LRC	Lr. Iron Fm.; Lr. Red Chert	6-16 (12.3)	65.0	5.00E-07	112.1	120.1	8.0
JWG-3	517.01	packer	LIF/LRC	Lr. Iron Fm.; Lr. Red Chert	38-78 (53.5)	86.5	8.30E-07	130.3	141.0	10.7
JWG-3	517.01	packer	LIF/LRC	Lr. Iron Fm.; Lr. Red Chert	20-54 (32.7)	92.3	4.20E-07	142.3	148.5	6.2
JWG-3	517.01	packer	RC	red chert	12-54 (35.5)	91.5	1.1E-07	157.8	171.0	13.2
JWG-4	529.49	packer	LIF/LRC	Lr. Iron Fm.; Lr. Red Chert	17-20 (18.5)	86.5	2.10E-06	37.6	42.3	4.7
JWG-4	529.49	packer	LIF/LRC	Lr. Iron Fm.; Lr. Red Chert	0-24 (11.2)	74.0	1.60E-06	52.6	63.3	10.7
JWG-4	529.49	packer	RC	red chert	15-26 (19.3)	90.0	2.30E-06	88.6	96.3	7.7
JWG-4	529.49	packer	Wishart	Quartzite/Sandstone	45-100 (71.8)	98.8	1.10E-08	112.6	123.3	10.7
JWG-4	529.49	packer	Wishart	Quartzite/Sandstone	41-64 (56.5)	97.0	8.00E-07	133.6	144.3	10.7
JWG-4	529.49	packer	Wishart	Quartzite/Sandstone	60-95 (73.7)	94.7	6.90E-07	145.6	156.3	10.7
JWG-4	529.49	packer	Wishart	Quartzite/Sandstone	74-98 (83.3)	97.3	1.20E-06	163.6	171.3	7.7
WESA Hydraulic testing October 2014						**Mean Packer**	**Pump Test**			
JWG-1	517.31	Injection Test		Bedrock	-	7.60E-07	3.0E-07	6.0	129.5	123.5
JWG-2	532.78	Injection Test		Bedrock	-	9.60E-07	1.0E-07	5.7	169.7	163.9
JWG-2	532.78	Injection Test		Bedrock	-	9.60E-07	8.0E-08	5.7	169.6	163.8
JWG-3	517.01	Pumping test		Bedrock	-	4.50E-07	3.0E-07	7.0	172.7	165.7
JWG-4	529.49	Injection Test		Bedrock	-	6.60E-07	2.0E-07	8.3	172.7	164.3
BH-P-03	526.33	Pumping test		Bedrock	-	-	7.0E-07	7.6	161.9	154.3
BH-P-04	519.26	Pumping test		Bedrock	-	-	3.0E-07	13.7	161.0	147.3
BH-P-03	526.33	Injection Test		Bedrock	-	-	2.0E-06	7.6	161.9	154.3
BH-P-04	519.26	Injection Test		Bedrock	-	-	5.0E-07	13.7	161.0	147.3
Stassinu Stantec (Open exploration holes)					-	**Method**				
JOY-12-87		Pumping test		Bedrock	-	drawdown	2.0E-06	1.0	46.0	45.0
JOY-12-102 (Test 2)		Pumping test		Bedrock	-	drawdown	1.4E-05	1.0	45.5	44.5
JOY-12-102 (Test 2)		Pumping test		Bedrock	-	recovery	7.5E-06	1.0	45.5	44.5
JOY-12-102 (Test 3)		Pumping test		Bedrock	-	drawdown	5.0E-06	1.0	45.5	44.5
JOY-12-102 (Test 3)		Pumping test		Bedrock	-	recovery	1.2E-05	1.0	45.5	44.5
JOY-12-103		Pumping test		Bedrock	-	drawdown	4.4E-05	1.0	32.5	31.5
JOY-12-103		Pumping test		Bedrock	-	recovery	5.8E-05	1.0	32.5	31.5

Table 2 General Chemistry - Joyce Lake Mine

Well ID								BH3	BH4	JGW-1	JGW-2	JGW-3	JGW-4	JOY-12-87	JOY-12-87	JOY-12-102	JOY-12-103
Well Depth (m)		Maxxam	Testmark	MMER[1]	CCME FAL[2]	NRL 65/03[3]		130 m	130 m	171 m	170 m	171 m	171 m	48 m	Lab-Dup	49.5 m	153 m
Sample Date	Units[2]	RDL	RDL	Sch. 4		Sch. A	GCDWQ[4]	18-Oct-14	19-Oct-14	16-Oct-14	21-Oct-14	16-Oct-14	22-Oct-14	6-Oct-12	6-Oct-12	5-Oct-12	6-Oct-12
Sodium	mg/L	0.1	0.1	-	-	-	200	19.9	2.96	8.92	2.45	3.56	2.45	0.7	0.4	0.7	0.7
Potassium	mg/L	0.1	0.1	-	-	-	-	1.14	0.46	2.01	0.8	0.28	0.97	0.2	0.2	0.3	0.7
Calcium	mg/L	0.1	0.05	-	-	-	-	6.81	2.1	3.7	8.88	1.14	9.59	1.5	1.5	2.0	6.9
Magnesium	mg/L	0.1	0.004	-	-	-	-	7.84	3.09	4.16	8.26	1.22	9.2	2.0	2.0	1.5	9.9
Alkalinity	mg/L	5.0	1.0	-	-	-	-	47.5	16.0	35.5	52.6	14.9	53.1	22.0	-	9.3	48.0
Acidity	mg/L	1.0	1.0	-	-	-	-	14.3	13.5	15.0	12.8	11.6	13.0	-	-	-	-
Sulfate	mg/L	2.0	1.0	-	-	-	500	9.0	13.6	15.6	11.1	2.1	13.8	2.5	-	2.3	40.0
Chloride	mg/L	1.0	0.2	-	120	-	250	31.0	1.4	3.5	0.2	1.3	0.3	1.0	0.5	1.0	1.0
Fluoride	mg/L	0.1	-	-	-	-	1.5	-	-	-	-	-	-	ND	-	ND	ND
Silicate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	4.4	-	7.5	6.8
Ortho Phosphorus	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	ND	-	ND	ND
Total Phosphorus	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	0.60	-	ND	0.20
Dissolved Phosphorus (P)	mg/L	0.10	-	-	-	-	-	-	-	-	-	-	-	ND	ND	ND	ND
Nitrate + Nitrite	mg/L	0.05	0.10	-	-	-	10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.20	-	0.21	0.45
Nitrate	mg/L	0.05	0.10	-	13	10	45	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	-	0.21	0.45
Nitrite	mg/L	0.01	0.03	-	-	-	1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	ND	-	ND	ND
Ammonia	mg/L	0.05	0.01	-	-	-	-	0.02	0.05	0.03	<0.01	0.02	0.11	0.14	-	0.03	0.03
Total Kjeldahl Nitrogen (TKN)	mg/L	0.10	-	-	-	-	-	-	-	-	-	-	-	0.87	-	0.18	0.05
Dissolved Organic Carbon (C)	mg/L	0.50	-	-	-	-	-	-	-	-	-	-	-	ND	-	ND	ND
Total Organic Carbon (C)	mg/L	50	-	-	-	-		-	-	-	-	-	-	<1	-	<0.5	0.53
Color	TCU	5.0	-	-	-	-	15.0	-	-	-	-	-	-	ND	-	ND	ND
Turbidity	NTU	10	-	-	-	-	5.0	-	-	-	-	-	-	>1000	-	1.7	56.0
Conductance	uS/cm	1.0	0.2	-	-	-	-	221.0	76.7	113.0	124.0	37.8	139.0	50	49	24	180
pH	units	N/A	-	-	6.5-9.0	-	6.5-8.5	7.73	6.97	7.24	7.78	6.91	7.8	6.9	7.0	6.7	7.1
Hardness		1	1	-	-	-		49	18	26	56	8	62	12	-	11	58
TDS	mg/L	1	30	-	-	1000	500	100	40	120	100	60	130	31		21	116
TSS	mg/L	100		-	-	-	-	-	-	-	-	-	-	6,500	6,600	4.8	96
Sum Anions	meq/L	N/A		-	-	-		-	-	-	-	-	-	0.51	-	0.25	1.82
Sum Cations	meq/L	N/A		-	-	-		-	-	-	-	-	-	0.27	-	0.26	1.37
% Difference	-	N/A		-	-	-		-	-	-	-	-	-	30.80	-	1.96	14.10
Bicarbonate	mg/L	1		-	-	-		-	-	-	-	-	-	22.0	-	9.3	48.0
Carbonate	mg/L	1		-	-	-		-	-	-	-	-	-	ND	-	ND	ND
Langelier Index (@ 4C)	-	-		-	-	-	-	-	-	-	-	-	-	-3.11	-	-3.53	-1.95
Langelier Index (@ 20C)	-	-		-	-	-	-	-	-	-	-	-	-	-2.86	-	-3.27	-1.70
Saturation pH (@ 4C)	-	-		-	-	-	-	-	-	-	-	-	-	10.00	-	10.30	9.08
Saturation pH (@ 20C)	-	-		-	-	-	-	-	-	-	-	-	-	9.78	-	10.00	8.83

Notes:

1. MMER Schedule 4- Metal Mining Effluent Regulations

*2. Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for protection of Freshwater Aquatic Life (FAL) (1999; available online at http://ceqg-rcqe.ccme.ca) (**bold-shaded** exceeds)*

3. NLR 65/03 Schedule A - Newfoundland and Labrador Regulation 65/03

Table 3 Metals Chemistry - Joyce Lake Mine

Well	Units[2]	Maxxam	WESA	Guidelines				BH3	BH4	JGW-1	JGW-2	JGW-3	JGW-4	JOY-12-87	JOY-12-87	JOY-12-102	JOY-12-103
Well depth				MMER[1]	CCME FAL[2]	NRL 65/03[3]	GCDWQ[4]	130 m	130 m	171 m	170 m	171 m	171 m	48 m	Lab-Dup	49.5 m	153.0 m
Sample Date		RDL	RDL	Sch. 4		Sch. A		18-Oct-14	19-Oct-14	16-Oct-14	21-Oct-14	16-Oct-14	22-Oct-14	6-Oct-12	6-Oct-12	5-Oct-12	6-Oct-12
Aluminum	µg/L	5			100		100	19.6	51.3	33.6	23.1	34.5	31.9	ND	ND	ND	ND
Antimony	µg/L	1	0.5				6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	ND	ND	ND
Arsenic	µg/L	1	1	1,000	5	500	10	<1	<1	<1	<1	<1	<1	ND	ND	ND	ND
Barium	µg/L	1				5,000	1,000	36	0.5	2	11.3	0.5	9.5	0.5	0.5	1.9	3.3
Beryllium	µg/L	1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	ND	ND	ND
Bismith	µg/L	2	1					<1	<1	<1	<1	<1	<1	ND	ND	ND	ND
Boron	µg/L	50	2		1,500	5,000	5,000	<2	<2	<2	<2	<2	<2	ND	ND	ND	ND
Cadmium	µg/L	0.017	0.01			50	5	0.14	<0.01	0.15	<0.01	<0.01	<0.01	0.046	0.044	<0.01	<0.01
Cerium	µg/L	-	1					<1	<1	<1	<1	<1	<1	-	-	-	
Cesium	µg/L	-	1					<1	<1	<1	<1	<1	<1	-	-	-	-
Chromium	µg/L	1	1		8.9	1,000	50	<1	<1	1.6	<1	<1	<1	ND	ND	ND	ND
Cobalt	µg/L	0.4						0.67	1.16	1.63	0.41	0.22	0.64	6.8	6.6	0.7	7.4
Copper	µg/L	2	2	600	2	300	1,000	<2	**4.7**	**7.5**	<2	**9.9**	<2	**2.7**	**2.6**	**4.5**	<2
Europium	µg/L	-	1					<1	<1	<1	<1	<1	<1	-	-	-	-
Gallium	µg/L	-	1					<1	<1	<1	<1	<1	<1	-	-	-	-
Iron	µg/L	50			300	10,000	300	**929**	<20	**521**	**618**	20	**647**	ND	ND	ND	**4,510**
Lanthanum	µg/L	-	1					<1	<1	<1	<1	<1	<1	-	-	-	-
Lead	µg/L	0.5	0.1	400	1	200	10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ND	ND	ND	ND
Lithium	µg/L	-	5					<5	5.5	5.4	<5	<5	<5	-	-	-	-
Manganese	µg/L	2					50	1,930	4,420	5,140	1,140	414	1,040	5,610	5,560	41.8	16,400
Mercury	µg/L	0.013	0.1		0.026	5	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.037**	-	ND	0.013
Molybdenum	µg/L	2		1,000	73	500		1	0.5	2.8	2	7.7	1.9	0.5	0.5	0.5	0.5
Nickel	µg/L	2			25			1.6	7.1	14.7	1	5.7	1.1	**39**	**37.8**	nd	5.5
Niobium	µg/L	-	1					<1	<1	<1	<1	<1	<1	-	-	-	-
Rubidium	µg/L	-	1					1.8	<1	1.9	1.1	<1	1.5	-	-	-	-
Scandium	µg/L	-	1					<1	<1	<1	<1	<1	<1	-	-	-	-
Selenium	µg/L	1	1		1	10	50	<1	<1	<1	<1	<1	<1	**4.5**	**4.7**	**11.2**	ND
Silicon	µg/L	-	600					<600	<600	<600	<600	<600	<600	-	-	-	-
Silver	µg/L	0.1	0.1		0.1	50		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ND	ND	ND	ND
Strontium	µg/L	2						27.4	6.2	10.8	37.4	4.5	64	4.5	4.6	6.4	9.6
Sulfur	µg/L	-	800					3,560	5,520	5,640	4,340	<800	6,020	-	-	-	-
Tellurium	µg/L	-	1					<1	<1	<1	<1	<1	<1	-	-	-	-
Thallium	µg/L	0.1	0.1		0.8			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ND	ND	ND	ND
Thorium	µg/L	-	1					<1	<1	<1	<1	<1	<1	-	-	-	-
Tin	µg/L	2	1					<1	<1	<1	<1	<1	<1	ND	ND	ND	ND
Titanium	µg/L	2	1					<1	<1	<1	<1	<1	<1	ND	ND	ND	ND
Tungsten	µg/L							2.4	7	25	22.4	80.8	22.4	-	-	-	-
Uranium	µg/L	0.1	1		15			<1	<1	<1	<1	<1	<1	ND	ND	ND	ND
Vanadium	µg/L	2	1					<1	<1	<1	<1	<1	<1	ND	ND	ND	ND
Yttrium	µg/L	-	1					<1	<1	1.8	<1	3.2	<1	-	-	-	-
Zinc	µg/L	5		1,000	30	500	5,000	18.8	6.1	**69.2**	3.6	5	2.4	ND	ND	ND	ND
Zirconium	µg/L		1					<1	<1	<1	<1	<1	<1	-	-	-	-

Notes:

1. MMER Schedule 4- Metal Mining Effluent Regulations

*2. Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for protection of Freshwater Aquatic Life (FAL) (1999; available online at http://ceqg-rcqe.ccme.ca) (**bold-shaded** exceeds)*

3. NLR 65/03 Schedule A - Newfoundland and Labrador Regulation 65/03

*4. Guidelines for Canadian Drinking Water Quality - Health Canada, October 2014; (**bold-underlined** exceeds)*

5. µ g/L - micrograms per liter; "-" not analyzed
nd or < - not detected above standard RDL
nd ( ) - not detected at elevated RDL indicated in brackets

6. 2012 Samples analyzed by MAXXAM Analytical Services Laboratory, Halifax, NS

7. 2014 samples analyzed by Testmark Laboratories Ltd., Garson, ON.

8. Metals results are dissolved metals

APPENDIX Q

Phase 1 Assessment for Acid Rock Drainage and Metal Leaching
ARD/ML

Joyce Lake Direct Shipping Iron Ore Project: Phase 1 Assessment for Acid Rock Drainage and Metal Leaching (ARD/ML)

PREPARED FOR:

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Sign-off Sheet

This document entitled Joyce Lake Direct Shipping Iron Ore Project: Phase 1 Assessment for Acid Rock Drainage and Metal Leaching (ARD/ML) was prepared by Stantec Consulting Ltd. for the account of Labec Century Iron Ore Corp. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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Executive Summary

Labec Century Iron Ore (Labec Century), a subsidiary of Century Iron Mines Corporation, intends to develop a Joyce Lake's Direct Shipping Iron Ore Project (DSO) in western Labrador. The project will include an open-pit mine, beneficiation plant and road to the closest railway. A tailings facility will be added in the second phase of the project for processing low-grade ore.

Stantec was retained by Labec Century to assess the potential for Acid Rock Drainage/Metal Leaching (ARD/ML) to occur from any of the project components. The assessment and ARD classification was based on 234 samples representing waste rock, ore and overburden, and 19 samples of tailings and concentrates tested for Acid-Base Accounting (ABA) tests, Shake Flask Extraction and Total Metals. In addition, Labec Century's geochemical database containing over a thousand analyses of total sulfur and carbon was also used for classification and delineation of waste rock and ore. The methodology for the assessment of ARD and ML generally follows the MEND Prediction Manual for characterizing Drainage Chemistry from the local Sulfidic Geological Materials (Price 2009).

The Open Pit will be developed within three upper lithological units of the Sokoman Formation, which is composed of bands of magnetite and hematite within chert-rich rock with variable amounts of silicates, carbonates and sulfides. These units are classified as non-Potentially Acid Generating (non-PAG) based on the median Carbonate Neutralization Potential Ratios (NPR) calculated from ABA test results, having a value of less than 2. Metal concentrations in all Shake Flask Extracts (SFE) from the units are compliant with *Mining Metal Effluent Regulation* (MMER) limits indicating low metal leaching potential.

The waste rock contains between 0.9 and 5.5% of potentially acid generating (PAG) and uncertain rock types according to preliminary estimates based on an evaluation of data in the geochemical database and the volumes of lithological units provided by Labec Century. If all rock types are deposited together, the risk of ARD/ML occurrence is low and, therefore special handling of waste rock is not required.

Concentrates and intermediate products, which will be stored on the site during the operation, were classified as non-PAG based on Sobek NPR. Potential for metal leaching from concentrate is low based on compliance of concentrate SFEs with MMER limits.

Overburden and tailings are classified as non-PAG material with low metal leaching potential based on median Carbonate NPR values being less than 2. Metal concentrations in leachates from these materials are substantially below the MMER limits and therefore runoff from the overburden and tailings effluent do not require removal of metals.

Preceding conclusions are preliminary and will be verified with ongoing kinetic testing.

Table of Contents

1.0 INTRODUCTION 1.1
1.1 OBJECTIVES AND SCOPE OF WORK 1.1

2.0 BACKGROUND 2.1
2.1 LOCATION AND TOPOGRAPHY 2.1
2.2 GEOLOGY 2.1
2.3 MINERALIZATION 2.1
2.4 MINING PLAN 2.2

3.0 METHODOLOGY 3.1
3.1 SAMPLING 3.1
3.2 LABORATORY ANALYSES 3.1
3.3 CALCULATIONS AND CRITERIA 3.3
3.3.1 Acid-Base Accounting 3.3
3.3.2 Metal Leaching Potential 3.4
3.3.3 Elemental Concentrations 3.4

4.0 RESULTS AND DISCUSSION 4.1
4.1 RUTH SHALE (RS) 4.1
4.2 LOWER RED CHERT (LRC) 4.1
4.3 LOWER MASSIVE HEMATITE (LMH) 4.6
4.4 RED CHERT (RC) 4.6
4.5 UPPER MASSIVE HEMATITE (UMH) 4.6
4.6 OVERBURDEN 4.7
4.7 CONCENTRATES 4.7
4.8 TAILINGS 4.7
4.9 OPEN PIT 4.8

5.0 DISCUSSION 5.1

6.0 CONCLUSIONS AND RECOMMENDATIONS 6.1

7.0 REFERENCES 7.1

8.0 CLOSURE 8.1

Attachments

Attachment 1 SGS Memorandum Summarizing Details of Metallurgical Tests
Attachment 2 Results of Acid-Base Accounting for Materials Exposed During the Joyce Lake Project
Attachment 3 Concentrations of Selected Elements and pH of Shake Flask Extractions from Materials Exposed During the Joyce Lake Project
Attachment 4 Concentrations of Selected Elements in Materials Exposed During the Joyce Lake Project
Attachment 5 Certificates of Analyses

List of Tables

Page

Table 2-1: Estimated Production of Ore, Waste Rock and Overburden by Year 2.3
Table 3-1: Material Classification Based on NPR Criteria 3.4
Table 4-1: Percentages of Samples Non-compliant with the Criteria for Bedrock Units and Other Materials Exposed During the Joyce Lake Project 4.2
Table 4-2: Summary of ABA statistics for Materials Exposed During the Joyce Lake Project 4.3
Table 4-3: Summary of SFE Statistics for Materials Exposed During the Joyce Lake Project 4.4
Table 4-4: Total Concentration of Selected Trace Elements Compared with the Average Concentration in the Earth's Upper Crust (ACUC)* 4.5
Table 5-1: Percentages and Tonnages of PAG and Uncertain Waste Rock 5.2

List of Figures

Page

Figure 2-1: Geological Map of the Joyce Lake Deposit Overlain with Borehole Locations, Cross-Sections and the Shell of the Proposed Pit 2.4
Figure 2-2: Longitudinal Section 2 of the Joyce Lake Deposit 2.5
Figure 2-3: Section 2.0N of the Joyce Lake Deposit 2.6
Figure 3-1: Relations Between Sulfur and Carbon Concentrations in Reanalyzed Samples 3.2

1.0 Introduction

1.1 OBJECTIVES AND SCOPE OF WORK

Labec Century Iron Ore (Labec Century), a joint ventureof Century Iron Mines Corporation, is planning to develop a Joyce Lake Direct Shipping Iron Ore Project (DSO) in western Labrador. The project will include an open-pit mine, beneficiation plant and road to the closest railway.

The project is subject to approval of the Government of Newfoundland and Labrador and environmental assessment (EA) under the Newfoundland and Labrador *Environmental Protection Act* (NL EPA) and associated Environmental Assessment Regulations. In addition, under the *Canadian Environmental Assessment Act*, 2012 (CEAA 2013), the Project is a Designated Project pursuant to Section 15(a) Regulations Designating Physical Activities which requires a federal EA. Stantec was retained by Labec Century to complete a geochemical study required by Environmental Impact Statement (EIS) Guidelines and to support the Preliminary Economic Assessment (PEA), and the subsequent Feasibility Study for the Joyce Lake DSO Project (CEAA 2013).

A phased approach was used for the study. The first phase of the study included two separate investigations:

- Acid Rock Drainage (ARD) and Metal Leaching (ML) assessment from exposed sulfidic minerals.
- Preliminary characterization of processing plant effluent (Stassinu Stantec 2012).

This report covers the first investigation, the ARD/ML assessment, which included:

- ARD classification of materials produced by the mine;
- Screening of the materials for potential elements of concern; and
- Recommendations on mitigation of ARD/ML issues.

The results will be incorporated in the EIS and in the project design treatment of liquid discharges such as drainage from stockpiles and mine water. The scope of the second phase of testing will be determined by the results of this first phase and will be more focused on kinetic testing.

2.0 Background

2.1 LOCATION AND TOPOGRAPHY

The proposed open pit mine is located in western Labrador, about 20 km northeast of Schefferville, Québec, on a peninsula in Attikamagen Lake near Joyce Lake. The property includes 309 claims over an area of 12,665 hectares (Stassinu Stantec 2012). The property is characterized by a rugged terrain of rolling hills and valleys covered with boreal forest. The elevation ranges from 472 meters above sea level (masl) to 564 masl. The overburden is composed of undifferentiated till, ranging in thickness from 3 m to 13 m (Stassinu Stantec 2012). The shallow bedrock therefore significantly influences the terrain topography.

2.2 GEOLOGY

The property is located on the western margin of the Labrador Trough (known as the Labrador-Quebec Fold belt) which is 1,100 km long and 100 km wide along the eastern margin of the Superior Craton, extending from Ungava Bay to Lake Pletpi, in Quebec. It is composed of proterozoic volcanic and sedimentary formations found between archean gneisses. Stratigraphically the property belongs to the Knob Lake Group, which is subdivided into the following eight geological formations: Seward, Lac Le Fer, Denault, Fleming, Dolly, Wishart, Sokoman and Menihek. The geological units mapped on the property were the Menihek, the Sokoman and the Wishart Formations, from the top of the stratigraphic column (SRK 2011). These units form a sedimentary cycle consisting of transgressive quartz arenite (Wishart formation), followed by shale and iron-units of the Sokoman formation, which are conformably overlain by the Menihek Formation, which is represented by carbonaceous and locally pyritic shale, slate and siltstone. The Sokoman Formation is where most of the iron ore is located.

The metamorphic grade in the Sokoman Formation ranges from sub-greenschists in the west to upper amphibolites and granulite assemblages in the east. The age of the thrusting and metamorphism is thought to be between 1,840 and 1,829 million years (Gan et al. 2012).

The property is similar structurally to the overall Joyce Lake syncline, plunging 20°-30° to the southeast and beds dipping 30°-40° towards the center at the tip of the fold (Figures 2-1 to 2-3). There is structural evidence of two folding events and faulting that provided space for circulation of meteoric fluids. The mineralization occurs mainly between tight, overturned synclines and high angle reverse faults (Gan et al. 2012).

2.3 MINERALIZATION

The iron mineralization of the Sokoman Formation is classified as Lake Superior type. It occurs in a sedimentary unit composed of bands of magnetite and hematite within chert-rich rock and variable amounts of silicate-carbonate-sulphide. The high-grade iron ore is thought to have

formed in-situ along bedding planes and fractures with hydrothermal or meteoric fluids circulation causing hematite to crystallize and other gangue minerals to leach resulting in iron enrichment (Gan et al. 2012).

Five lithological units were locally defined within the Sokoman Formation from the bottom upwards, according to Gan et al. (2012):

- Ruth Shale (RS), black colored shale and sometimes defined as Ruth Formation.
- Lower Red Chert (LRC), blue grey shale-chert mixed with less than 40% of hematite.
- Lower Massive Hematite (LMH), generally 40-70% hematite and blue grey shale.
- Red Chert (RC), dominated by <40% hematite, and chert and blue grey shale mixture.
- Upper Massive Hematite (UMH), generally 40-70% hematite and blue grey shale.

Based on a mineralogical analysis of 13 samples done by Corem for Labec Century in 2012, the hematite is the main source of iron ore whereas the magnetite content in the ore is low. The hematite is fine grained and closely associated with quartz. Significant iron enrichment also occurs as iron carbonates (siderite), iron silicates (minnesotite) and manganese carbonates (rhodocrosite, kutnahorite) altered to iron oxides, goethite, limonite and manganese oxides. Other minerals identified by X-Ray Diffraction (XRD) in the samples include chlorite, pyrite and calcite (Corem 2012).

2.4 MINING PLAN

The mining operation will be performed using one pit. The single open pit will be mined primarily with drilling; blasting will be applied as required. Loading of iron ore into haulage trucks will be accomplished using a shovel and wheel loader. Current mining plans indicate that ore will be mined from three lithological units of Sokoman Formation: LMH, RC, and UMH. The estimated production plans for ore waste rock and overburden is shown in Table 2-1 (based on Chong 2013a pers. comm.).

Beneficiation of ore will include a dry circuit with two crushing and two screening steps necessitating no water addition, during of the first phase of the project (2015-2017). Therefore, the beneficiation plant will not produce any tailings at that time. A wet circuit will be added in the second phase of the project (post 2018), when ore with lower grade will be processed, resulting in tailings generation. Currently volume of tailings is unknown because processing details for Phase II have not yet been determined and are being studied.

Table 2-1: Estimated Production of Ore, Waste Rock and Overburden by Year

Description	Units	2014		2015		2016		2017		2018		Total
		Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	
Product	**kt**	**0**		**1,000**		**1,987**		**1,987**		**1,987**		**6,960**
Feed to Plant	kt	0	0	0	1,000	0	1,987	0	1,987	0	1,987	6,960
ROM to Stockpile A[1]	kt	0	94	0	911	0	429	0	1,415	0	0	2,849
ROM to Stockpile A[2]	kt	0	0	905	0	1,076	0	1,557	0	572	0	4,111
Stockpile A to B	kt	0	0	94	0	911	0	429	0	1,415	0	2,849
Total Waste	kt	0	949	1,181	10,403	2,004	13,658	2,148	3,227	140	0	33,711
Waste Rock	kt	0	881	976	9,736	1,607	12,840	1,614	2,679	93	0	30,425
Low Grade	kt	0	69	205	668	397	818	534	548	47	0	3,287
Total Material Moved	*kt*	*0*	*1,044*	*2,180*	*11,314*	*3,990*	*14,088*	*4,135*	*4,642*	*2,128*	*0*	*43,520*
Total Material Moved	*t/d*	*0*	*17,393*	*23,893*	*41,329*	*43,731*	*51,461*	*45,313*	*16,957*	*23,317*	*0*	
Strip Ratio		*10.1*		*6.4*		*10.4*		*1.8*		*0.2*		*4.8*

[1] - Stockpile A is the ROM stockpile on the Joyce Lake side of Iron Arm
[2] - Stockpile B is the stockpile next to the crushing and screening operation
Source: Labec Century (Chong 2013b pers. comm.)

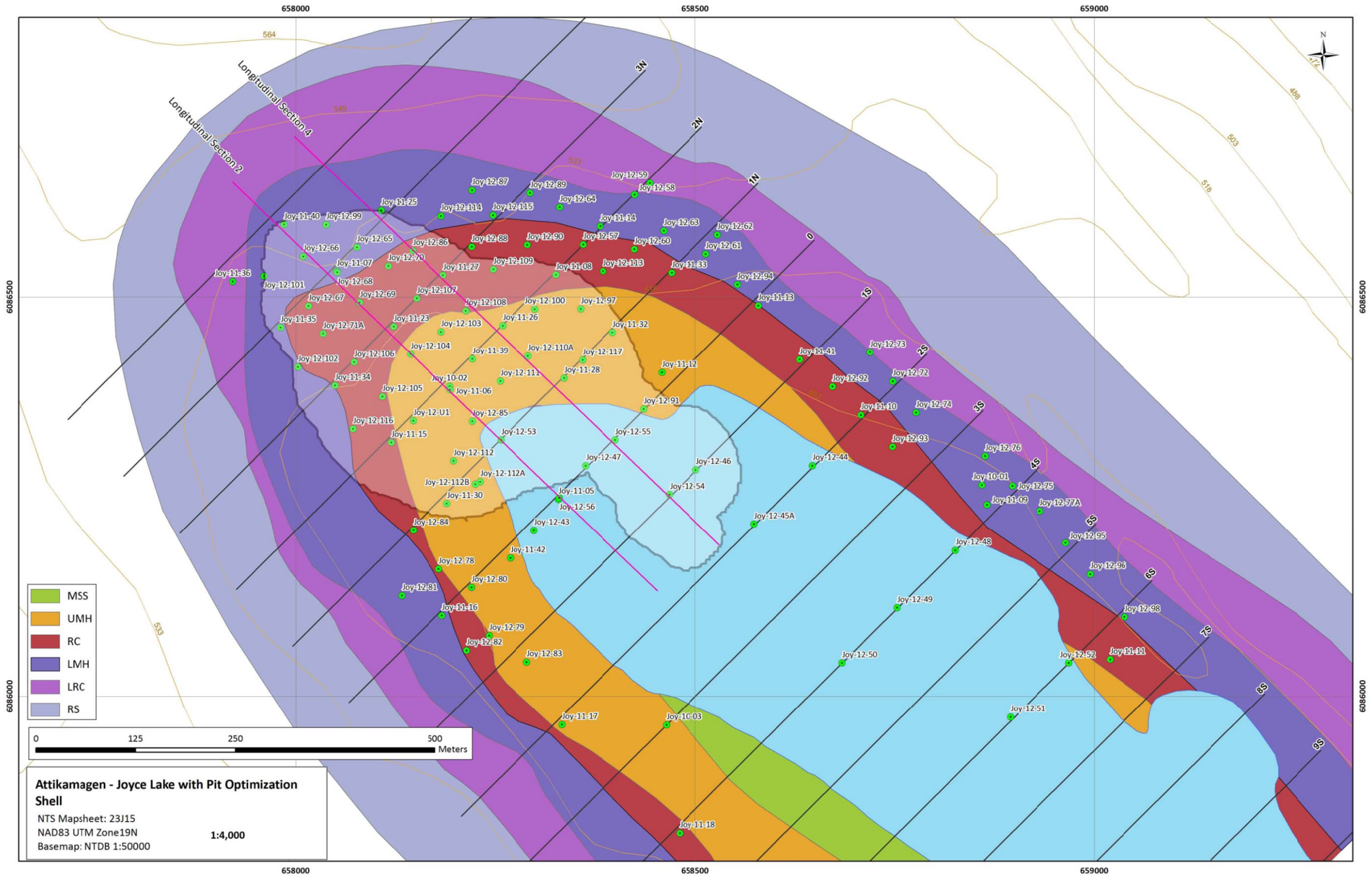

Figure 2-1: Geological Map of the Joyce Lake Deposit Overlain with Borehole Locations, Cross-Sections and the Shell of the Proposed Pit
Source: Labec Century

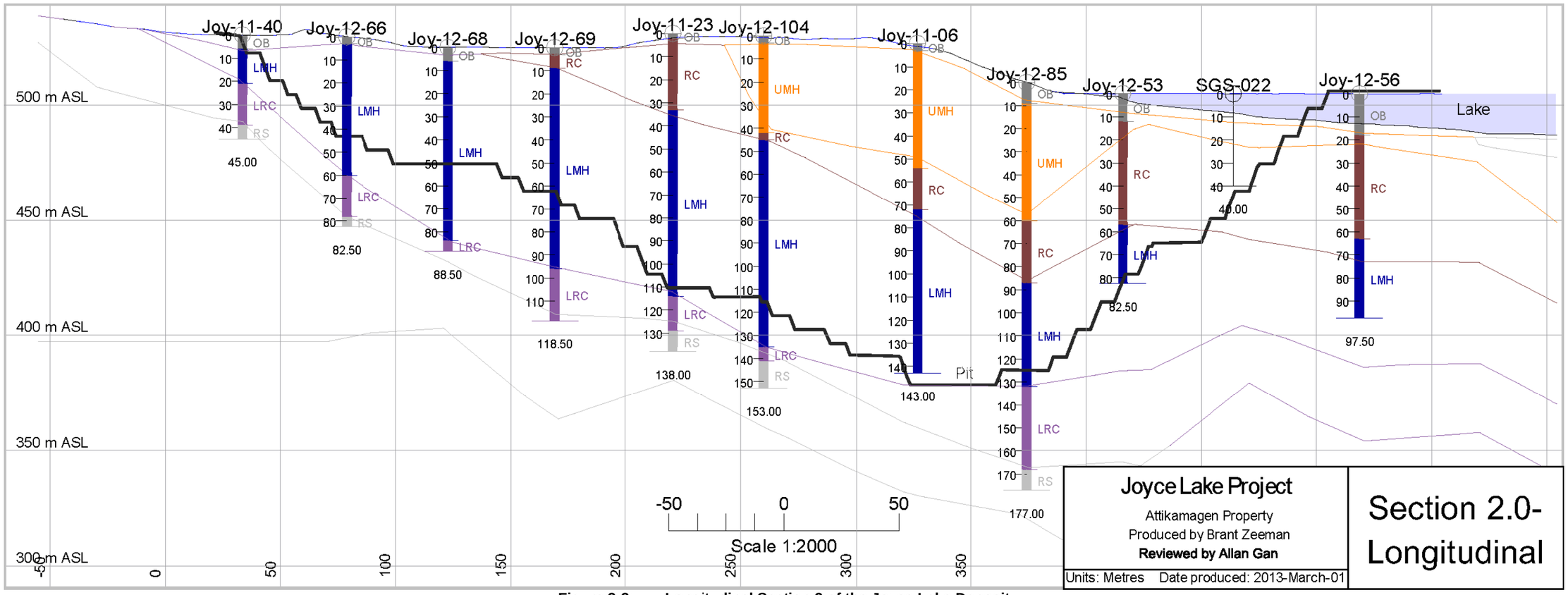

Figure 2-2: Longitudinal Section 2 of the Joyce Lake Deposit
Source: Labec Century

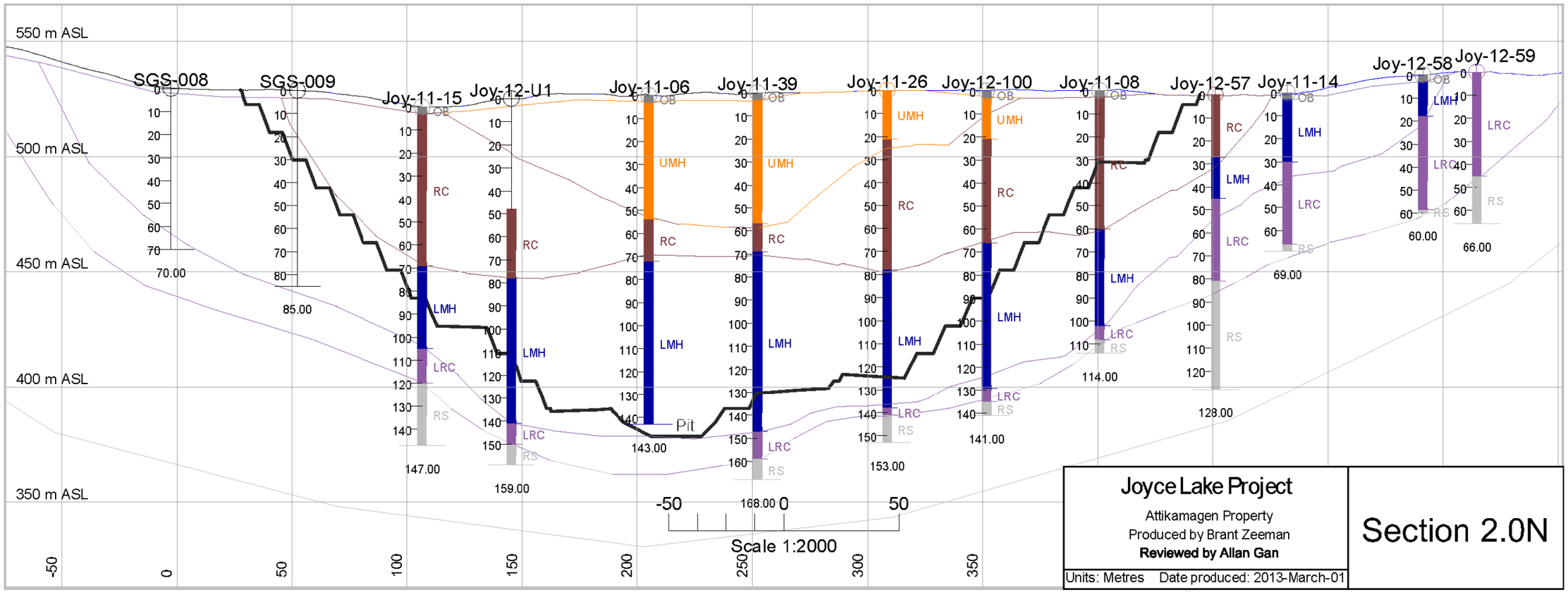

Figure 2-3: Section 2.0N of the Joyce Lake Deposit

Source: Labec Century

3.0 Methodology

The methodology for the assessment of ARD and ML generally followed the MEND ("Mine Effluent Neutral Drainage") Prediction Manual for characterizing Drainage Chemistry from the Sulfidic Geological Materials (Price 2009).

3.1 SAMPLING

A total of 234 samples of waste rock, ore and overburden were collected. Nineteen (19) samples of the overburden were collected from the surface, while the rest of the samples were obtained from previous Labec Century drilling programs. These programs included collection of drill cuttings, which were produced by the reverse circulation drilling method and were composed at 3-meter intervals along each borehole. Details on drilling and sampling are presented in Gan et al. (2012).

Samples of tailing and concentrates were collected in triplicate during metallurgical testing, which was done by SGS under the direction of Soutex. The details on different metallurgical tests resulting in the generation of these samples are presented in a memorandum prepared by SGS Laboratory (Attachment 1). In total, eighteen (18) samples of tailings, concentrates and intermediate materials were collected.

3.2 LABORATORY ANALYSES

Static tests of waste rock and overburden include Acid Base Accounting (ABA), Shake Flask Extraction (SFE) and analysis for concentrations of total elements.

All (252) samples were analyzed for ABA, and included the following tests:

- Paste pH using calibrated pH-meter.
- Total sulfur; determined by Leco furnace.
- Sulfate sulfur; extracted by dilute hydrochloric acid digestion and measured by colorimetry.
- Sulfide sulfur; calculated as the difference between total sulfur and sulfate sulfur and used to calculate acid potential (AP).
- Modified Sobek neutralization potential (Sobek NP) using EPA-600 titration method (Sobek 1978).
- Total inorganic carbon measured by a Leco furnace.

- Carbonate carbon separated by pyrolysis (heating to 550oC) from organic carbon and measured by a Leco furnace. Carbonate carbon was used to calculate Carbonate neutralization potential (Carbonate NP).

The results of the ABA are presented in Attachment 1. In addition to these results, Labec Century analyzed 1,340 samples of ore and water rock for total carbon and total sulfur. These analyses were repeated in some samples for quality control during this study, and the results show good agreement between the datasets (Figure 3-1). This allows classification of rock and ore using a relatively large dataset, which provides better confidence in the estimates. Eighty six (86) and one hundred and six (136) samples were selected for elemental analysis and Shake Flask Extraction testing, respectively. Elemental analysis included aqua regia digestion of

pulverized samples and measurement of elements by Inductively Coupled Plasma Mass Spectrometry (ICP/MS). Shake Flask Extraction involved continuous mixing of 250 g of a crushed sample with 750 mL of deionized water for 24 hours. Resulting leachate was filtered and analyzed for trace elements by ICP/MS and by cold vapor Atomic Adsorption Spectrometry (AAS) for mercury. The results of SFE and elemental analysis are summarized in Attachments 2 and 3, respectively.

Samples for humidity cell testing were selected based on ABA results during the first phase of the study. Kinetic testing started in the first week of May 2013.

Attachment 4 contains certificates of analyses mentioned in this section. These certificates contain specific details on analytical methods and QC/QA.

3.3 CALCULATIONS AND CRITERIA

Values below the detection limit were set at half the value of the detection limit in calculations discussed below.

3.3.1 Acid-Base Accounting

ABA parameters were calculated based on the results of the analyses:

Acid Potential (AP as $CaCO_3$t/1000t) = Sulfide sulfur (wt%) x 31.25 (1)

Carbonate Neutralization Potential (Carbonate NP, $CaCO_3$t/1000t) = CO_3 (wt%) x 16.7 (2)

Sobek Net Neutralization Potential (Sobek NNP, $CaCO_3$t/1000t) = Sobek NP- AP (3)

Carbonate Net Neutralization Potential (Carbonate NNP, $CaCO_3$t/1000t) =

Carbonate NP – AP (4)

Sobek Neutralization Ratio (Sobek NNR)= Sobek NP/AP) (5)

Carbonate Neutralization Potential Ratio (Carbonate NPR) = Carbonate NP/AP (6)

The Labec Century data was also used to calculate AP, NP and Carbonate NPR values based on total concentrations of sulfur and carbon as follows:

Acid Potential (AP as $CaCO_3$t/1000t) = Total sulfur (wt%) x 31.25 (7)

Carbonate Neutralization Potential (Carbonate NP, $CaCO_3$t/1000t) = Carbon (wt%) x 83.3 (8)

Carbonate Neutralization Potential Ratio (Carbonate NPR) = Carbonate NP/AP (9)

These calculations assume that all carbon is present in the form of carbonate and sulfur occurs in sulfide minerals. This assumption is based on visual mineralogical descriptions and XRD analyses of the ore (Corem 2012).

Neutralization Potential Ratio (NPR = NP/AP) is used as a generic criteria for the classification of sulfide materials in Canada and is presented in Table 3-1 (Price 2009). Because median values are less sensitive to outliers, classification of geological units is based on the median NPR in this assessment. Carbonate NPR values are generally lower than Sobek NPR. Therefore, Carbonate NPR median values were used for the classification of geological units in an effort to provide a conservative analysis.

Table 3-1: Material Classification Based on NPR Criteria

NPR Criteria	Material Classification
NPR > 2	Non-Potentially Acid Generating (Non-PAG)
2 > NPR > 1	Uncertain Rock Type
NPR < 1	Potentially Acid Generating (PAG) or Acid Generating (AG)

3.3.2 Metal Leaching Potential

Metal concentrations and pH in SFE leachates were compared to respective parameters prescribed by the *Metal Mining Effluent Regulation* (MMER 2002) in order to identify potential parameters of concern. Comparison of the SFE results to the MMER limits represents only a qualitative comparison, because the rock:solution ratio (1:3) used in the extraction will differ from the actual project ratio. A more accurate evaluation of metal leaching can be done using water-quality modeling which includes conducting a water balance and evaluating element loadings from kinetic tests. Results of the SFE were also compared with relevant parameters in the federal *Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life* (CCME 1999, updated periodically). Because the CCME guidelines do not apply to the effluent, the comparison was done only to screen potential contaminants of concern which might affect a receiving water body.

3.3.3 Elemental Concentrations

Element concentrations in the overburden, ore, and waste rock were compared with average elemental abundances in the upper crust (Rudnick and Gao 2004). Element concentrations exceeding ten times the average elemental abundances were considered to have the potential of enriching the sample and environmental significance. However, elemental enrichment alone does not adequately predict the leaching behavior of that element.

4.0 Results and Discussion

The following sections discuss the static testing results carried out on samples from the main lithological units, overburden and tailings. Percentages of samples exceeding certain criteria are identified in Table 4-1, while a summary of statistical distributions for ABA parameters, elemental concentrations in SFE and total elemental concentrations are presented in Tables 4-2, 4-3 and 4-4, respectively.

4.1 RUTH SHALE (RS)

Ruth shale will not be mined. This unit was included in the evaluation because mining plans were not finalized when the samples were selected for the ARD/ML assessment. Median values of Carbonate NPR are below 2, and therefore Ruth shale is classified as Potentially Acid Generating (PAG) material (Table 4-2).

Copper concentrations of SFE exceed the MMER limit in 11% of the samples while nickel, lead and zinc are above the limits in 4% of the samples (Table 4-1). These exeedances are observed in samples generating acidic leachate (Attachment 2). The CCME water-quality guidelines are exceeded in SFE for all regulated trace-elements except molybdenum and uranium. CCME guideline exceedances are observed at the highest frequency (>40% of samples analyzed) for the following elements: selenium, cadmium, cobalt, copper and zinc indicating potential contaminants of concern (Tables 4-1 and 4-3).

4.2 LOWER RED CHERT (LRC)

The Lower Red Chert lies outside of the proposed pit shell, and therefore will not be mined according to current mining plans (Figures 2-1 to 2-3). This unit contains 18% PAG rock and 10% uncertain material classified by a Carbonate NPR value between 1 and 2 (Table 4-2). The median Carbonate NPR value is greater than 2 (3.87), which classifies the LRC unit as Non-PAG rock.

Concentrations of metals in SFE from the LRC unit comply with the MMER limits. The CCME guidelines are exceeded in SFE for cobalt, cadmium, selenium, mercury, copper, zinc and aluminum (Tables 4-1 and 4-3). Some LRC samples show enrichment for manganese and selenium with respect to average crustal concentrations (Tables 4-1 and 4-4). Preceding screening results indicate that the metal leaching potential of the LRC unit is low.

Table 4-1: Percentages of Samples Non-compliant with the Criteria for Bedrock Units and Other Materials Exposed During the Joyce Lake Project

Parameter	Units	Criteria	RS unit		LRC unit		LMH unit		RC unit		UMH unit		Overburden		Concentrate		Tailings	
			n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Acid-Base Accounting																		
Samples analyzed for ABA			54	100	50	100	32	100	46	100	8	100	42	100	15	100	3	100
Paste pH	pH unit	<4.5	14	26	4	8	0	0	0	0	0	0	0	0	0	0	0	0
NPR sobek	ratio	<2	36	67	10	20	2	6	0	0	0	0	3	7	0	0	0	0
NPR sobek	ratio	<1	33	61	9	18	1	3	0	0	0	0	3	7	0	0	0	0
NPR carbonate	ratio	<2	38	70	14	28	9	28	5	11	1	13	5	12	15	100	1	33
NPR carbonate	ratio	<1	37	69	9	18	3	9	0	0	0	0	1	2	8	53	0	0
Stot		> 0.01	50	93	21	42	6	19	3	7	6	75	19	45	0	0	0	0
Samples analyzed fortrace-metals			27	100	25	100	16	100	23	100	4	100	23	100	15	100	3	100
Shake Flask Extractions greater than the criteria - CCME FAL Guidelines																		
Hg	mg/L	>0.000026	6	22	3	12	3	19	0	0	0	0	13	57	0	0	0	0
Ag	mg/L	>0.0001	2	7	0	0	0	0	0	0	0	0	8	35	0	0	0	0
Al	mg/L	>0.1	10	37	1	4	0	0	1	4	0	0	14	61	3	20	3	100
As	mg/L	>0.005	3	11	0	0	0	0	1	4	0	0	4	17	0	0	0	0
Cd	mg/L	>0.00004	23	85	8	32	0	0	0	0	1	25	11	48	0	0	0	0
Co	mg/L	>0.004	22	81	9	36	0	0	0	0	0	0	7	30	0	0	0	0
Cr	mg/L	>0.001	4	15	0	0	1	6	1	4	0	0	13	57	6	40	3	100
Cu	mg/L	>0.0028	16	59	3	12	0	0	1	4	0	0	17	74	0	0	0	0
Fe	mg/L	>0.3	7	26	0	0	3	19	4	17	0	0	14	61	6	40	3	100
Mo	mg/L	>0.073	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni	mg/L	>0.113	8	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	mg/L	>0.0063	1	4	0	0	0	0	0	0	0	0	1	4	0	0	0	0
Se	mg/L	>0.001	24	89	7	28	3	19	0	0	0	0	2	9	0	0	0	0
Tl	mg/L	>0.0008	4	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	mg/L	>0.015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	mg/L	>0.03	12	44	2	8	0	0	1	4	0	0	4	17	0	0	0	0
Shake Flask Extractions greater than the criteria - MMER Guidelines																		
As	mg/L	>0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	mg/L	>0.3	3	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ni	mg/L	>0.5	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	mg/L	>0.2	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	mg/L	>0.5	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elemental cocnetrations above 10x average in upper crust (Rudnick and Gao, 2004)																		
Samples Analyzed for total Metals			14	100	11	100	8	100	11	100	1	100	23	100	15	100	3	100
Ag	µg/g	>530	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
As	µg/g	>48	0	0	0	0	1	13	0	0	0	0	0	0	9	60	3	100
Ba	µg/g	>6280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bi	µg/g	>1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cd	µg/g	>0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Co	µg/g	>173	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cr	µg/g	>920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	µg/g	>280	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0
Mn	µg/g	>3678	5	36	4	36	4	50	0	0	0	0	1	4	0	0	0	0
Mo	µg/g	>11	8	57	1	9	0	0	0	0	0	0	0	0	0	0	0	0
Ni	µg/g	>470	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	µg/g	>170	1	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sb	µg/g	>4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Se	µg/g	>0.9	14	100	4	36	2	25	0	0	0	0	2	9	0	0	3	100
Sn	µg/g	>23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sr	µg/g	>3200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ti	µg/g	>25632	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tl	µg/g	>9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	µg/g	>27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	µg/g	>970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	µg/g	>670	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MMER - Metal Mining Effluent Regulations (2002)
CCME FAL - Canadian Council of Ministers of the Environment Guidelines for Protection of Freshwater Aquatic Life (1999)

Table 4-2. Summary of ABA Statistics for Materials Exposed During the Joyce Lake Project

Parameter	Paste pH	Final pH	NP_{Sobek}	NP_{Carb}	AP	NNP_{Sobek}	NNP_{Carb}	NPR_{Sobek}	NPR_{Carb}	S_{Total}	$S_{Sulfate}$	$S_{Sulphide}$	C_{Total}	CO_3
Units	pH units	units	t CaCO3/1000 t					ratio		wt. %				
Ruth Shale (RS), 54 samples.														
Min	3.44	0.84	0.0	0.67	0.16	-71	-79	**0**	**0.01**	0.005	0.005	0.005	0.031	0.040
10th, %ile	3.92	0.93	1.0	0.78	0.16	-40	-41	**0.04**	**0.03**	0.005	0.010	0.005	0.103	0.047
Median	5.49	1.01	2.8	1.08	15	-8	-14	**0.45**	**0.08**	0.48	0.040	0.480	1.090	0.065
90th, %ile	6.21	1.79	20	1.58	42	5	0.8	19	5.9	1.35	0.177	1.35	2.271	0.095
Max	6.74	1.98	50	2.17	81	27	1.4	35	10.1	2.58	0.510	2.58	4.940	0.13
Average	5.23	1.13	6.8	1.14	19	-12	-17	5.79	**1.73**	0.59	0.077	0.59	1.179	0.068
Standard Deviation	0.89	0.30	12.1	0.32	19	20	19	9.44	2.75	0.62	0.088	0.62	1.002	0.019
Lower Red Chert (LRC), 50 samples.														
Min	4.40	0.86	0.0	0.04	0.16	-28.49	-28.60	**0**	**0.04**	0.005	0.005	0.005	0.015	0.003
10th, %ile	4.55	0.91	0.6	0.24	0.16	-4.06	-2.89	**0.08**	**0.26**	0.005	0.005	0.005	0.019	0.015
Median	5.76	1.03	1.3	0.79	0.16	0.94	0.43	7.36	3.87	0.005	0.005	0.005	0.062	0.048
90th, %ile	6.30	1.14	2.8	1.18	4.28	2.64	0.93	18	6.46	0.137	0.031	0.14	0.866	0.071
Max	7.40	1.19	4.9	1.42	29.69	4.74	1.01	31	7.47	0.950	0.210	0.95	1.840	0.085
Average	5.66	1.04	1.5	0.75	1.76	-0.25	-0.99	8.4	3.67	0.056	0.021	0.06	0.285	0.045
Standard Deviation	0.67	0.09	1.0	0.35	5.18	5.20	5.03	6.7	2.31	0.166	0.040	0.17	0.449	0.021
Lower Magnetite-Hematite (LMH), 32 samples.														
Min	5.21	0.93	1.2	0.04	0.16	-0.58	-0.27	**0.7**	**0.27**	0.005	0.005	0.005	0.011	0.003
10th, %ile	5.62	0.96	1.4	0.18	0.16	1.06	0.01	7.7	**1.07**	0.005	0.005	0.005	0.012	0.011
Median	6.10	1.04	1.8	0.50	0.16	1.59	0.26	11	2.67	0.005	0.005	0.005	0.019	0.030
90th, %ile	6.60	1.10	2.8	1.06	0.30	2.61	0.68	16	5.3	0.010	0.020	0.010	0.202	0.064
Max	7.01	1.16	4.6	4.42	1.88	4.44	4.26	29	28	0.060	0.040	0.060	1.240	0.27
Average	6.14	1.04	2.0	0.67	0.25	1.75	0.42	12	3.67	0.008	0.009	0.008	0.110	0.040
Standard Deviation	0.41	0.06	0.7	0.78	0.34	0.82	0.76	5.2	4.8	0.011	0.009	0.011	0.273	0.047
Red Chert (RC), 46 samples.														
Min	5.51	0.90	0.9	0.17	0.16	0.74	0.01	5.8	**1.07**	0.005	0.005	0.005	0.009	0.010
10th, %ile	5.84	0.97	1.2	0.33	0.16	1.04	0.14	7.7	**1.87**	0.005	0.005	0.005	0.013	0.020
Median	6.37	1.05	1.6	0.42	0.16	1.44	0.26	10.2	2.67	0.005	0.005	0.005	0.019	0.025
90th, %ile	6.93	1.11	2.4	0.54	0.16	2.24	0.39	15	3.47	0.005	0.005	0.005	0.09	0.03
Max	7.80	1.17	4.2	2.34	0.31	4.04	2.18	27	15	0.010	0.020	0.010	0.34	0.14
Average	6.38	1.04	1.8	0.48	0.16	1.62	0.32	11.1	3.02	0.005	0.006	0.005	0.04	0.029
Standard Deviation	0.46	0.06	0.7	0.36	0.02	0.68	0.36	4.1	2.33	0.001	0.004	0.001	0.060	0.022
Upper Magnetite Hematite (UMH), 8 samples.														
Min	5.21	0.91	1.0	0.25	0.16	0.84	0.09	6.4	**1.60**	0.005	0.005	0.005	0.018	0.015
10th, %ile	5.60	0.92	1.1	0.31	0.16	0.91	0.15	6.8	**1.97**	0.005	0.005	0.005	0.019	0.019
Median	5.88	0.97	1.7	0.33	0.16	1.49	0.18	10.6	2.13	0.015	0.015	0.005	0.031	0.020
90th, %ile	6.03	0.99	2.4	0.42	0.16	2.20	0.26	15.1	2.67	0.005	0.023	0.005	0.143	0.025
Max	6.10	1.00	2.5	0.42	0.16	2.34	0.26	16.0	2.67	0.005	0.030	0.005	0.227	0.025
Average	5.82	0.96	1.7	0.35	0.16	1.49	0.20	10.6	2.27	0.005	0.015	0.005	0.066	0.021
Standard Deviation	0.27	0.04	0.6	0.06	0.00	0.55	0.06	3.54	**0.38**	0.000	0.009	0.000	0.072	0.004
Overburden, 43 samples.														
Min	4.90	0.96	-1.2	0.23	0.16	-1.36	-0.89	**-7.7**	**0.72**	0.005	0.005	0.005	0.019	0.014
10th, %ile	5.16	0.99	1.3	0.51	0.16	0.87	0.23	5.8	**1.82**	0.005	0.005	0.005	0.061	0.031
Median	5.60	1.19	3.2	0.83	0.16	2.97	0.59	18	4.8	0.005	0.010	0.005	0.587	0.050
90th, %ile	7.12	1.32	5.9	1.91	0.31	5.7	1.56	34	10.5	0.010	0.030	0.010	1.145	0.11
Max	7.86	1.78	12.0	4.92	3.13	9	3.13	49	21	0.10	0.060	0.10	30.200	0.30
Average	5.99	1.19	3.6	1.11	0.33	3.2	0.78	18	5.6	0.010	0.014	0.010	1.431	0.066
Standard Deviation	0.81	0.15	2.4	0.85	0.62	2.2	0.66	11	3.8	0.020	0.013	0.02	4.674	0.051
Concentrate, 15 samples.														
Min	6.02	0.96	0.6	0.04	0.16	0.44	-0.15	2.6	**0.27**	0.005	0.005	0.005	0.008	0.003
10th, %ile	6.38	0.97	0.6	0.04	0.16	0.44	-0.11	3.8	**0.27**	0.005	0.005	0.005	0.010	0.003
Median	6.63	1.01	0.9	0.17	0.16	0.74	-0.11	5.8	**0.53**	0.005	0.005	0.005	0.013	0.010
90th, %ile	6.76	1.09	3.9	0.17	0.16	3.78	0.01	25	**1.07**	0.005	0.005	0.005	0.020	0.010
Max	6.96	1.22	6.3	0.25	0.31	6.14	0.09	40	**1.60**	0.010	0.005	0.010	0.022	0.015
Average	6.59	1.02	1.6	0.11	0.17	1.44	-0.05	10.1	**0.69**	0.005	0.005	0.005	0.015	0.007
Standard Deviation	0.22	0.07	1.7	0.07	0.04	1.73	0.08	11.1	0.46	0.001	0.000	0.001	0.004	0.004
Tailings, 3 samples.														
Min	6.79	1.00	0.9	0.33	0.16	0.59	0.18	2.88	**1.60**	0.005	0.005	0.005	0.046	0.020
10th, %ile	6.79	1.01	0.9	0.35	0.16	0.64	0.18	3.58	**1.71**	0.005	0.005	0.005	0.046	0.021
Median	6.80	1.03	1.0	0.42	0.16	0.84	0.19	6.4	2.13	0.005	0.005	0.005	0.046	0.025
90th, %ile	6.81	1.04	1.3	0.48	0.28	1.16	0.25	8.4	2.56	0.009	0.005	0.009	0.048	0.029
Max	6.81	1.04	1.4	0.50	0.31	1.24	0.26	9.0	2.67	0.010	0.005	0.010	0.048	0.030
Average	6.80	1.02	1.1	0.42	0.21	0.89	0.21	6.1	2.13	0.007	0.005	0.007	0.047	0.025
Standard Deviation	0.01	0.02	0.3	0.08	0.09	0.33	0.05	3.05	0.53	0.003	0.000	0.003	0.001	0.005

Notes: NP_{Sobek} = Modified Sobek Neutralization Potential; NP_{Carb} (Carbonate Neutralization Potential) = CO3 *16.7

AP (Acid Potential) = % Sulphide Sulphur x 31.25

NNP_{Sobek} (Sobek Net Neutralization Potential) = NP_{Sobek}-AP; NNP_{Carb} (Carbonate Net Neutralization Potential) = NP_{Carb}-AP

NNR_{Sobek} (Sobek Neutralization Ratio) = NP_{Sobek}/AP; NPR_{Carb} (Carbonate Neutralization Neutralization Ratio) = NP_{Carb}/AP

NPR values below 2 are bolded; see details of analytical methods in Certificates of Analyses

Table 4-3. Summary of SFE Statistics for Materials Exposed During the Joyce Lake Project

Parameter	Initial pH	Final pH	Hg	Ag	Al	As	Cd	Co	Cr	Cu	Fe	Mo	Ni	Pb	Se	Tl	U	Zn
Units	pH units	pH units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
MMER Guideline	-	-	-	-	-	0.500000	-	-	-	0.300000	-	-	0.500000	0.200000	-	-	-	0.500000
CCME FAL Guideline	4.5-9.5	4.5-9.5	0.000026	0.000100	0.100000	0.005000	0.000040	0.004000	0.001000	0.002800	0.300000	0.073000	0.113000	0.006300	0.001000	0.000800	0.015000	0.030000
Ruth Shale (RS), 54 samples.																		
Min	**3.23**	**3.31**	0.000005	0.000005	0.005	0.0001	0.0000015	0.000168	0.00025	0.00025	0.0015	0.000005	0.00020	0.00001	0.0005	0.00001	0.000001	0.0005
10th, %ile	**3.43**	**3.68**	0.000005	0.000005	0.005	0.0001	0.0000232	0.000744	0.00025	0.00052	0.0050	0.000005	0.00336	0.00001	0.0020	0.00001	0.000005	0.0036
Median	4.67	5.16	0.000005	0.000005	0.020	0.0011	0.0002360	**0.0598**	0.00025	0.00540	0.0460	0.000030	0.03850	0.00001	0.0090	0.00023	0.000029	0.0180
90th, %ile	6.24	6.39	0.000050	0.000064	**4.566**	0.0052	**0.0012600**	**0.466**	0.00186	**0.20360**	2.55	0.000770	0.20240	0.00040	**0.0624**	0.00106	0.001245	0.1818
Max	7.05	7.03	0.000140	0.000180	**6.670**	**0.0627**	**0.0166000**	**4.080**	**0.03580**	**2.20000**	**38**	0.004110	**2.66000**	**0.92000**	**1.9500**	0.00259	0.006425	**0.5140**
Average	4.82	5.08	0.000018	0.000028	0.979	0.0038	**0.0010231**	**0.2815**	0.00239	**0.18709**	2.0771	0.000380	0.17661	0.03420	**0.0921**	0.00045	0.000647	0.0730
Standard Deviation	1.14	1.11	0.000029	0.000043	2.005	0.0119	0.0031476	0.785535	0.00736	0.55599	7.4685	0.000915	0.50590	0.17703	0.3728	0.00068	0.001573	0.1133
Lower Red Chert (LRC), 50 samples.																		
Min	**3.72**	**4.05**	0.000005	0.000005	0.005	0.0001	0.0000015	0.000078	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.0005	0.00001	0.000001	0.0005
10th, %ile	4.55	4.87	0.000005	0.000005	0.005	0.0001	0.0000015	0.000181	0.00025	0.00025	0.0015	0.000005	0.00018	0.00001	0.0005	0.00001	0.000001	0.0005
Median	5.21	5.59	0.000005	0.000005	0.005	0.0001	0.0000100	0.001980	0.00025	0.00025	0.0015	0.000005	0.00460	0.00001	0.0005	0.00001	0.000005	0.0020
90th, %ile	6.17	6.28	0.000026	0.000010	0.016	0.0013	0.0001192	0.038960	0.00025	0.00780	0.0840	0.000078	0.01770	0.00002	**0.0146**	0.00044	0.000024	0.0122
Max	6.51	6.51	0.000240	0.000020	0.340	0.0033	0.0003620	**0.136000**	0.00025	**0.03260**	0.2110	0.000550	0.08310	0.00007	**0.0450**	0.00059	0.000091	0.0990
Average	5.32	5.57	0.000018	0.000007	0.023	0.0004	0.0000477	0.013083	0.00025	0.00286	0.0238	0.000039	0.00998	0.00002	0.0048	0.00012	0.000012	0.0097
Standard Deviation	0.73	0.64	0.000048	0.000004	0.067	0.0008	0.0000880	0.031723	0.00000	0.00729	0.0508	0.000113	0.01951	0.00002	0.0106	0.00018	0.000019	0.0229
Lower Magnetite-Hematite (LMH), 32 samples.																		
Min	5.01	5.38	0.000005	0.000005	0.005	0.0001	0.0000015	0.000008	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.0005	0.00001	0.000002	0.0005
10th, %ile	5.53	5.73	0.000005	0.000005	0.005	0.0001	0.0000015	0.000014	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.0005	0.00001	0.000002	0.0005
Median	6.27	6.41	0.000008	0.000005	0.005	0.0003	0.0000030	0.000078	0.00025	0.00025	0.0028	0.000005	0.00030	0.00002	0.0005	0.00001	0.000005	0.0005
90th, %ile	7.60	7.55	0.000050	0.000005	0.025	0.0010	0.0000095	0.000372	0.00038	0.00090	1.6010	0.000018	0.00425	0.00012	0.0020	0.00002	0.000022	0.0035
Max	8.09	7.73	0.000090	0.000005	0.030	0.0016	0.0000120	0.000473	0.00120	0.00150	2.9100	0.000130	0.01470	0.00037	0.0030	0.00005	0.000049	0.0300
Average	6.47	6.56	0.000018	0.000005	0.010	0.0004	0.0000042	0.000126	0.00033	0.00043	0.3964	0.000014	0.00163	0.00005	0.0008	0.00001	0.000010	0.0029
Standard Deviation	0.87	0.72	0.000025	0.000000	0.009	0.0004	0.0000035	0.000149	0.00024	0.00038	0.9482	0.000031	0.00398	0.00009	0.0008	0.00001	0.000013	0.0073
Red Chert (RC), 46 samples.																		
Min	4.84	5.28	0.000005	0.000005	0.005	0.0001	0.0000015	0.000005	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.0005	0.00001	0.000001	0.0005
10th, %ile	5.24	5.84	0.000005	0.000005	0.005	0.0001	0.0000015	0.000035	0.00025	0.00025	0.0015	0.000005	0.00006	0.00001	0.0005	0.00001	0.000001	0.0005
Median	6.22	6.66	0.000005	0.000005	0.005	0.0001	0.0000015	0.000220	0.00025	0.00025	0.0040	0.000005	0.00050	0.00001	0.0005	0.00001	0.000004	0.0005
90th, %ile	7.07	7.30	0.000010	0.000009	0.020	0.0007	0.0000134	0.001598	0.00025	0.00196	**0.65**	0.002162	0.00468	0.00003	0.0005	0.00002	0.000021	0.0072
Max	8.32	8.42	0.000020	0.000040	0.440	0.0052	0.0000310	0.002500	0.00170	0.00340	**47**	0.013200	0.02160	0.00026	0.0010	0.00005	0.000585	0.0570
Average	6.22	6.57	0.000006	0.000007	0.028	0.0004	0.0000053	0.000615	0.00035	0.00058	2.2196	0.000888	0.00222	0.00002	0.0005	0.00001	0.000041	0.0040
Standard Deviation	0.83	0.75	0.000003	0.000008	0.090	0.0011	0.0000078	0.000725	0.00033	0.00086	9.7981	0.002790	0.00459	0.00005	0.0001	0.00001	0.000128	0.0118
Upper Magnetite Hematite (UMH), 8 samples.																		
Min	5.64	5.82	0.000005	0.000005	0.005	0.0001	0.0000015	0.000008	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.0005	0.00001	0.000001	0.0005
10th, %ile	5.78	5.93	0.000005	0.000005	0.005	0.0001	0.0000015	0.000039	0.00025	0.00025	0.0015	0.000005	0.00016	0.00001	0.0005	0.00001	0.000001	0.0010
Median	6.11	6.17	0.000005	0.000005	0.005	0.0001	0.0000015	0.000164	0.00025	0.00025	0.0113	0.000008	0.00055	0.00001	0.0005	0.00002	0.000002	0.0020
90th, %ile	6.26	6.35	0.000005	0.000005	0.016	0.0001	0.0000390	0.000255	0.00050	0.00057	0.0819	0.000024	0.00147	0.00002	0.0005	0.00004	0.000005	0.0020
Max	6.32	6.43	0.000005	0.000005	0.020	0.0001	0.0000550	0.000271	0.00060	0.00070	0.1080	0.000030	0.00180	0.00002	0.0005	0.00004	0.000006	0.0020
Average	6.05	6.15	0.000005	0.000005	0.009	0.0001	0.0000149	0.000152	0.00034	0.00036	0.0330	0.000013	0.00074	0.00001	0.0005	0.00002	0.000003	0.0016
Standard Deviation	0.29	0.25	0.000000	0.000000	0.008	0.0000	0.0000268	0.000117	0.00018	0.00023	0.0508	0.000012	0.00076	0.00001	0.0000	0.00002	0.000003	0.0008
Overburden, 43 samples.																		
Min	5.20	5.33	0.000005	0.000005	0.005	0.0001	0.0000015	0.000192	0.00025	0.00070	0.0015	0.000010	0.00020	0.00001	0.0005	0.00001	0.000001	0.0005
10th, %ile	5.40	5.50	0.000005	0.000005	0.006	0.0001	0.0000015	0.000312	0.00025	0.00152	0.0022	0.000022	0.00046	0.00001	0.0005	0.00001	0.000003	0.0005
Median	5.60	5.90	0.000050	0.000060	**1.05**	0.0007	0.0000390	0.002070	0.00140	0.00460	1.2200	0.000280	0.00380	0.00040	0.0005	0.00001	0.000090	0.0040
90th, %ile	6.24	6.74	0.000050	0.000390	**2.94**	0.0074	**0.0006458**	0.007292	**0.01028**	**0.03852**	**6.224**	0.008754	0.02160	0.00444	0.0009	0.00003	0.001714	0.0474
Max	7.30	7.32	0.000680	0.000590	**7.94**	0.0103	**0.0008600**	0.013600	**0.03200**	**0.09080**	**11.000**	0.018100	0.03770	0.00708	0.0070	0.00016	0.004470	0.1140
Average	5.77	6.03	0.000065	0.000122	**1.44**	0.0022	0.0001811	0.003155	0.00412	0.01421	2.4713	0.002503	0.00774	0.00136	0.0010	0.00002	0.000527	0.0157
Standard Deviation	0.50	0.56	0.000140	0.000167	1.910	0.0030	0.0002722	0.003381	0.00762	0.02307	3.1640	0.004625	0.01011	0.00198	0.0016	0.00003	0.001033	0.0283
Concentrate, 15 samples.																		
Min	6.38	6.71	0.000005	0.000005	0.005	0.0001	0.0000015	0.000054	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.0005	0.00001	0.000001	0.0005
10th, %ile	6.66	6.76	0.000005	0.000005	0.005	0.0001	0.0000015	0.000062	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.0005	0.00001	0.000001	0.0005
Median	6.82	6.95	0.000005	0.000005	0.010	0.0005	0.0000015	0.000100	0.00060	0.00025	0.0210	0.000020	0.00020	0.00001	0.0005	0.00001	0.000004	0.0010
90th, %ile	7.21	7.32	0.000010	0.000005	0.168	0.0022	0.0000080	0.000141	0.00312	0.00076	0.7140	0.000126	0.00040	0.00012	0.0005	0.00001	0.000017	0.0040
Max	8.18	7.70	0.000020	0.000005	0.270	0.0037	0.0000160	0.000183	0.00340	0.00110	0.8280	0.000370	0.00040	0.00023	0.0005	0.00001	0.000054	0.0040
Average	6.91	7.01	0.000008	0.000005	0.062	0.0009	0.0000036	0.000100	0.00123	0.00041	0.2719	0.000061	0.00020	0.00005	0.0005	0.00001	0.000010	0.0018
Standard Deviation	0.41	0.26	0.000004	0.000000	0.083	0.0010	0.0000041	0.000035	0.00119	0.00027	0.3388	0.000095	0.00015	0.00006	0.0000	0.00000	0.000014	0.0014
Tailings, 3 samples.																		
Min	7.19	7.01	0.000010	0.000005	0.220	0.0011	0.0000015	0.000129	0.00360	0.00060	0.7200	0.000140	0.00040	0.00016	0.0005	0.00001	0.000027	0.0010
10th, %ile	7.20	7.03	0.000012	0.000005	0.226	0.0011	0.0000015	0.000132	0.00366	0.00062	0.7354	0.000146	0.00042	0.00017	0.0005	0.00001	0.000029	0.0010
Median	7.26	7.09	0.000020	0.000005	0.250	0.0013	0.0000015	0.000144	0.00390	0.00070	0.7970	0.000170	0.00050	0.00021	0.0005	0.00001	0.000039	0.0010
90th, %ile	7.27	7.16	0.000020	0.000005	0.258	0.0022	0.0000015	0.000157	0.00406	0.00094	0.8082	0.000194	0.00050	0.00040	0.0005	0.00001	0.000041	0.0018
Max	7.27	7.18	0.000020	0.000005	0.260	0.0024	0.0000015	0.000160	0.00410	0.00100	0.8110	0.000200	0.00050	0.00045	0.0005	0.00001	0.000042	0.0020
Average	7.24	7.09	0.000017	0.000005	0.243	0.0016	0.0000015	0.000144	0.00387	0.00077	0.7760	0.000170	0.00047	0.00027	0.0005	0.00001	0.000036	0.0013
Standard Deviation	0.04	0.09	0.000006	0.000000	0.021	0.0007	0.0000000	0.000016	0.00025	0.00021	0.0490	0.000030	0.00006	0.00016	0.0000	0.00000	0.000008	0.0006

Note: Exceedances of Metal Mining Effluent Regulation (MMER) are highlighted and ones for Canadian Council of Ministers of the Environment Guidelines for Protection of Freshwater Aquatic Life (CCME FAL) highlighted

Table 4-4. Total Concentration of Selected Trace Elements Compared with the Average Concentration in the Earth's Upper Crust (ACUC)*

Parameter	Ag	Al	As	Cd	Co	Cr	Cu	Fe	Mo	Ni	Pb	Se	Tl	U	Zn
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
ACUC, 10 x ug/g*	530	-	48	0.9	173	920	280	-	11	470	170	0.9	9	27	670
RS, 14 samples.															
Min	0.01	770	5.5	0.01	0.67	40	3.6	150000	3.2	6.1	1.2	1.70	0.01	0.4	9.2
10th, %ile	0.06	2250	10.7	0.05	1.40	43	4.5	283000	5.9	6.5	5.4	2.26	0.01	1.6	9.6
Median	0.22	6500	24.5	0.10	10.30	60	14.5	350000	12.5	17.0	7.5	6.20	0.12	3.7	17.0
90th, %ile	0.41	11320	32.0	0.22	17.50	121	39.0	390000	16.7	26.4	51.4	158	0.18	4.9	25.4
Max	0.49	25000	45.0	0.31	43.00	210	93.0	400000	18.0	30.0	1100	510	0.21	6.3	33.0
Average	0.24	7419	23.8	0.13	10.70	77	21.1	327857	11.5	16.3	90.7	57	0.11	3.5	16.9
Standard Deviation	0.13	5822	10.4	0.08	10.89	46	23.4	64591	4.5	8.3	291	142	0.07	1.5	7.2
LRC, 11 sample.															
Min	0.01	1100	12.0	0.01	1.30	38	1.5	310000	2.1	2.3	1.3	0.35	0.01	0.9	5.4
10th, %ile	0.01	1100	13.0	0.01	1.60	43	1.7	340000	2.2	3.9	1.7	0.35	0.01	1.5	6.9
Median	0.08	3800	22.0	0.06	3.80	48	4.0	360000	7.6	6.0	3.5	0.35	0.01	1.9	15.0
90th, %ile	0.22	5800	34.0	0.12	16.00	170	12.0	420000	9.3	16.0	10.0	3.50	0.07	3.5	33.0
Max	0.36	14000	36.0	0.15	28.00	210	21.0	440000	13.0	22.0	15.0	4.10	0.12	7.2	57.0
Average	0.10	4145	23.0	0.07	7.02	81	6.6	370909	6.6	8.2	5.3	1.42	0.03	2.5	20.3
Standard Deviation	0.11	3680	8.5	0.05	8.15	60	6.0	38329	3.5	5.9	4.4	1.54	0.04	1.7	15.1
LMH, 8 samples.															
Min	0.03	600	8.9	0.01	0.35	43	1.8	320000	1.9	3.7	1.3	0.35	0.01	1.2	8.6
10th, %ile	0.04	880	11.8	0.02	1.58	45	2.1	341000	2.5	4.8	1.9	0.35	0.01	1.3	9.6
Median	0.06	2700	15.5	0.05	3.45	65	13.5	425000	4.3	9.0	2.9	0.35	0.02	1.9	21.5
90th, %ile	0.13	5090	28.9	0.08	5.43	112	19.3	660000	7.4	10.3	6.7	5.14	0.08	3.8	28.5
Max	0.20	6000	52.0	0.09	6.90	160	20.0	660000	8.1	11.0	12.0	9.90	0.09	4.6	32.0
Average	0.07	2900	19.5	0.05	3.53	77	12.2	462500	4.6	8.1	4.0	1.89	0.03	2.3	20.2
Standard Deviation	0.06	1976	13.6	0.03	1.96	38	7.3	131665	2.1	2.6	3.4	3.38	0.03	1.2	8.1
RC, 11 samples.															
Min	0.01	860	12.0	0.01	0.84	42	1.6	320000	1.2	3.1	1.1	0.35	0.01	0.5	5.4
10th, %ile	0.01	1000	14.0	0.01	1.20	63	1.7	350000	1.2	3.4	1.4	0.35	0.01	0.6	6.8
Median	0.02	2500	22.0	0.03	2.20	96	2.5	390000	2.2	4.6	2.1	0.35	0.01	0.8	8.3
90th, %ile	0.06	3600	39.0	0.04	3.80	130	16.0	470000	3.1	9.4	3.9	0.35	0.03	2.1	36.0
Max	0.10	14000	46.0	0.16	8.00	190	28.0	630000	4.1	11.0	4.0	0.90	0.12	2.8	40.0
Average	0.02	3124	25.5	0.04	2.70	100	6.5	404545	2.3	5.7	2.3	0.40	0.02	1.2	13.9
Standard Deviation	0.03	3732	10.2	0.04	1.99	38	8.3	84186	0.9	2.6	0.9	0.17	0.03	0.7	12.2
UMH, 1 sample.															
Min	0.08	11000	27.0	0.05	2.60	91	4.7	350000	1.3	5.4	2.8	0.35	0.01	1.3	20.0
10th, %ile	0.08	11000	27.0	0.05	2.60	91	4.7	350000	1.3	5.4	2.8	0.35	0.01	1.3	20.0
Median	0.08	11000	27.0	0.05	2.60	91	4.7	350000	1.3	5.4	2.8	0.35	0.01	1.3	20.0
90th, %ile	0.08	11000	27.0	0.05	2.60	91	4.7	350000	1.3	5.4	2.8	0.35	0.01	1.3	20.0
Max	0.08	11000	27.0	0.05	2.60	91	4.7	350000	1.3	5.4	2.8	0.35	0.01	1.3	20.0
Average	0.08	11000	27.0	0.05	2.60	91	4.7	350000	1.3	5.4	2.8	0.35	0.01	1.3	20.0
Standard Deviation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Overburden, 23 samples.															
Min	0.01	1200	11.0	0.01	2.90	50	3.9	79000	2.1	5.4	1.5	0.35	0.01	0.8	2.0
10th, %ile	0.01	3460	11.0	0.01	5.42	64	9.9	85600	2.7	9.8	2.7	0.35	0.02	1.1	6.3
Median	0.06	41000	14.0	0.38	10.00	78	17.0	160000	3.7	20.0	9.7	0.35	0.43	3.0	66.0
90th, %ile	0.33	53000	22.0	0.82	13.00	140	38.6	348000	5.6	36.2	13.0	0.78	0.53	3.9	96.2
Max	0.48	56000	30.0	0.88	14.00	190	1400	400000	10.0	43.0	14.0	1.10	0.62	4.0	100.0
Average	0.12	31243	15.5	0.40	9.79	92	82.5	197739	4.0	21.7	8.8	0.45	0.32	2.7	53.2
Standard Deviation	0.14	21410	5.1	0.31	3.30	37	287.6	111736	1.8	10.4	4.4	0.24	0.22	1.0	35.4
BS1L&F and BS2L&C&F, 15 samples.															
Min	0.01	980	28.0	0.01	2.10	12	0.6	620000	2.8	0.5	1.2	0.35	0.01	1.9	0.4
10th, %ile	0.01	1200	28.0	0.01	2.44	12	0.8	620000	2.8	0.7	1.4	0.35	0.01	2.2	0.4
Median	0.01	2900	54.0	0.02	3.00	22	1.3	660000	3.3	1.8	1.9	0.35	0.03	3.4	2.4
90th, %ile	0.07	4000	66.6	0.04	5.84	26	3.5	696000	3.7	3.9	4.7	0.35	0.03	4.2	6.2
Max	0.08	4000	73.0	0.05	6.90	31	4.2	710000	3.7	4.2	12.0	0.35	0.04	4.3	8.5
Average	0.03	2752	48.5	0.02	3.45	20	2.0	659333	3.3	2.2	2.9	0.35	0.02	3.2	3.0
Standard Deviation	0.03	1042	15.5	0.01	1.45	6	1.2	28149	0.3	1.3	2.7	0.00	0.01	0.9	2.6
BS2T, 3 samples.															
Min	0.23	5500	59.0	0.06	9.50	33	6.2	540000	3.1	9.8	11.0	1.00	0.04	3.4	25.0
10th, %ile	0.23	5500	59.2	0.06	9.54	33	6.6	540000	3.1	12.6	11.0	1.12	0.04	3.4	29.6
Median	0.24	5500	60.0	0.07	9.70	33	8.3	540000	3.2	24.0	11.0	1.60	0.04	3.6	48.0
90th, %ile	0.34	5660	60.0	0.07	10.74	34	8.5	556000	3.3	32.8	11.0	1.60	0.04	3.6	64.8
Max	0.36	5700	60.0	0.07	11.00	34	8.6	560000	3.3	35.0	11.0	1.60	0.04	3.6	69.0
Average	0.28	5567	59.7	0.07	10.07	33	7.7	546667	3.2	22.9	11.0	1.40	0.04	3.5	47.3
Standard Deviation	0.07	115	0.6	0.01	0.81	1	1.3	11547	0.1	12.6	0.0	0.35	0.00	0.1	22.0

* Based on Rudnick and Gao (2004); values exceeding 10x the Average Concentration in the Upper Earth's Crust are highlighted

4.3 LOWER MASSIVE HEMATITE (LMH)

Approximately 16,534,300 tonnes of ore and waste rock will be mined from the Lower Massive Hematite unit (Chong 2013b pers. comm.). The LMH unit contains 9% of PAG and 19% of uncertain samples based on Carbonate NPR (Table 4-1). It is noted that two of three PAG samples have an undetectable concentration of sulfide sulfur. Overall, the LMH unit is classified as non-PAG based on median Carbonate NPR of 2.67.

All SFE analyses from LMH units are compliant with the MMER limits. In 19% of the SFE samples, mercury, selenium and iron concentrations exceed the CCME guidelines. A single exeedance of the CCME chromium guideline is observed. Four or less of the 32 samples are enriched with manganese (4), selenium (2) and arsenic (1), in comparison with 10x the average crustal concentrations. The potential for metal leaching is currently considered to be low based on compliance of SFE concentrations with the MMER limits. Ongoing humidity testing will provide further insight into the metal leaching potential of waste rock from the LMH unit.

4.4 RED CHERT (RC)

In total, 15,907,440 tonnes of ore and waste rock will be mined from Red Chert (RC). This unit is represented by 89% non-PAG samples with a Carbonate NPR > 2. The rest of the samples classify as uncertain with Carbonate NPR values between 1 and 2 and contain less than 0.02 wt% sulfide sulfur (Attachment 2). This unit has a low ARD potential based on a low percentage of PAG samples and median Carbonate NPR of 2.67.

All SFE analyses from the RC unit are compliant with the MMER limits. The CCME guidelines were exceeded for iron in 17% of the samples. A single sample exeedance (4% of samples) of the CCME guidelines is observed for aluminum, arsenic, chromium, copper and zinc. Current results indicate that the Red Chert has low metal leaching potential, but ongoing kinetic testing will verify this preliminary conclusion.

4.5 UPPER MASSIVE HEMATITE (UMH)

Approximately 10,059,840 tonnes of ore and waste rock will be mined from the Upper Massive Hematite unit (Chong 2013b pers. comm.). The median Carbonate NPR is 2.13, indicating that this unit has a low ARD potential. Only one of eight samples (12.5%) has an uncertain Carbonate NPR value between two and one falling in the uncertain class. The rest of the samples are Non-PAG (Table 4-1). SFE leachates are compliant with the MMER and the CCME limits except for a single exceedance of the CCME cadmium guideline. Overall, the UHM unit is classified as non-PAG material with low metal-leaching potential. These conclusions are preliminary pending evaluation of UHM metal-leaching potential with kinetic testing.

4.6 OVERBURDEN

Approximately 3.5 Mt of the overburden will be removed during the DSO project (Stassinu Stantec 2012). Of a total of 42 overburden samples, five (5) exhibit Carbonate NPR values less than 2, accounting for 12% of the material tested, but only 1 (or 2%) of these samples have Carbonate NPR values less than 1, which can be classified as PAG. Based on a median Carbonate NPR value of 4.8, the overburden is classified as non-PAG material.

All SFE analyses of overburden samples are compliant with the MMER limits, but exceed more stringent CCME guidelines for all regulated trace elements, except for nickel, molybdenum, thallium and uranium. The metal-leaching potential of the overburden is currently considered to be low, based on the compliance of SFE concentrations with the MMER limits, but ongoing humidity cell testing will provide quantitative estimates of metal loadings for further predictions of the leachate quality.

4.7 CONCENTRATES

All fifteen samples of concentrate and intermediate products have Carbonate NPR values below 2 and eight samples (53%) have values below 1. Therefore, the majority of AP and carbonate NP values for the concentrate have been calculated using one half of the detection limit as the reported value, resulting in a low median Carbonate NPR value. If Sobek NPR were to be used as the criteria instead of Carbonate NPR, all samples would be classified as Non-PAG. Sobek NP is higher than Carbonate NP because it includes slow-reactive NP released by silicate and metal oxide mineral dissolution. Slowly reactive NP may be sufficient to offset slow acid-generation rates, which occurs in materials with low sulfur concentrations (Matson 2009; Miller et. al. 2010). Taking into account that sulfide sulfur content is low (below or at detection limit), Sobek NPR can be used for classification of the concentrates and intermediate products. Based on a median Sobek NPR value of 5.8, these materials are not expected to generate acidic leachate. The metal-leaching potential of concentrate, as with the tailings, will be further evaluated using kinetic testing.

4.8 TAILINGS

Carbonate NPR values in the three samples of the final tailings range from 1.6 to 2.7, with a median value of 2.13. Sulfide sulfur does not exceed 0.01 wt% in the samples. Metal concentrations in SFE from tailings are compliant with MMER limits. Aluminum, chromium and iron concentrations in the SFE exceed the CCME guidelines in all of the samples. Analyses of process water from metallurgical testing also show that cadmium marginally exceeds the CCME guideline in addition to the elements mentioned above (Stassinu 2013). The exeedances are related to suspended material, which will be removed by the addition of coagulant and subsequent settling. Overall, the tailings are classified as non-PAG material with low metal-

leaching potential. Ongoing kinetic testing will be used to evaluate trace-element concentrations in seepage from tailings.

4.9 OPEN PIT

The walls of the proposed open pit will be represented by the three lithological units described above. The rock from the units have low ARD/ML leaching potential based on static tests. Therefore, it is unlikely that the mine water will be acidic or contain trace elements in concentrations exceeding the MMER limits. Additional analysis, including geochemical modeling, will be done to understand mine-water quality and the chemistry of the end pit lake.

5.0 Discussion

Stantec previously assessed two mine sites in the Schefferville area (within 50 km from the proposed project), where iron ore was mined form the middle and upper units of the Sokoman Formation since the 1950s (Stantec 2009; LIM 2009). The ABA indicated that the waste rock could be classified as non-acid generating based on NPR criteria. Surface drainage, including flooded open pits and runoff water from rock, did not show any evidence for ARD/ML. Observed iron and manganese exceedances of CCME guidelines in water samples have been attributed to the suspended particles and to annual redox stratification of water bodies.

In the Joyce Lake Iron Ore Deposit, acid generating and metal-leaching potential decreases from lower to upper units of the Sokoman Formation. The three upper units identified for extraction are all classified as non-PAG rock based on median Carbonate NPR values. Uncertain and PAG samples in these bedrock units are characterized by low sulfur content, which does not exceed 0.01 wt% in most cases.

Percentages of non-PAG rock were evaluated using Carbonate NPR values calculated from Labec Century's geochemical database containing over one thousand samples analyzed for total sulfur and total carbon (see Section 3.3.1). Similar to the concentrate evaluation, the majority of AP and carbonate NP values were calculated using one half of the detection limit as the reported value, resulting in a relatively low percentage of samples with NPR values less than 2 in the LMH and RC units (Table 5-1). It should be noted that almost half of these samples have concentrations of sulfur either at or below the detection limit (0.01 wt%, Attachment 2). Therefore, an alternative estimate was also considered, excluding samples with low sulfur content, wherein additional criterion for total sulfur was arbitrarily selected. Samples that are classified as uncertain and PAG materials have NPR values below 2 and total sulfur content above 0.01 wt%. Based on the primary and alternative estimates, 94.5% and 99.1% of waste rock are classified as non-PAG, respectively. The estimated mass of uncertain and PAG waste rock ranges between 644,000 and 1,121,000 tonnes or 0.9% and 5.5% of total waste rock volume.

Table 5-1: Percentages and Tonnages of PAG and Uncertain Waste Rock

Lithological Unit	LMH		RC		UHM	
Waste Rock (tonnes*)	**3,395,760**		**11,167,200**		**5,719,440**	
Parameter	**n**	**%**	**n**	**%**	**n**	**%**
Samples analyzed	569	100	331	100	224	100
Samples NPR>2	28	5	26	7.9	3	1.3
PAG and uncertain waste rock (tonnes), primary calculation	167,102		877,182		76,600	
Samples NPR>2 and Stotal >0.01%	16	3	14	4.2	3	1.3
PAG and uncertain waste rock (tonnes), alternative calculation	95,487		472,329		76,600	
Note: waste rock tonnages provided by Labec Century (Chong 2013b pers. comm.)						

Uncertain and PAG waste rock seem to form irregular discontinuous lenses, which are generally less than 3 m thick, indicating potential difficulties for separation of the rock with large mining equipment. However, PAG and uncertain rock were intercepted in intervals exceeding 3 m in a few boreholes. If Labec Century proceeds with separation of PAG and non-PAG rock, mining blocks of PAG rock should be delineated and tonnages evaluated. Alternatively, if all rock types are deposited together, risk of acidified seepage into the disposal area is still low, based on the following evidence:

- Low percentage of uncertain and PAG waste rock (less than 5.5% of total tonnage).
- Low sulfur content in uncertain and PAG waste rock (less than 0.01 wt% in average).
- Paste pH > 4.5 in all samples (including weathered materials).
- No evidence of ARD from similar mines in the area.

Because ARD is unlikely to occur in waste rock, produced waste rock should not require special handling and separation based on current knowledge. However, final conclusions should be made after the completion of kinetic tests.

Metal leaching potential for bedrock is low, based on compliance of SFE metal concentrations with the MMER limits. Therefore, mine water pumped from the pit and runoff from waste rock does not appear to require metals removal. Ongoing kinetic testing of samples and subsequent water-quality modeling will provide a more accurate evaluation of metal leaching.

Overburden, tailings and concentrate have low ARD/ML potential, based on the results of static testing. The expected exceedances of the CCME guidelines for aluminum, chromium, iron and cadmium in the tailings effluent and runoff from overburden and concentrate stockpile are

attributable to suspended particles. If observed concentrations are mostly attributable to suspended particles, then the proposed treatment for total suspended solids should also reduce concentrations of these elements in the discharge.

6.0 Conclusions and Recommendations

Ore, waste rock and walls of the open pit are represented by the three upper lithological units of the Sokoman Formation. These units are characterized by low acid-generation potential and neutralization potential. All units are classified as non-PAG based on median Carbonate NPR values. Metal concentrations in all SFE from the units planned for mining are compliant with MMER limits, indicating low metal leaching potential.

Waste rock contains between 0.9 and 5.5% of PAG and uncertain rock types according to preliminary estimates, based on an evaluation of the geochemical database and the volumes of lithological units provided by Labec Century. If all rock types are deposited together, the risk of acidification and metal leaching from the disposal area is low according to the historical data and results of this study. Therefore, special handling and separate disposal of PAG and uncertain waste-rock types is not warranted. It is recommended that the current conclusions are verified once ongoing kinetic testing is completed. In addition, delineation of mining blocks with measurable sulfur concentrations will help better estimate tonnages of PAG rock.

The overburden stockpile should not generate acidic runoff from sulfide oxidation, considering median Carbonate NPR values (4.8) and the low percentage of PAG samples (5%), and assuming that the overburden would be mixed during disposal. The metal-leaching potential of the overburden is currently considered to be low and does not require special management, but ongoing humidity cell testing will provide further insight into the leachate quality.

Concentrates and intermediate products, which will be stored on the site during operating, are classified as non-PAGs based on Sobek NPR. Low Carbonate NPR values are below 2 because they are impacted by a mathematical artifact resulting from use of one half the detection limit as the reported values in the calculations for a majority of concentrate samples. The potential for metal leaching from concentrate is low, based on the compliance of concentrate SFE metal concentrations with the MMER limits.

Tailings are classified as non-PAG material with low metal-leaching potential based on the results of static tests (ABA, SFE) and analyses of process water generated during the metallurgical study. Therefore, tailings effluent will not require removal of metals. Water quality seeping from tailings is being currently evaluated with humidity cell testing.

7.0 References

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8.0 Closure

This report was prepared on behalf of Labec Century Iron Ore Corporation. The report may not be relied upon by any other person or entity without the express written consent of Stantec Consulting Ltd. and Labec Century Iron Ore Corporation.

Any use which a third party makes of this report, or any reliance on decisions made based on it, is the responsibility of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with accepted scientific practices current at the time the work was performed. The conclusions and recommendations presented represent the best judgment of Stantec Consulting Ltd. based on the data obtained from the work and on the site conditions encountered at the time the work was performed at the specific sampling, testing, and/or observation locations.

ATTACHMENT 1

SGS MEMORANDUM SUMMARIZING DETAILS OF METALLURGICAL TESTS

MEMO

To: Simon-David Durand, Soutex

From: Thomas Davies

Date: April 16, 2013

Copies: Danielle Bouffard and Mathieu Girard (both Soutex), Nikolay Sidenko (Stantec)

Re: Process Water Generation

Dear Simon-David,

As requested, the following briefly describes the general steps taken in order to generate the process water samples tested by Stantec.

PW1 and PW2: Bulk sample #2 was wet screened at 28 mesh, and the undersize and oversize was collected. The undersize was allowed to settle overnight prior to being decanted. 1 drum of the decanted water was collected and stored. The undersize material was then submitted to Wilfley table testing, generating three streams (concentrate, middlings and tailings). The tailings stream was allowed to settle overnight and the water decanted, with 1 drum of water collected. The two drums were then agitated and mixed into 50:50 proportions, to generate two drums of combined screen/Wilfley tails process water. One sub-sample was collected from each drum, while the water was being mixed, and submitted for environmental testing.

PWS1 and PWS2, Scrubber #1 and Scrubber #2: Bulk sample #2 was scrubbed at 50% solids for 30 minutes and the product was discharged onto a 28 mesh screen. Additional water was added to aid the screening, and the undersize and oversize was collected. The undersize was allowed to settle overnight prior to being decanted. 1 drum of the decanted water was collected and stored. The undersize material was then submitted to Wilfley table testing, generating three streams (concentrate, middlings and tailings). The tailings stream was allowed to settle overnight and the water decanted, with 1 drum of water collected. The two drums were then agitated and mixed into 50:50 proportions, to generate two drums of combined scrub/screen/Wilfley tails process water. One sub-sample was collected from each drum, while the water was being mixed, and submitted for environmental testing (PWS1 and PWS2). Further samples were collected from each drum at a later date (Scrubber #1 and Scrubber #2).

Wilfley Tails: 57-62% Comp was scrubbed at 50% solids for 30 minutes and the product was discharged onto a 10 mesh screen. The undersize material was then submitted to Wilfley table testing, generating three streams (concentrate, middlings and tailings). The tailings stream was allowed to settle for a few hours, and the water decanted. A 20-L pail of process water was collected for environmental testing.

Please feel free to contact me if you have any questions.

Kind regards,

Thomas Davies, M.Sc.

Mineral Services
Metallurgist, Mineral Processing

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ATTACHMENT 2

RESULTS OF ACID-BASE ACCOUNTING FOR MATERIALS EXPOSED DURING THE JOYCE LAKE PROJECT

Attachment 2: Results of Acid-Base Accounting for Materials Exposed During the Joyce Lake Project.

Hole	Sample ID	Sample Taken		Lithological	Paste pH	NP_{Sobek}	NP_{Carb}	AP	NNP_{Carb}	NNP_{Sobek}	NPR_{Carb}	NPR_{Sobek}	SO4-S	Total S	S-S	C	CO3
		From	To	Unit	units	t CaCO3/1000 t					ratio		wt. %				
Joy-11-07	492067	12	15	LMH	6.9	2.3	0.42	0.16	0.26	2.14	2.67	14.72	0.005	0.008	0.005	0.026	0.025
Joy-11-07	492069	18	21	LMH	6.6	1.5	0.33	0.16	0.18	1.34	2.13	9.60	0.005	0.005	0.005	0.015	0.02
Joy-11-07	492078	36	39	LMH	6.42	2	0.17	0.16	0.01	1.84	1.07	12.80	0.005	0.006	0.005	0.012	0.01
Joy-11-07	492084	51	54	LMH	6.06	1.7	0.33	0.16	0.18	1.54	2.13	10.88	0.005	0.0025	0.005	0.011	0.02
Joy-11-07	492088	60	63	LMH	6.55	1.5	0.58	0.16	0.43	1.34	3.74	9.60	0.005	0.005	0.005	0.019	0.035
Joy-11-07	492092	69	72	LMH	5.61	1.7	0.67	0.16	0.51	1.54	4.27	10.88	0.005	0.007	0.005	0.018	0.04
Joy-11-07	492094	75	78	LMH	5.98	1.2	0.75	0.16	0.59	1.04	4.80	7.68	0.01	0.01	0.005	0.019	0.045
Joy-11-10	492218	66	69	LMH	5.78	1.6	0.04	0.16	-0.11	1.44	0.27	10.24	0.005	0.0025	0.005	0.012	0.0025
Joy-11-10	492220	72	75	LMH	6.01	1.4	0.04	0.16	-0.11	1.24	0.27	8.96	0.005	0.006	0.005	0.012	0.0025
Joy-11-10	492222	78	81	LMH	5.92	1.8	0.67	0.63	0.04	1.18	1.07	2.88	0.02	0.035	0.02	0.028	0.04
Joy-11-10	492225	87	90	LMH	5.5	1.7	0.33	0.16	0.18	1.54	2.13	10.88	0.005	0.006	0.005	0.02	0.02
Joy-11-16	492493	2	3	LMH	6	2.4	1.17	0.16	1.01	2.24	7.47	15.36	0.005	0.008	0.005	0.218	0.07
Joy-11-16	492497	12	15	LMH	6.45	2.4	0.33	0.16	0.18	2.24	2.13	15.36	0.005	0.009	0.005	0.016	0.02
Joy-11-16	492503	27	30	LMH	7.01	2.3	0.42	0.16	0.26	2.14	2.67	14.72	0.005	0.009	0.005	0.021	0.025
Joy-11-16	492507	39	42	LMH	6.43	4.6	0.50	0.16	0.34	4.44	3.20	29.44	0.005	0.007	0.005	0.025	0.03
Joy-11-16	492513	54	57	LMH	6.29	2.8	0.83	0.16	0.68	2.64	5.34	17.92	0.005	0.0025	0.005	0.019	0.05
Joy-11-16	492518	69	72	LMH	6.27	1.9	0.50	0.16	0.34	1.74	3.20	12.16	0.005	0.0025	0.005	0.018	0.03
Joy-11-25	501064	3	6	LMH	6.14	3.4	0.33	0.31	0.02	3.09	1.07	10.88	0.02	0.032	0.01	0.05	0.02
Joy-11-25	501065	6	9	LMH	6.15	1.7	0.67	0.94	-0.27	0.76	0.71	1.81	0.04	0.067	0.03	0.06	0.04
Joy-11-25	501068	15	18	LMH	5.96	1.8	0.75	0.16	0.59	1.64	4.80	11.52	0.005	0.008	0.005	0.038	0.045
Joy-11-25	501070	21	24	LMH	6.26	1.6	1.08	0.16	0.93	1.44	6.94	10.24	0.01	0.012	0.005	0.035	0.065
Joy-11-35	502189	6	9	LMH	6.53	2.4	0.42	0.16	0.26	2.24	2.67	15.36	0.005	0.007	0.005	0.032	0.025
Joy-11-35	502194	21	24	LMH	5.91	1.9	0.33	0.16	0.18	1.74	2.13	12.16	0.005	0.005	0.005	0.018	0.02
Joy-11-35	502196	27	30	LMH	5.8	2.5	0.58	0.16	0.43	2.34	3.74	16.00	0.01	0.01	0.005	0.544	0.035
Joy-11-35	502197	30	33	LMH	5.46	2	4.42	0.16	4.26	1.84	28.29	12.80	0.02	0.02	0.005	0.897	0.265
Joy-11-35	502198	33	36	LMH	5.21	1.3	2.00	1.88	0.13	-0.58	1.07	0.69	0.04	0.097	0.06	1.24	0.12
Joy-11-40	502381	6	9	LMH	6.63	1.6	0.33	0.16	0.18	1.44	2.13	10.24	0.005	0.0025	0.005	0.018	0.02
Joy-11-40	502383	12	15	LMH	6.31	2	0.50	0.16	0.34	1.84	3.20	12.80	0.005	0.0025	0.005	0.018	0.03
Joy-11-40	502385	18	21	LMH	6.51	2.8	0.67	0.16	0.51	2.64	4.27	17.92	0.005	0.0025	0.005	0.027	0.04
Joy-11-41	502409	45	48	LMH	6.02	1.7	0.17	0.16	0.01	1.54	1.07	10.88	0.005	0.0025	0.005	0.015	0.01
Joy-11-41	502413	54	57	LMH	6.05	1.2	0.25	0.16	0.09	1.04	1.60	7.68	0.005	0.0025	0.005	0.011	0.015
Joy-11-41	502416	63	66	LMH	5.69	1.5	0.83	0.16	0.68	1.34	5.34	9.60	0.005	0.0025	0.005	0.014	0.05
Joy-11-07	492098	84	87	LRC	5.92	2.8	0.83	0.16	0.68	2.64	5.34	17.92	0.02	0.015	0.005	0.427	0.05
Joy-11-07	492099	87	90	LRC	5.28	3.4	0.83	15.94	-15.10	-12.54	0.05	0.21	0.13	0.64	0.51	1.67	0.05
Joy-11-07	492100	90	93	LRC	4.69	1.2	1.08	29.69	-28.60	-28.49	0.04	0.04	0.21	1.16	0.95	1.84	0.065
Joy-11-10	492231	102	105	LRC	5.81	1.6	0.42	0.16	0.26	1.44	2.67	10.24	0.005	0.0025	0.005	0.015	0.025
Joy-11-10	492233	108	111	LRC	5.66	1.6	0.50	0.16	0.34	1.44	3.20	10.24	0.005	0.0025	0.005	0.018	0.03
Joy-11-10	492234	111	114	LRC	5.83	2.2	0.42	0.16	0.26	2.04	2.67	14.08	0.005	0.0025	0.005	0.026	0.025
Joy-11-10	492236	117	120	LRC	6.02	1.3	0.67	0.16	0.51	1.14	4.27	8.32	0.005	0.0025	0.005	0.018	0.04
Joy-11-15	492485	105	108	LRC	6.09	1	0.58	0.16	0.43	0.84	3.74	6.40	0.005	0.0025	0.005	0.026	0.035
Joy-11-15	492489	114	117	LRC	5.75	0.6	0.58	0.16	0.43	0.44	3.74	3.84	0.005	0.006	0.005	0.023	0.035
Joy-11-25	501073	30	33	LRC	6.2	1.4	0.67	0.16	0.51	1.24	4.27	8.96	0.01	0.01	0.005	0.157	0.04
Joy-11-25	501074	33	36	LRC	5.72	0.6	1.08	0.16	0.93	0.44	6.94	3.84	0.02	0.015	0.005	0.658	0.065
Joy-11-25	501076	36	39	LRC	4.96	1	1.25	13.75	-12.50	-12.75	0.09	0.07	0.005	0.447	0.44	1.2	0.075
Joy-11-27	501159	81	84	LRC	5.89	1	0.75	0.16	0.59	0.84	4.80	6.40	0.005	0.009	0.005	0.028	0.045
Joy-11-27	501161	87	90	LRC	6.29	1.1	0.83	0.16	0.68	0.94	5.34	7.04	0.005	0.0025	0.005	0.112	0.05
Joy-11-27	501164	93	96	LRC	6.44	1	1.00	0.16	0.84	0.84	6.40	6.40	0.02	0.018	0.005	0.512	0.06
Joy-11-27	501165	96	99	LRC	5.9	0.5	1.33	6.25	-4.92	-5.75	0.21	0.08	0.04	0.236	0.2	0.93	0.08
Joy-11-40	502388	24	27	LRC	6.08	0.9	0.83	0.16	0.68	0.74	5.34	5.76	0.005	0.006	0.005	0.068	0.05
Joy-11-40	502389	27	30	LRC	6.22	0.8	0.83	0.16	0.68	0.64	5.34	5.12	0.01	0.012	0.005	0.129	0.05
Joy-11-40	502390	30	33	LRC	5.17	0	1.17	4.06	-2.89	-4.06	0.29	0.00	0.09	0.218	0.13	1.45	0.07
Joy-11-40	502391	33	36	LRC	5.76	0.6	1.25	0.31	0.94	0.29	4.00	1.92	0.03	0.044	0.01	0.815	0.075
Joy-11-40	502392	36	39	LRC	6.09	1.2	1.42	2.19	-0.77	-0.99	0.65	0.55	0.02	0.094	0.07	0.543	0.085
Joy-11-41	502424	87	90	LRC	5.83	1	0.50	0.16	0.34	0.84	3.20	6.40	0.005	0.005	0.005	0.022	0.03
Joy-11-41	502429	99	102	LRC	5.69	1.7	0.42	0.16	0.26	1.54	2.67	10.88	0.005	0.0025	0.005	0.022	0.025
Joy-11-41	502433	111	114	LRC	5.59	0.9	0.67	0.16	0.51	0.74	4.27	5.76	0.005	0.009	0.005	0.026	0.04
Joy-11-41	502438	123	126	LRC	5.64	1.6	0.58	0.16	0.43	1.44	3.74	10.24	0.005	0.007	0.005	0.015	0.035
Joy-11-41	502441	132	135	LRC	5.67	1.4	0.92	0.16	0.76	1.24	5.87	8.96	0.02	0.015	0.005	0.019	0.055
Joy-11-41	502446	147	150	LRC	5.92	0.9	1.08	0.16	0.93	0.74	6.94	5.76	0.02	0.016	0.005	0.02	0.065
Joy-11-41	502447	150	153	LRC	6.1	1.5	0.92	0.16	0.76	1.34	5.87	9.60	0.01	0.01	0.005	0.051	0.055
Joy-12-107	A00117824	108	111	LRC	6.14	1.2	0.83	0.16	0.68	1.04	5.34	7.68	0.005	0.006	0.005	0.03	0.05
Joy-12-73	A00154554	3	6	LRC	5.68	4.9	0.50	0.16	0.34	4.74	3.20	31.36	0.005	0.009	0.005	0.164	0.03
Joy-12-73	A00154556	9	12	LRC	5.3	3.2	0.75	0.16	0.59	3.04	4.80	20.48	0.005	0.009	0.005	0.078	0.045
Joy-12-73	A00154558	15	18	LRC	5.1	2.8	0.50	0.16	0.34	2.64	3.20	17.92	0.005	0.009	0.005	0.095	0.03
Joy-12-73	A00154560	21	24	LRC	5.18	3.1	0.92	0.16	0.76	2.94	5.87	19.84	0.02	0.016	0.005	0.454	0.055
Joy-12-76	A00154658	84	87	LRC	6.45	1.2	0.75	0.16	0.59	1.04	4.80	7.68	0.02	0.015	0.005	0.101	0.045
Joy-12-76	A00154660	90	93	LRC	6.38	0.4	0.92	0.16	0.76	0.24	5.87	2.56	0.005	0.006	0.005	0.057	0.055
Joy-12-86	A00154878	54	57	LRC	5.41	2	0.42	0.16	0.26	1.84	2.67	12.80	0.005	0.007	0.005	0.015	0.025
Joy-12-86	A00154881	63	66	LRC	5.9	1.7	0.75	0.16	0.59	1.54	4.80	10.88	0.01	0.012	0.005	0.039	0.045
Joy-12-86	A00154884	72	75	LRC	6.02	1.7	1.08	0.16	0.93	1.54	6.94	10.88	0.02	0.016	0.005	0.499	0.065
Joy-12-93	A00115624	45	48	LRC	4.4	0.9	0.17	0.16	0.01	0.74	1.07	5.76	0.005	0.006	0.005	0.065	0.01
Joy-12-93	A00115626	48	51	LRC	4.47	0.8	0.17	0.16	0.01	0.64	1.07	5.12	0.005	0.009	0.005	0.044	0.01
Joy-12-93	A00115627	51	54	LRC	4.52	1.4	0.25	0.16	0.09	1.24	1.60	8.96	0.005	0.007	0.005	0.085	0.015
Joy-12-93	A00115628	54	57	LRC	4.55	2.7	0.17	0.16	0.01	2.54	1.07	17.28	0.005	0.007	0.005	0.047	0.01
Joy-12-93	A00115629	57	60	LRC	4.46	0	0.25	0.16	0.09	-0.16	1.60	0.00	0.01	0.01	0.005	0.034	0.015
Joy-12-93	A00115630	60	63	LRC	7.37	2.2	1.00	0.16	0.84	2.04	6.40	14.08	0.005	0.006	0.005	0.056	0.06
Joy-12-93	A00115631	63	66	LRC	7.4	1.8	0.92	0.16	0.76	1.64	5.87	11.52	0.005	0.006	0.005	0.059	0.055
Joy-12-93	A00115633	69	72	LRC	4.49	0	0.04	0.16	-0.11	-0.16	0.27	0.00	0.01	0.011	0.005	0.029	0.0025
Joy-12-93	A00115634	72	75	LRC	4.76	1	0.04	0.16	-0.11	0.84	0.27	6.40	0.005	0.006	0.005	0.02	0.0025
Joy-12-99	A00115836	36	39	LRC	5.8	2.5	1.17	0.16	1.01	2.34	7.47	16.00	0.01	0.011	0.005	0.288	0.07
Joy-12-99	A00115840	45	48	LRC	5.48	3	1.17	0.16	1.01	2.84	7.47	19.20	0.02	0.016	0.005	0.306	0.07
Joy-12-99	A00115842	51	54	LRC	5.45	1.7	1.25	9.06	-7.81	-7.36	0.14	0.19	0.15	0.439	0.29	0.859	0.075
Joy-11-10	492194	3	6	RC	6.33	2.3	0.58	0.16	0.43	2.14	3.74	14.72	0.02	0.015	0.005	0.029	0.035
Joy-11-10	492197	12	15	RC	6.43	2.1	0.50	0.16	0.34	1.94	3.20	13.44	0.005	0.006	0.005	0.026	0.03
Joy-11-10	492200	21	24	RC	6.61	2.4	0.42	0.16	0.26	2.24	2.67	15.36	0.005	0.009	0.005	0.017	0.025
Joy-11-10	492204	30	33	RC	6.39	1.9	0.50	0.16	0.34	1.74	3.20	12.16	0.005	0.0025	0.005	0.014	0.03
Joy-11-10	492208	39	42	RC	6.7	3.6	2.34	0.16	2.18	3.44	14.94	23.04	0.005	0.0025	0.005	0.035	0.14

Notes: See text for lithology describtion. Values below detection limit from certificates of analyses (CoA) are reported here as a half of detection limit. See CoA for details

Attachment 2: Results of Acid-Base Accounting for Materials Exposed During the Joyce Lake Project.

Hole	Sample ID	Sample Taken		Lithological	Paste pH	NP_{Sobek}	NP_{Carb}	AP	NNP_{Carb}	NNP_{Sobek}	NPR_{Carb}	NPR_{Sobek}	SO4-S	Total S	S-S	C	CO3
		From	To	Unit	units	t CaCO3/1000 t					ratio		wt. %				
Joy-11-10	492211	48	51	RC	5.67	2	0.50	0.16	0.34	1.84	3.20	12.80	0.005	0.0025	0.005	0.014	0.03
Joy-11-10	492215	57	60	RC	5.51	1.6	0.25	0.16	0.09	1.44	1.60	10.24	0.005	0.0025	0.005	0.009	0.015
Joy-11-10	492217	63	66	RC	5.8	1.7	0.33	0.16	0.18	1.54	2.13	10.88	0.005	0.0025	0.005	0.012	0.02
Joy-11-15	492448	3	6	RC	6.8	2.3	0.42	0.16	0.26	2.14	2.67	14.72	0.005	0.008	0.005	0.076	0.025
Joy-11-15	492451	9	12	RC	6.42	1.2	0.33	0.16	0.18	1.04	2.13	7.68	0.005	0.0025	0.005	0.015	0.02
Joy-11-15	492453	15	18	RC	6.36	2	0.42	0.16	0.26	1.84	2.67	12.80	0.005	0.0025	0.005	0.014	0.025
Joy-11-15	492456	24	27	RC	6.49	1.2	0.42	0.16	0.26	1.04	2.67	7.68	0.005	0.0025	0.005	0.014	0.025
Joy-11-15	492459	33	36	RC	6.52	2.1	0.92	0.16	0.76	1.94	5.87	13.44	0.005	0.007	0.005	0.024	0.055
Joy-11-15	492461	42	45	RC	6.43	1.2	0.33	0.16	0.18	1.04	2.13	7.68	0.005	0.0025	0.005	0.017	0.02
Joy-11-15	492463	45	48	RC	6.58	1.2	0.33	0.16	0.18	1.04	2.13	7.68	0.005	0.005	0.005	0.017	0.02
Joy-11-15	492465	51	54	RC	6.18	1.8	0.33	0.16	0.18	1.64	2.13	11.52	0.005	0.0025	0.005	0.014	0.02
Joy-11-15	492467	57	60	RC	6.2	1.5	0.25	0.16	0.09	1.34	1.60	9.60	0.005	0.0025	0.005	0.012	0.015
Joy-11-15	492469	63	66	RC	6.37	2.1	0.33	0.16	0.18	1.94	2.13	13.44	0.005	0.0025	0.005	0.02	0.02
Joy-11-23	501013	2	3	RC	6.74	1.2	0.33	0.16	0.18	1.04	2.13	7.68	0.005	0.006	0.005	0.023	0.02
Joy-11-23	501015	6	9	RC	7.01	1.7	0.25	0.16	0.09	1.54	1.60	10.88	0.005	0.0025	0.005	0.011	0.015
Joy-11-23	501018	12	15	RC	6.42	1.4	0.33	0.16	0.18	1.24	2.13	8.96	0.005	0.009	0.005	0.019	0.02
Joy-11-23	501021	21	24	RC	5.88	0.9	0.17	0.16	0.01	0.74	1.07	5.76	0.02	0.016	0.005	0.022	0.01
Joy-11-23	501023	27	30	RC	6.21	1.2	0.33	0.16	0.18	1.04	2.13	7.68	0.005	0.006	0.005	0.015	0.02
Joy-11-27	501132	6	9	RC	5.93	1.5	0.33	0.16	0.18	1.34	2.13	9.60	0.005	0.005	0.005	0.092	0.02
Joy-11-27	501134	12	15	RC	6.59	1.6	0.33	0.16	0.18	1.44	2.13	10.24	0.005	0.0025	0.005	0.043	0.02
Joy-11-27	501136	18	21	RC	6.36	1.4	0.50	0.16	0.34	1.24	3.20	8.96	0.005	0.0025	0.005	0.019	0.03
Joy-11-27	501139	24	27	RC	6.33	1.3	0.42	0.16	0.26	1.14	2.67	8.32	0.005	0.0025	0.005	0.035	0.025
Joy-11-27	501141	30	33	RC	6.34	1.5	0.42	0.16	0.26	1.34	2.67	9.60	0.005	0.0025	0.005	0.016	0.025
Joy-11-27	501143	36	39	RC	6.36	1.3	0.50	0.16	0.34	1.14	3.20	8.32	0.005	0.005	0.005	0.019	0.03
Joy-11-41	502393	3	6	RC	6.28	3.4	0.42	0.31	0.10	3.09	1.33	10.88	0.02	0.027	0.01	0.118	0.025
Joy-11-41	502396	12	15	RC	6.08	1	0.42	0.16	0.26	0.84	2.67	6.40	0.005	0.0025	0.005	0.012	0.025
Joy-11-41	502398	18	21	RC	6.17	1.3	0.42	0.16	0.26	1.14	2.67	8.32	0.005	0.0025	0.005	0.017	0.025
Joy-11-41	502400	24	27	RC	6.26	1.1	0.33	0.16	0.18	0.94	2.13	7.04	0.005	0.0025	0.005	0.014	0.02
Joy-11-41	502402	27	30	RC	5.99	1.8	0.33	0.16	0.18	1.64	2.13	11.52	0.005	0.0025	0.005	0.018	0.02
Joy-11-41	502405	36	39	RC	5.89	1.4	0.42	0.16	0.26	1.24	2.67	8.96	0.005	0.0025	0.005	0.016	0.025
Joy-11-41	502408	42	45	RC	5.9	1.2	0.42	0.16	0.26	1.04	2.67	7.68	0.005	0.0025	0.005	0.019	0.025
Joy-12-107	A00117785	3	6	RC	7.8	4.2	1.75	0.16	1.60	4.04	11.21	26.88	0.005	0.008	0.005	0.089	0.105
Joy-12-107	A00117788	9	12	RC	6.61	1.4	0.42	0.16	0.26	1.24	2.67	8.96	0.005	0.006	0.005	0.031	0.025
Joy-12-107	A00117790	15	18	RC	6.47	1	0.50	0.16	0.34	0.84	3.20	6.40	0.005	0.007	0.005	0.023	0.03
Joy-12-107	A00117792	21	24	RC	6.4	1.6	0.58	0.16	0.43	1.44	3.74	10.24	0.005	0.0025	0.005	0.025	0.035
Joy-12-107	A00117794	27	30	RC	6.87	1.9	0.50	0.16	0.34	1.74	3.20	12.16	0.005	0.0025	0.005	0.051	0.03
Joy-12-107	A00117796	33	36	RC	7.16	1.8	0.42	0.16	0.26	1.64	2.67	11.52	0.005	0.005	0.005	0.04	0.025
Joy-12-86	A00154857	0	3	RC	7.47	2.3	0.42	0.16	0.26	2.14	2.67	14.72	0.005	0.008	0.005	0.072	0.025
Joy-12-86	A00154858	3	6	RC	6.99	2.4	0.33	0.16	0.18	2.24	2.13	15.36	0.005	0.007	0.005	0.338	0.02
Joy-12-86	A00154859	6	9	RC	5.78	2.2	0.50	0.16	0.34	2.04	3.20	14.08	0.005	0.007	0.005	0.242	0.03
Joy-12-86	A00154860	9	12	RC	5.56	2.6	0.33	0.16	0.18	2.44	2.13	16.64	0.005	0.005	0.005	0.1	0.02
Joy-11-15	492491	120	123	RS	6.74	4.4	0.75	0.16	0.59	4.24	4.80	28.16	0.01	0.012	0.005	0.264	0.045
Joy-11-15	492492	123	126	RS	4.3	1.7	1.42	13.13	-11.71	-11.43	0.11	0.13	0.17	0.592	0.42	1.08	0.085
Joy-11-15	492536	126	129	RS	4.73	0.7	1.08	18.44	-17.35	-17.74	0.06	0.04	0.07	0.664	0.59	1.2	0.065
Joy-11-16	492535	117	120	RS	4.69	1.4	1.33	12.81	-11.48	-11.41	0.10	0.11	0.13	0.542	0.41	1.53	0.08
Joy-11-23	501061	129	132	RS	6.17	1.6	1.08	0.63	0.46	0.98	1.73	2.56	0.01	0.033	0.02	1.17	0.065
Joy-11-23	501063	132	135	RS	4.47	1.3	1.17	27.81	-26.64	-26.51	0.04	0.05	0.03	0.922	0.89	1.22	0.07
Joy-11-27	501166	99	102	RS	5.49	1.4	1.42	9.06	-7.64	-7.66	0.16	0.15	0.2	0.487	0.29	0.934	0.085
Joy-11-27	501168	102	105	RS	6.1	45	1.67	35.94	-34.27	9.06	0.05	1.25	0.02	1.17	1.15	4.23	0.1
Joy-11-35	502208	57	60	RS	5.26	2.2	1.00	15.94	-14.94	-13.74	0.06	0.14	0.07	0.584	0.51	1.37	0.06
Joy-11-35	502209	60	63	RS	5.53	12	1.08	21.56	-20.48	-9.56	0.05	0.56	0.1	0.791	0.69	1.61	0.065
Joy-11-41	502448	153	156	RS	4.01	3	0.75	0.16	0.59	2.84	4.80	19.20	0.01	0.01	0.005	0.035	0.045
Joy-11-41	502449	156	159	RS	5.91	1.9	1.58	0.16	1.43	1.74	10.14	12.16	0.51	0.506	0.005	1.07	0.095
Joy-12-101	A00115861	51	54	RS	4.9	1.2	0.83	21.88	-21.04	-20.68	0.04	0.05	0.16	0.862	0.7	1.07	0.05
Joy-12-104	A00117614	141	144	RS	5.79	2.6	0.92	0.16	0.76	2.44	5.87	16.64	0.02	0.017	0.005	0.031	0.055
Joy-12-104	A00117615	144	147	RS	5.9	2.7	0.67	0.16	0.51	2.54	4.27	17.28	0.01	0.012	0.005	0.033	0.04
Joy-12-104	A00117616	147	150	RS	5.98	3.9	1.25	0.31	0.94	3.59	4.00	12.48	0.02	0.028	0.01	1.34	0.075
Joy-12-104	A00117617	150	153	RS	4.81	3.5	1.33	14.69	-13.35	-11.19	0.09	0.24	0.03	0.501	0.47	1.18	0.08
Joy-12-105	A00117704	132	135	RS	6.1	2.8	1.58	0.16	1.43	2.64	10.14	17.92	0.005	0.008	0.005	0.811	0.095
Joy-12-106	A00117744	111	114	RS	6.3	1.5	0.92	0.16	0.76	1.34	5.87	9.60	0.01	0.014	0.005	0.719	0.055
Joy-12-106	A00117745	114	117	RS	5.99	1.3	1.00	0.31	0.69	0.99	3.20	4.16	0.01	0.024	0.01	1.5	0.06
Joy-12-107	A00117827	114	117	RS	6.29	2.5	0.92	0.16	0.76	2.34	5.87	16.00	0.005	0.006	0.005	0.034	0.055
Joy-12-107	A00117828	117	120	RS	5.43	1	1.00	15.94	-14.94	-14.94	0.06	0.06	0.16	0.67	0.51	1.05	0.06
Joy-12-107	A00117829	120	123	RS	5.49	0.8	1.08	25.94	-24.85	-25.14	0.04	0.03	0.02	0.849	0.83	1.1	0.065
Joy-12-65	A00154370	72	75	RS	5.73	6	1.08	58.13	-57.04	-52.13	0.02	0.10	0.24	2.1	1.86	1.44	0.065
Joy-12-65	A00154371	75	78	RS	5.75	27	1.83	80.63	-78.79	-53.63	0.02	0.33	0.07	2.65	2.58	3.06	0.11
Joy-12-65	A00154372	78	81	RS	5.09	4.8	0.75	28.13	-27.37	-23.33	0.03	0.17	0.06	0.964	0.9	0.875	0.045
Joy-12-66	A00154329	78	81	RS	3.89	0	1.00	71.25	-70.25	-71.25	0.01	0.00	0.1	2.38	2.28	1.57	0.06
Joy-12-67	A00154404	84	87	RS	4.9	2.7	0.83	4.69	-3.85	-1.99	0.18	0.58	0.06	0.208	0.15	1.22	0.05
Joy-12-67	A00154405	87	90	RS	4	1	0.92	23.13	-22.21	-22.13	0.04	0.04	0.1	0.837	0.74	1.21	0.055
Joy-12-70	A00154485	84	87	RS	5.45	3.7	0.75	11.25	-10.50	-7.55	0.07	0.33	0.14	0.498	0.36	0.658	0.045
Joy-12-70	A00154486	87	90	RS	4.92	2.2	0.92	32.50	-31.58	-30.30	0.03	0.07	0.04	1.08	1.04	1.04	0.055
Joy-12-70	A00154488	90	93	RS	5.31	24	1.25	32.81	-31.56	-8.81	0.04	0.73	0.1	1.15	1.05	1.97	0.075
Joy-12-72	A00154548	72	75	RS	4.19	2.4	1.08	41.25	-40.17	-38.85	0.03	0.06	0.005	1.32	1.32	1.33	0.065
Joy-12-72	A00154549	75	78	RS	4	1	1.25	33.75	-32.50	-32.75	0.04	0.03	0.12	1.2	1.08	1.16	0.075
Joy-12-72	A00154551	78	81	RS	3.76	1.3	1.75	42.50	-40.75	-41.20	0.04	0.03	0.04	1.4	1.36	1.2	0.105
Joy-12-72	A00154552	81	84	RS	6.04	47	1.58	31.25	-29.67	15.75	0.05	1.50	0.06	1.06	1	3.52	0.095
Joy-12-73	A00154563	27	30	RS	3.59	1.3	1.17	29.38	-28.21	-28.08	0.04	0.04	0.12	1.06	0.94	1.27	0.07
Joy-12-73	A00154564	30	33	RS	4.17	2.2	1.00	21.25	-20.25	-19.05	0.05	0.10	0.24	0.92	0.68	1.1	0.06
Joy-12-74	A00154584	51	54	RS	6.05	5.4	0.83	0.16	0.68	5.24	5.34	34.56	0.02	0.022	0.005	0.1	0.05
Joy-12-74	A00154585	54	57	RS	6.23	5.1	0.92	0.16	0.76	4.94	5.87	32.64	0.02	0.019	0.005	0.181	0.055
Joy-12-74	A00154586	57	60	RS	5.71	3.8	1.08	0.16	0.93	3.64	6.94	24.32	0.005	0.008	0.005	0.111	0.065
Joy-12-74	A00154588	60	63	RS	5.59	3.1	1.33	0.31	1.02	2.79	4.27	9.92	0.02	0.031	0.01	0.139	0.08
Joy-12-74	A00154589	63	66	RS	5.68	3.5	0.75	0.16	0.59	3.34	4.80	22.40	0.01	0.012	0.005	0.087	0.045
Joy-12-74	A00154590	66	69	RS	5.74	5.7	0.83	0.31	0.52	5.39	2.67	18.24	0.02	0.03	0.01	0.392	0.05
Joy-12-74	A00154591	69	72	RS	5.4	3.4	1.08	3.44	-2.35	-0.04	0.32	0.99	0.04	0.151	0.11	0.711	0.065
Joy-12-74	A00154592	72	75	RS	5.48	4	1.00	5.94	-4.94	-1.94	0.17	0.67	0.04	0.227	0.19	0.5	0.06

Notes: See text for lithology describtion. Values below detection limit from certificates of analyses (CoA) are reported here as a half of detection limit. See CoA for details

Attachment 2: Results of Acid-Base Accounting for Materials Exposed During the Joyce Lake Project.

Hole	Sample ID	Sample Taken		Lithological Unit	Paste pH	NP_{Sobek}	NP_{Carb}	AP	NNP_{Carb}	NNP_{Sobek}	NPR_{Carb}	NPR_{Sobek}	SO4-S	Total S	S-S	C	CO3
		From	To		units	t CaCO3/1000 t					ratio		wt. %				
Joy-12-74	A00154593	75	78	RS	3.62	3.6	1.17	22.19	-21.02	-18.59	0.05	0.16	0.04	0.75	0.71	0.691	0.07
Joy-12-74	A00154594	78	81	RS	4.05	3.2	1.08	31.88	-30.79	-28.68	0.03	0.10	0.09	1.11	1.02	1.05	0.065
Joy-12-76	A00154661	93	96	RS	5.82	3.9	1.00	5.94	-4.94	-2.04	0.17	0.66	0.04	0.225	0.19	0.307	0.06
Joy-12-76	A00154663	96	99	RS	5.83	3.2	1.00	46.88	-45.87	-43.68	0.02	0.07	0.2	1.7	1.5	0.805	0.06
Joy-12-81	A00154790	57	60	RS	3.76	2.5	1.00	15.31	-14.31	-12.81	0.07	0.16	0.18	0.668	0.49	1.15	0.06
Joy-12-81	A00154791	60	63	RS	3.44	1	1.58	53.13	-51.54	-52.13	0.03	0.02	0.03	1.73	1.7	2.4	0.095
Joy-12-87	A00154946	45	48	RS	6.37	41	1.58	14.38	-12.79	26.63	0.11	2.85	0.06	0.524	0.46	2.88	0.095
Joy-12-99	A00115843	54	57	RS	6.41	50	2.17	25.63	-23.46	24.38	0.08	1.95	0.07	0.893	0.82	4.94	0.13
Joy-12-80	A00154738	3	6	UMH	5.21	2.5	0.33	0.16	0.18	2.34	2.13	16.00	0.005	0.007	0.005	0.03	0.02
Joy-12-80	A00154740	9	12	UMH	6.1	1.5	0.42	0.16	0.26	1.34	2.67	9.60	0.02	0.016	0.005	0.107	0.025
Joy-12-80	A00154741	12	15	UMH	5.88	1.8	0.42	0.16	0.26	1.64	2.67	11.52	0.01	0.014	0.005	0.02	0.025
Joy-12-80	A00154743	18	21	UMH	5.78	2.3	0.42	0.16	0.26	2.14	2.67	14.72	0.005	0.007	0.005	0.018	0.025
Joy-12-80	A00154745	24	27	UMH	5.88	1.2	0.33	0.16	0.18	1.04	2.13	7.68	0.02	0.016	0.005	0.227	0.02
Joy-12-80	A00154747	30	33	UMH	5.96	1.1	0.33	0.16	0.18	0.94	2.13	7.04	0.02	0.016	0.005	0.068	0.02
Joy-12-80	A00154748	33	36	UMH	6	1	0.33	0.16	0.18	0.84	2.13	6.40	0.03	0.027	0.005	0.031	0.02
Joy-12-80	A00154749	36	39	UMH	5.77	1.8	0.25	0.16	0.09	1.64	1.60	11.52	0.01	0.012	0.005	0.025	0.015
Joy-12-101	A00115844	0	3	OB	6.68	4.3	1.58	0.31	1.27	3.99	5.07	13.76	0.02	0.035	0.01	1.16	0.095
Joy-12-61	A00154082	0	3	OB	5.41	2.9	0.88	0.16	0.73	2.74	5.66	18.56	0.005	0.0025	0.005	0.06	0.053
Joy-12-62	A00154201	0	3	OB	6.05	3.3	0.85	0.31	0.54	2.99	2.72	10.56	0.005	0.015	0.01	0.309	0.051
Joy-12-62	A00154202	3	6	OB	5.51	3	0.60	0.16	0.44	2.84	3.84	19.20	0.02	0.017	0.005	0.098	0.036
Joy-12-64	A00154256	0	3	OB	7.16	4.1	1.45	0.16	1.29	3.94	9.29	26.24	0.01	0.013	0.005	0.125	0.087
Joy-12-65	A00154280	0	3	OB	7.03	7.6	1.33	0.16	1.18	7.44	8.54	48.64	0.03	0.026	0.005	0.44	0.08
Joy-12-66	A00154303	0	3	OB	7.08	5.4	0.92	0.16	0.76	5.24	5.87	34.56	0.03	0.027	0.005	0.389	0.055
Joy-12-68	A00154330	0	3	OB	5.48	3	2.23	3.13	-0.89	-0.13	0.72	0.96	0.06	0.159	0.1	6.76	0.134
Joy-12-68	A00154331	3	6	OB	7.86	12	4.92	2.81	2.11	9.19	1.75	4.27	0.03	0.121	0.09	0.874	0.295
Joy-12-69	A00154410	0	3	OB	4.9	1.8	1.93	0.16	1.78	1.64	12.38	11.52	0.05	0.054	0.005	30.2	0.116
Joy-12-70	A00154454	0	3	OB	6.91	8	1.13	0.94	0.20	7.06	1.21	8.53	0.005	0.024	0.03	0.763	0.068
Joy-12-70	A00154455	3	6	OB	6.77	4.4	0.73	0.16	0.58	4.24	4.70	28.16	0.04	0.037	0.005	0.374	0.044
Joy-12-76	A00154628	0	3	OB	6.12	1.3	1.72	0.16	1.56	1.14	10.99	8.32	0.005	0.006	0.005	0.074	0.103
Joy-12-79	A00154705	0	3	OB	6.01	2.5	0.65	0.16	0.49	2.34	4.16	16.00	0.005	0.01	0.005	0.041	0.039
Joy-12-79	A00154706	3	6	OB	6.56	3.3	0.43	0.16	0.28	3.14	2.78	21.12	0.005	0.01	0.005	0.049	0.026
Joy-12-80	A00154736	0	3	OB	6.82	3.1	3.29	0.16	3.13	2.94	21.03	19.84	0.005	0.007	0.005	0.259	0.197
Joy-12-83	A00154792	0	3	OB	6.79	3.1	0.23	0.16	0.08	2.94	1.49	19.84	0.005	0.0025	0.005	0.095	0.014
Joy-12-83	A00154793	3	6	OB	5.76	3.3	0.50	0.16	0.34	3.14	3.20	21.12	0.005	0.0025	0.005	0.058	0.03
Joy-12-85	A00115554	0	6	OB	7.12	3.9	1.33	0.16	1.18	3.74	8.54	24.96	0.03	0.028	0.005	0.1	0.08
Joy-12-85	A00115555	6	9	OB	5.89	3.4	2.32	0.16	2.16	3.24	14.84	21.76	0.005	0.006	0.005	0.019	0.139
Joy-12-88	A00154888	0	3	OB	5.54	3.3	0.38	0.16	0.23	3.14	2.46	21.12	0.005	0.007	0.005	0.206	0.023
Joy-12-90	A00154947	0	3	OB	6.31	9	0.80	0.63	0.18	8.38	1.28	14.40	0.02	0.043	0.02	0.442	0.048
Joy-12-99	A00115823	0	3	OB	7.45	5.3	1.67	0.16	1.51	5.14	10.67	33.92	0.005	0.016	0.005	0.361	0.1
Overburden surficial samples	OV-1	0	0.3	OB	7.37	5.7	0.67	0.16	0.51	5.54	4.27	36.48	0.01	0.013	0.005	0.609	0.04
	OV-2	0	0.3	OB	6.52	4.5	0.58	0.16	0.43	4.34	3.74	28.80	0.005	0.009	0.005	0.224	0.035
	OV-3	0	0.3	OB	5.53	3.4	0.75	0.16	0.59	3.24	4.80	21.76	0.005	0.009	0.005	0.633	0.045
	OV-4	0	0.3	OB	5.36	5.1	0.92	0.16	0.76	4.94	5.87	32.64	0.02	0.021	0.005	0.652	0.055
	OV-5	0	0.3	OB	5.43	5.9	0.67	0.16	0.51	5.74	4.27	37.76	0.005	0.008	0.005	0.444	0.04
	OV-7	0	0.3	OB	5.09	2.7	0.83	0.16	0.68	2.54	5.34	17.28	0.005	0.008	0.005	0.951	0.05
	OV-8	0	0.3	OB	5.3	2.9	0.75	0.16	0.59	2.74	4.80	18.56	0.005	0.009	0.005	0.766	0.045
	OV-9	0	0.3	OB	5.3	1.4	0.75	0.16	0.59	1.24	4.80	8.96	0.005	0.009	0.005	0.717	0.045
	OV-10	0	0.3	OB	5.15	2.1	0.92	0.16	0.76	1.94	5.87	13.44	0.01	0.01	0.005	2.78	0.055
	OV-11	0	0.3	OB	5.43	0.9	0.83	0.16	0.68	0.74	5.34	5.76	0.01	0.01	0.005	0.801	0.05
	OV-12	0	0.3	OB	5.02	-1.2	0.92	0.16	0.76	-1.36	5.87	-7.68	0.01	0.01	0.005	1.69	0.055
	OV-13	0	0.3	OB	5.47	0	0.83	0.16	0.68	-0.16	5.34	0.00	0.01	0.01	0.005	0.915	0.05
	OV-14	0	0.3	OB	5.37	3.8	0.92	0.16	0.76	3.64	5.87	24.32	0.01	0.01	0.005	0.868	0.055
	OV-21	0	0.3	OB	5.3	2.2	0.75	0.16	0.59	2.04	4.80	14.08	0.01	0.01	0.005	0.707	0.045
	OV-22	0	0.3	OB	5.27	1.4	0.50	0.16	0.34	1.24	3.20	8.96	0.01	0.01	0.005	0.564	0.03
	OV-23	0	0.3	OB	5.4	2.2	0.67	0.16	0.51	2.04	4.27	14.08	0.01	0.012	0.005	0.777	0.04
	OV-24	0	0.3	OB	5.65	2.4	0.75	0.16	0.59	2.24	4.80	15.36	0.01	0.011	0.005	0.978	0.045
	OV-25	0	0.3	OB	5.14	1	0.75	0.16	0.59	0.84	4.80	6.40	0.01	0.01	0.005	0.766	0.045
	OV-20	0	0.3	OB	5.23	2.5	0.75	0.16	0.59	2.34	4.80	16.00	0.01	0.012	0.005	1.01	0.045
Products from Metallurgical testing	BS1LC1	-	-	Lump Concentrate	6.96	0.80	0.17	0.31	-0.15	0.49	0.53	2.56	0.005	0.006	0.01	0.011	0.01
	BS1LC2	-	-		6.78	0.60	0.04	0.16	-0.11	0.44	0.27	3.84	0.005	0.0025	0.005	0.009	0.0025
	BS1LC3	-	-		6.63	0.80	0.04	0.16	-0.11	0.64	0.27	5.12	0.005	0.0025	0.005	0.008	0.0025
	BS1SF1	-	-	Sinter Feed	6.73	1.4	0.25	0.16	0.09	1.24	1.60	8.96	0.005	0.0025	0.005	0.017	0.015
	BS1SF2	-	-		6.69	1.2	0.17	0.16	0.01	1.04	1.07	7.68	0.005	0.0025	0.005	0.018	0.01
	BS1SF3	-	-		6.73	1.0	0.17	0.16	0.01	0.84	1.07	6.40	0.005	0.0025	0.005	0.012	0.01
	BS2LC1	-	-	Lump Concentrate	6.7	0.90	0.17	0.16	0.01	0.74	1.07	5.76	0.005	0.0025	0.005	0.016	0.01
	BS2LC2	-	-		6.61	0.60	0.04	0.16	-0.11	0.44	0.27	3.84	0.005	0.0025	0.005	0.013	0.0025
	BS2LC3	-	-		6.71	0.60	0.04	0.16	-0.11	0.44	0.27	3.84	0.005	0.0025	0.005	0.016	0.0025
	BS2CSF1	-	-	Coarse Sinter Feed	6.36	1.0	0.04	0.16	-0.11	0.84	0.27	6.40	0.005	0.0025	0.005	0.012	0.0025
	BS2CSF2	-	-		6.53	0.80	0.04	0.16	-0.11	0.64	0.27	5.12	0.005	0.0025	0.005	0.011	0.0025
	BS2CSF3	-	-		6.52	0.80	0.04	0.16	-0.11	0.64	0.27	5.12	0.005	0.0025	0.005	0.013	0.0025
	BS2FSF1	-	-	Fines Sinter Feed	6.44	2.2	0.17	0.16	0.01	2.04	1.07	14.08	0.005	0.0025	0.005	0.020	0.01
	BS2FSF2	-	-		6.41	5.1	0.17	0.16	0.01	4.94	1.07	32.64	0.005	0.0025	0.005	0.020	0.01
	BS2FSF3	-	-		6.02	6.3	0.17	0.16	0.01	6.14	1.07	40.32	0.005	0.0025	0.005	0.022	0.01
	BS2T1	-	-	Tailings	6.8	1.4	0.42	0.16	0.26	1.24	2.67	8.96	0.005	0.007	0.005	0.048	0.025
	BS2T2	-	-		6.81	1.0	0.33	0.16	0.18	0.84	2.13	6.40	0.005	0.007	0.005	0.046	0.02
	BS2T3	-	-		6.79	0.90	0.50	0.31	0.19	0.59	1.60	2.88	0.005	0.006	0.01	0.046	0.03

Notes: See text for lithology describtion. Values below detection limit from certificates of analyses (CoA) are reported here as a half of detection limit. See CoA for details

ATTACHMENT 3

CONCENTRATIONS OF SELECTED ELEMENTS AND PH OF SHAKE FLASK EXTRACTIONS FROM MATERIALS EXPOSED DURING THE JOYCE LAKE PROJECT

Attachment 3 :SFE Concentrations of Selected Elements and pH of Shake Flask Extractions from Materials Exposed During the Joyce Lake Project.

Hole	Sample ID	Sample Taken		Lithological Unit	Sample Weight g	Volume D.I. Water	Initial pH	Final pH	Hg	Al	As	Cd	Cr	Cu	Fe	Mo	Ni	Pb	Se	Tl	U	Zn
				MMER			pH units	units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
							4.5-9.5		-	-	0.5	-	-	0.3	-	-	0.5	0.2	-	-	-	0.5
		From	To	CCME FAL			4.5-9.5		0.000026	0.1	0.005	0.00004	0.001	0.0028	0.3	0.073	0.113	0.0063	0.001	0.0008	0.015	0.03
Joy-11-07	492067	12	15	LMH	250	750	7.3	7.45	0.000005	0.02	0.0016	0.000011	0.00025	0.00025	0.181	0.00013	0.0003	0.00003	0.0005	0.00001	0.000031	0.0005
Joy-11-07	492078	36	39	LMH	250	750	7.02	6.95	0.00004	0.005	0.0002	0.000007	0.00025	0.0006	0.008	0.000005	0.0001	0.00001	0.0005	0.00001	0.000003	0.003
Joy-11-07	492088	60	63	LMH	250	750	8.09	7.64	0.000005	0.03	0.001	1.5E-06	0.00025	0.0012	2.69	0.000005	0.00005	0.00015	0.002	0.00001	0.000008	0.001
Joy-11-07	492094	75	78	LMH	250	750	6.42	6.34	0.000005	0.005	0.0003	0.000003	0.00025	0.00025	0.006	0.000005	0.0004	0.00001	0.0005	0.00003	0.000002	0.0005
Joy-11-10	492220	72	75	LMH	250	750	5.01	5.38	0.00001	0.01	0.0001	0.000012	0.00025	0.0005	0.0015	0.000005	0.0147	0.00001	0.0005	0.00001	0.000013	0.03
Joy-11-10	492225	87	90	LMH	250	750	6.1	5.93	0.000005	0.005	0.0001	0.000003	0.00025	0.00025	0.0015	0.000005	0.0079	0.00008	0.0005	0.00001	0.000011	0.003
Joy-11-16	492503	27	30	LMH	250	750	7.9	7.73	0.000005	0.005	0.0009	1.5E-06	0.0005	0.0015	2.91	0.000005	0.0004	0.00037	0.0005	0.00001	0.000049	0.004
Joy-11-16	492507	39	42	LMH	250	750	6.43	6.72	0.00001	0.01	0.0003	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0006	0.00002	0.0005	0.00001	0.000006	0.0005
Joy-11-16	492518	69	72	LMH	250	750	5.74	5.89	0.00001	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0003	0.00001	0.0005	0.00001	0.000006	0.0005
Joy-11-25	501065	6	9	LMH	250	750	5.87	6.47	0.00001	0.005	0.0002	0.000004	0.00025	0.00025	0.0015	0.000005	0.0005	0.00001	0.0005	0.00001	0.000003	0.0005
Joy-11-25	501070	21	24	LMH	250	750	6	6.27	0.00001	0.005	0.0003	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.00005	0.00004	0.003	0.00001	0.000002	0.0005
Joy-11-35	502194	21	24	LMH	250	750	6.08	6.3	0.00006	0.01	0.0002	1.5E-06	0.00025	0.00025	0.02	0.000005	0.0002	0.00001	0.0005	0.00001	0.000002	0.0005
Joy-11-35	502197	30	33	LMH	250	750	5.32	5.57	0.000005	0.005	0.0007	0.000004	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.002	0.00005	0.000002	0.0005
Joy-11-40	502381	6	9	LMH	250	750	7.25	7.44	0.00009	0.03	0.0006	0.000008	0.0012	0.00025	0.512	0.00003	0.00005	0.00002	0.0005	0.00001	0.00001	0.0005
Joy-11-40	502385	18	21	LMH	250	750	6.87	6.66	0.000005	0.005	0.0001	0.000004	0.00025	0.00025	0.004	0.000005	0.0002	0.00003	0.0005	0.00001	0.000002	0.001
Joy-11-41	502413	54	57	LMH	250	750	6.12	6.22	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0003	0.00001	0.0005	0.00001	0.000002	0.0005
Joy-11-07	492098	84	87	LRC	250	750	6.13	6.1	0.000005	0.01	0.0008	0.000011	0.00025	0.00025	0.126	0.00017	0.00005	0.00001	0.007	0.00002	0.000016	0.0005
Joy-11-07	492100	90	93	LRC	250	750	4.03	4.12	0.000005	0.07	0.0015	0.000261	0.00025	0.0326	0.013	0.00001	0.0604	0.00007	0.019	0.00024	0.000021	0.099
Joy-11-10	492233	108	111	LRC	250	750	5.62	5.91	0.00003	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0004	0.00001	0.0005	0.00001	0.000005	0.0005
Joy-11-10	492236	117	120	LRC	250	750	5.72	6.11	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0001	0.00001	0.0005	0.00001	0.000003	0.001
Joy-11-15	492489	114	117	LRC	250	750	5.97	6.15	0.00001	0.02	0.0003	1.5E-06	0.00025	0.00025	0.09	0.000005	0.0003	0.00001	0.0005	0.00001	0.000004	0.001
Joy-11-25	501073	30	33	LRC	250	750	5.85	5.91	0.00024	0.01	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.002	0.00001	0.002	0.00001	5E-07	0.0005
Joy-11-25	501076	36	39	LRC	250	750	3.72	4.05	0.000005	0.34	0.0033	0.000362	0.00025	0.0167	0.075	0.000005	0.0831	0.00007	0.027	0.00048	0.000091	0.068
Joy-11-27	501161	87	90	LRC	250	750	6.2	6.37	0.000005	0.005	0.0003	0.000003	0.00025	0.00025	0.211	0.000005	0.0011	0.00001	0.0005	0.00002	0.000001	0.0005
Joy-11-27	501165	96	99	LRC	250	750	5.1	5.38	0.000005	0.005	0.0011	0.000046	0.00025	0.00025	0.0015	0.000005	0.0058	0.00001	0.008	0.00037	5E-07	0.004
Joy-11-40	502389	27	30	LRC	250	750	5.86	5.88	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.0005	0.00004	5E-07	0.0005
Joy-11-40	502391	33	36	LRC	250	750	4.99	5.21	0.000005	0.005	0.0002	0.000005	0.00025	0.00025	0.0015	0.000005	0.001	0.00001	0.0005	0.00021	5E-07	0.0005
Joy-11-41	502429	99	102	LRC	250	750	5.73	5.9	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0126	0.00001	0.0005	0.00001	0.000004	0.0005
Joy-11-41	502438	123	126	LRC	250	750	5.2	5.56	0.000005	0.01	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0027	0.00001	0.0005	0.00001	0.000007	0.001
Joy-11-41	502446	147	150	LRC	250	750	5.95	6.04	0.00006	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0004	0.00001	0.0005	0.00001	5E-07	0.0005
Joy-12-107	A00117824	108	111	LRC	250	750	6.51	6.41	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.039	0.00003	0.0006	0.00001	0.0005	0.00001	5E-07	0.0005
Joy-12-73	A00154554	3	6	LRC	250	750	5.47	5.76	0.000005	0.005	0.0001	0.000046	0.00025	0.0112	0.015	0.000005	0.0067	0.00001	0.0005	0.00001	0.000022	0.006
Joy-12-73	A00154558	15	18	LRC	250	750	4.44	4.77	0.000005	0.01	0.0001	0.000086	0.00025	0.0027	0.0015	0.000005	0.0048	0.00002	0.0005	0.00024	0.000029	0.007
Joy-12-76	A00154658	84	87	LRC	250	750	6.49	6.51	0.00002	0.01	0.0001	0.0001	0.00025	0.0009	0.0015	0.000005	0.0055	0.00001	0.002	0.00059	0.000022	0.004
Joy-12-93	A00115624	45	48	LRC	250	750	4.71	5.29	0.000005	0.005	0.0001	0.000024	0.00025	0.0007	0.0015	0.000005	0.0118	0.00001	0.0005	0.00001	0.000014	0.013
Joy-12-93	A00115627	51	54	LRC	250	750	4.97	5.59	0.000005	0.005	0.0001	0.000015	0.00025	0.00025	0.0015	0.000005	0.0085	0.00001	0.0005	0.00001	0.000007	0.011
Joy-12-93	A00115629	57	60	LRC	250	750	4.83	5.29	0.000005	0.005	0.0001	0.000014	0.00025	0.00025	0.0015	0.000005	0.0046	0.00001	0.0005	0.00013	0.000009	0.002
Joy-12-93	A00115631	63	66	LRC	250	750	4.93	5.35	0.000005	0.005	0.0001	0.00001	0.00025	0.00025	0.0015	0.000005	0.0061	0.00001	0.0005	0.00001	0.000015	0.005
Joy-12-93	A00115634	72	75	LRC	250	750	4.73	5.01	0.000005	0.005	0.0001	0.000008	0.00025	0.00025	0.0015	0.000005	0.0035	0.00001	0.0005	0.00001	0.000025	0.003
Joy-12-99	A00115836	36	39	LRC	250	750	5.21	5.49	0.000005	0.005	0.0001	0.000057	0.00025	0.001	0.0015	0.00055	0.0062	0.00001	0.0005	0.00004	0.000001	0.004
Joy-12-99	A00115842	51	54	LRC	250	750	4.73	5.05	0.000005	0.005	0.0018	0.000132	0.00025	0.0015	0.0015	0.00011	0.0211	0.00001	0.045	0.0005	0.000001	0.008
Joy-11-10	492197	12	15	RC	250	750	6.26	7.1	0.000005	0.02	0.0004	1.5E-06	0.00025	0.00025	0.038	0.00003	0.00005	0.00001	0.0005	0.00001	0.000009	0.0005
Joy-11-10	492204	30	33	RC	250	750	6.22	6.73	0.00001	0.01	0.0002	1.5E-06	0.00025	0.00025	0.014	0.000005	0.0019	0.00001	0.0005	0.00001	0.000002	0.004
Joy-11-10	492211	48	51	RC	250	750	5.27	6	0.000005	0.005	0.0001	0.00001	0.00025	0.00025	0.0015	0.000005	0.0038	0.00001	0.0005	0.00001	0.000001	0.001
Joy-11-10	492217	63	66	RC	250	750	4.99	5.47	0.000005	0.005	0.0001	0.000011	0.00025	0.00025	0.0015	0.000005	0.0049	0.00001	0.0005	0.00001	0.000004	0.057
Joy-11-15	492451	9	12	RC	250	750	6.19	6.3	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.023	0.00002	0.0009	0.00001	0.0005	0.00001	0.000002	0.0005
Joy-11-15	492456	24	27	RC	250	750	6.47	6.91	0.00001	0.02	0.0003	1.5E-06	0.00025	0.00025	0.542	0.000005	0.0001	0.00001	0.0005	0.00001	0.000011	0.0005
Joy-11-15	492461	42	45	RC	250	750	6.36	6.66	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.053	0.000005	0.0019	0.00001	0.0005	0.00001	0.000002	0.0005
Joy-11-15	492465	51	54	RC	250	750	5.91	6.09	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0004	0.00001	0.0005	0.00001	0.000008	0.0005
Joy-11-15	492469	63	66	RC	250	750	6.49	6.91	0.000005	0.02	0.0003	1.5E-06	0.00025	0.00025	0.681	0.000005	0.0002	0.00001	0.0005	0.00001	0.000021	0.0005
Joy-11-23	501015	6	9	RC	250	750	6.45	7.33	0.000005	0.005	0.0007	1.5E-06	0.00025	0.00025	0.034	0.00018	0.0005	0.00001	0.0005	0.00001	0.000007	0.0005

Notes: See text for lithology describtion. Values below detection limit from certificates of analyses (CoA) are reported here as a half of detection limit. See CoA for details

Attachment 3 :SFE Concentrations of Selected Elements and pH of Shake Flask Extractions from Materials Exposed During the Joyce Lake Project.

Hole	Sample ID	Sample Taken		Lithological Unit	Sample Weight g	Volume D.I. Water	Initial pH	Final pH	Hg	Al	As	Cd	Cr	Cu	Fe	Mo	Ni	Pb	Se	Tl	U	Zn
				MMER			pH units	units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
							4.5-9.5		-	-	0.5	-	-	0.3	-	-	0.5	0.2	-	-	-	0.5
		From	To	CCME FAL			4.5-9.5		0.000026	0.1	0.005	0.00004	0.001	0.0028	0.3	0.073	0.113	0.0063	0.001	0.0008	0.015	0.03
Joy-11-23	501021	21	24	RC	250	750	6.01	6.34	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0001	0.00001	0.0005	0.00001	0.000003	0.0005
Joy-11-27	501134	12	15	RC	250	750	6.26	6.75	0.000005	0.005	0.0001	0.000003	0.00025	0.00025	0.0015	0.00004	0.0068	0.00001	0.0005	0.00005	0.000003	0.001
Joy-11-27	501139	24	27	RC	250	750	6.31	6.72	0.000005	0.01	0.0001	1.5E-06	0.00025	0.00025	0.004	0.000005	0.0007	0.00001	0.0005	0.00001	0.000004	0.001
Joy-11-27	501143	36	39	RC	250	750	6.39	6.77	0.00001	0.005	0.0001	1.5E-06	0.00025	0.00025	0.007	0.000005	0.0002	0.00001	0.0005	0.00001	0.000007	0.002
Joy-11-41	502393	3	6	RC	250	750	6.02	6.47	0.000005	0.005	0.0001	0.000014	0.00025	0.00025	0.0015	0.000005	0.0216	0.00001	0.0005	0.00002	0.000002	0.002
Joy-11-41	502398	18	21	RC	250	750	6.04	6.04	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0006	0.00001	0.0005	0.00001	5E-07	0.0005
Joy-11-41	502402	27	30	RC	250	750	5.92	6.02	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.0005	0.00001	5E-07	0.0005
Joy-11-41	502408	42	45	RC	250	750	5.67	5.85	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0004	0.00001	0.0005	0.00001	0.000003	0.0005
Joy-12-107	A00117785	3	6	RC	250	750	8.16	8.42	0.000005	0.03	0.0009	1.5E-06	0.00025	0.0006	0.049	0.0132	0.0002	0.00001	0.0005	0.00001	0.000585	0.0005
Joy-12-107	A00117790	15	18	RC	250	750	7.22	7.16	0.000005	0.02	0.0005	1.5E-06	0.001	0.00025	2.49	0.00031	0.0001	0.00001	0.0005	0.00001	0.000019	0.0005
Joy-12-107	A00117794	27	30	RC	250	750	8.32	8.04	0.00002	0.44	0.0052	0.000007	0.0017	0.0034	47.1	0.00161	0.00005	0.00026	0.001	0.00001	0.000232	0.002
Joy-12-86	A00154858	3	6	RC	250	750	5.23	5.84	0.000005	0.005	0.0001	0.000023	0.00025	0.0023	0.0015	0.0023	0.0032	0.00004	0.0005	0.00001	0.000009	0.008
Joy-12-86	A00154860	9	12	RC	250	750	4.84	5.28	0.000005	0.005	0.0001	0.000031	0.00025	0.0024	0.0015	0.00267	0.0025	0.00003	0.0005	0.00002	0.000015	0.008
Joy-11-15	492492	123	126	RS	250	750	3.29	3.55	0.000005	0.83	0.0081	0.000773	0.0007	0.0569	0.684	0.00002	0.198	0.00053	0.062	0.00025	0.000734	0.154
Joy-11-16	492535	117	120	RS	250	750	3.92	4.15	0.000005	0.07	0.0063	0.000314	0.00025	0.0148	0.02	0.00002	0.198	0.00012	0.166	0.00081	0.00013	0.032
Joy-11-23	501063	132	135	RS	250	750	3.93	4.17	0.000005	0.15	0.0022	0.00052	0.00025	0.0511	0.02	0.00021	0.0937	0.00001	0.042	0.00023	0.000065	0.08
Joy-11-27	501168	102	105	RS	250	750	6.11	6.22	0.00002	0.005	0.001	0.000123	0.00025	0.0008	0.012	0.0004	0.0385	0.00001	0.016	0.00026	0.000025	0.006
Joy-11-35	502209	60	63	RS	250	750	5.58	6.03	0.000005	0.005	0.0011	0.000107	0.00025	0.00025	0.005	0.00002	0.0263	0.00001	0.018	0.00016	0.000008	0.004
Joy-11-41	502449	156	159	RS	250	750	3.26	3.31	0.000005	5.73	0.0627	0.001587	0.0358	2.2	2.88	0.00033	2.66	0.92	1.95	0.00013	0.006425	0.239
Joy-12-104	A00117614	141	144	RS	250	750	6.06	6.29	0.000005	0.01	0.0001	1.5E-06	0.00025	0.00025	0.067	0.000005	0.0007	0.00001	0.0005	0.00001	0.000003	0.0005
Joy-12-104	A00117616	147	150	RS	250	750	6.43	6.56	0.00014	0.72	0.0044	0.000144	0.003	0.005	38	0.00411	0.0027	0.00094	0.024	0.00001	0.000778	0.01
Joy-12-105	A00117704	132	135	RS	250	750	7.05	6.53	0.000005	0.005	0.0011	0.000003	0.00025	0.00025	0.327	0.00003	0.0002	0.00004	0.004	0.00002	0.000006	0.005
Joy-12-106	A00117745	114	117	RS	250	750	6.59	7.03	0.00006	0.13	0.0022	0.000022	0.0008	0.0037	10.4	0.00046	0.0038	0.00028	0.022	0.00001	0.00003	0.002
Joy-12-107	A00117828	117	120	RS	250	750	5.38	5.36	0.000005	0.005	0.0014	0.000024	0.00025	0.0009	0.046	0.000005	0.0076	0.00024	0.015	0.0001	5E-07	0.003
Joy-12-65	A00154370	72	75	RS	250	750	5.03	5.61	0.000005	0.005	0.0007	0.000837	0.00025	0.0009	0.144	0.00003	0.146	0.00001	0.015	0.00003	0.000014	0.049
Joy-12-65	A00154372	78	81	RS	250	750	4.16	4.93	0.000005	0.005	0.0005	0.000272	0.00025	0.0087	0.027	0.000005	0.0858	0.00001	0.009	0.00001	0.000015	0.049
Joy-12-67	A00154404	84	87	RS	250	750	4.1	4.49	0.000005	0.03	0.0012	0.000388	0.00025	0.0054	0.016	0.000005	0.0216	0.00001	0.023	0.00074	0.000007	0.035
Joy-12-70	A00154485	84	87	RS	250	750	4.63	5.18	0.00003	0.005	0.0002	0.000182	0.00025	0.0009	0.019	0.000005	0.0396	0.00001	0.006	0.00005	0.000004	0.015
Joy-12-70	A00154488	90	93	RS	250	750	5.4	5.96	0.00005	0.005	0.0002	0.000184	0.00025	0.0007	0.031	0.00001	0.0331	0.00001	0.005	0.00009	0.000008	0.011
Joy-12-72	A00154549	75	78	RS	250	750	3.53	3.77	0.000005	0.93	0.0012	0.00118	0.00025	0.125	0.211	0.000005	0.177	0.00013	0.003	0.00259	0.000277	0.186
Joy-12-72	A00154552	81	84	RS	250	750	5.88	6.09	0.000005	0.005	0.0002	0.00016	0.00025	0.0016	0.032	0.000005	0.03	0.00001	0.006	0.00024	0.000009	0.006
Joy-12-73	A00154564	30	33	RS	250	750	3.54	3.83	0.000005	3.79	0.0012	0.00105	0.0011	0.082	0.199	0.00067	0.111	0.00032	0.011	0.00072	0.000685	0.178
Joy-12-74	A00154585	54	57	RS	250	750	5.32	5.52	0.00003	0.06	0.0001	0.000048	0.0006	0.0213	0.376	0.00262	0.0139	0.00003	0.0005	0.00001	0.000104	0.017
Joy-12-74	A00154588	60	63	RS	250	750	4.67	5.05	0.000005	0.005	0.0001	0.00006	0.00025	0.0016	0.005	0.00092	0.0069	0.00001	0.0005	0.00029	0.000013	0.018
Joy-12-74	A00154590	66	69	RS	250	750	4.96	5.16	0.000005	0.005	0.0001	0.000057	0.00025	0.0007	0.0015	0.00024	0.0047	0.00001	0.005	0.00055	0.000005	0.006
Joy-12-74	A00154592	72	75	RS	250	750	4.52	4.75	0.000005	0.02	0.0009	0.000236	0.00025	0.0078	0.005	0.00004	0.0474	0.00001	0.008	0.00037	0.000029	0.029
Joy-12-74	A00154594	78	81	RS	250	750	3.73	3.85	0.000005	1.33	0.0006	0.0011	0.0007	0.308	0.122	0.00002	0.209	0.00016	0.003	0.00143	0.000849	0.179
Joy-12-76	A00154663	96	99	RS	250	750	3.77	4.08	0.000005	5.9	0.0016	0.00138	0.0009	0.134	0.084	0.000005	0.151	0.00027	0.006	0.00056	0.00534	0.136
Joy-12-81	A00154791	60	63	RS	250	750	3.23	3.35	0.000005	6.67	0.0034	0.0166	0.0163	2	2.33	0.00003	0.43	0.00015	0.063	0.00247	0.00184	0.514
Joy-12-87	A00154946	45	48	RS	250	750	6	6.24	0.00005	0.005	0.0003	0.00027	0.00025	0.0189	0.019	0.00003	0.0319	0.00001	0.004	0.00009	0.000052	0.008
Joy-12-80	A00154740	9	12	UMH	250	750	5.64	5.82	0.000005	0.005	0.0001	0.000055	0.00025	0.00025	0.0015	0.00001	0.0018	0.00001	0.0005	0.00003	0.000004	0.002
Joy-12-80	A00154743	18	21	UMH	250	750	6.32	6.43	0.000005	0.02	0.0001	1.5E-06	0.0006	0.0007	0.108	0.00003	0.0007	0.00002	0.0005	0.00004	0.000006	0.0005
Joy-12-80	A00154747	30	33	UMH	250	750	6.12	6.17	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.0015	0.000005	0.0004	0.00001	0.0005	0.00001	5E-07	0.002
Joy-12-80	A00154749	36	39	UMH	250	750	6.1	6.17	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.021	0.000005	0.00005	0.00001	0.0005	0.00001	5E-07	0.002
Joy-12-62	A00154201	0	3	OB	250	750	5.6	5.94	0.00005	0.005	0.0001	0.000094	0.0007	0.0065	0.005	0.0004	0.0114	0.00001	0.0005	0.00001	0.000015	0.004
Joy-12-62	A00154202	3	6	OB	250	750	5.2	5.78	0.00005	0.005	0.0003	0.000039	0.00025	0.0048	0.0015	0.00003	0.0046	0.00001	0.0005	0.00001	0.000006	0.002
Joy-12-68	A00154330	0	3	OB	250	750	5.4	5.35	0.00005	1.76	0.0001	0.00022	0.0058	0.0908	8.55	0.00028	0.0204	0.00102	0.005	0.00001	0.00193	0.051
Joy-12-68	A00154331	3	6	OB	250	750	7.3	7.25	0.00005	0.63	0.0021	0.000029	0.002	0.0112	0.959	0.0098	0.002	0.00027	0.007	0.00001	0.000372	0.004
Joy-12-70	A00154454	0	3	OB	250	750	5.8	6.21	0.0002	0.02	0.0007	0.000652	0.0009	0.0209	0.016	0.00181	0.0377	0.00001	0.0005	0.00001	0.00005	0.003
Joy-12-70	A00154455	3	6	OB	250	750	5.8	6.03	0.00005	0.02	0.0003	0.000761	0.0005	0.0074	0.011	0.00024	0.0281	0.00001	0.0005	0.00001	0.000013	0.004
Joy-12-79	A00154705	0	3	OB	250	750	5.4	5.68	0.00005	0.01	0.0001	1.5E-06	0.00025	0.0044	0.006	0.00002	0.0044	0.00001	0.0005	0.00001	0.000002	0.0005

Notes: See text for lithology describtion. Values below detection limit from certificates of analyses (CoA) are reported here as a half of detection limit. See CoA for details

Attachment 3 :SFE Concentrations of Selected Elements and pH of Shake Flask Extractions from Materials Exposed During the Joyce Lake Project.

Hole	Sample ID	Sample Taken		Lithological Unit	Sample Weight g	Volume D.I. Water	Initial pH	Final pH	Hg	Al	As	Cd	Cr	Cu	Fe	Mo	Ni	Pb	Se	Tl	U	Zn
				MMER			pH units	units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
							4.5-9.5		-	-	0.5	-	-	0.3	-	-	0.5	0.2	-	-	-	0.5
		From	To	CCME FAL			4.5-9.5		0.000026	0.1	0.005	0.00004	0.001	0.0028	0.3	0.073	0.113	0.0063	0.001	0.0008	0.015	0.03
Joy-12-79	A00154706	3	6	OB	250	750	5.6	6.14	0.00005	0.005	0.0001	1.5E-06	0.00025	0.0043	0.0015	0.00002	0.0026	0.00001	0.0005	0.00001	0.000002	0.0005
Joy-12-83	A00154792	0	3	OB	215	645	5.5	6.28	0.00005	0.02	0.0007	1.5E-06	0.00025	0.004	0.009	0.00003	0.0025	0.00001	0.0005	0.00001	0.000005	0.0005
Joy-12-83	A00154793	3	6	OB	250	750	5.4	5.9	0.00005	0.02	0.0018	0.00001	0.00025	0.0043	0.0015	0.00001	0.0064	0.00008	0.0005	0.00001	0.000001	0.003
Joy-12-85	A00115554	0	6	OB	250	750	6.8	7.32	0.00005	0.12	0.0007	0.000028	0.00025	0.0688	5.34	0.00457	0.0072	0.00037	0.001	0.00001	0.000327	0.033
Joy-12-85	A00115555	6	9	OB	250	750	6.1	6.56	0.00005	0.03	0.0001	1.5E-06	0.00025	0.0046	0.258	0.00003	0.0047	0.00004	0.0005	0.00001	0.000012	0.0005
Overburden Surficial Samples	OV-1	0	0.3	-	250	750	6.22	6.71	0.00068	7.94	0.009	0.00086	0.032	0.041	11	0.0181	0.0219	0.00708	0.0005	0.00016	0.00447	0.114
	OV-2	0	0.3	-	250	750	6.25	6.75	0.000005	4.62	0.0077	0.000621	0.0205	0.0286	5.92	0.0119	0.014	0.00544	0.0005	0.00009	0.0021	0.075
	OV-4	0	0.3	-	250	750	5.91	5.68	0.00001	2.21	0.0064	0.000148	0.0033	0.0059	1.22	0.00343	0.0016	0.00146	0.0005	0.00001	0.000686	0.011
	OV-7	0	0.3	-	250	750	5.52	5.67	0.000005	1.07	0.0016	0.000007	0.0015	0.0021	1.44	0.00028	0.0003	0.00099	0.0005	0.00001	0.000061	0.003
	OV-9	0	0.3	-	250	750	5.32	5.57	0.000005	1.05	0.0006	0.000008	0.0014	0.0007	1.28	0.00022	0.0002	0.00062	0.0005	0.00001	0.000063	0.001
	OV-10	0	0.3	-	250	750	5.41	5.33	0.000005	2.4	0.0103	0.000384	0.0114	0.0056	6.3	0.00302	0.0038	0.00464	0.0005	0.00003	0.000848	0.026
	OV-11	0	0.3	-	250	750	5.55	5.69	0.000005	1.12	0.0019	0.000011	0.0013	0.0009	0.382	0.00035	0.0004	0.0004	0.0005	0.00001	0.00009	0.002
	OV-13	0	0.3	-	250	750	5.53	5.82	0.000005	2.26	0.0005	0.000111	0.0023	0.0014	2.42	0.00016	0.0007	0.00129	0.0005	0.00001	0.00017	0.004
	OV-21	0	0.3	-	250	750	5.63	5.62	0.00001	3.01	0.0012	0.000092	0.0027	0.0041	2.55	0.00151	0.0011	0.00164	0.0005	0.00001	0.000371	0.009
	OV-23	0	0.3	-	250	750	5.55	5.96	0.000005	2.67	0.0013	0.00006	0.0028	0.0026	3.44	0.00014	0.0009	0.00233	0.0005	0.00001	0.000208	0.005
	OV-25	0	0.3	-	250	750	5.87	5.48	0.000005	2.19	0.0019	0.000025	0.0038	0.002	5.73	0.00122	0.0012	0.00362	0.0005	0.00001	0.000311	0.006
Products from Metallurgical Testing	BS1LC1	-	-	Lump Concentrate	250	750	8.18	7.70	0.000005	0.01	0.0007	0.00001	0.00025	0.0005	0.006	0.00037	0.0003	0.00001	0.0005	0.00001	0.000011	0.003
	BS1LC2	-	-		250	750	6.71	7.51	0.000005	0.005	0.0001	0.000004	0.00025	0.00025	0.0015	0.00003	0.00005	0.00001	0.0005	0.00001	5E-07	0.001
	BS1LC3	-	-		250	750	6.38	6.96	0.000005	0.005	0.0004	0.000004	0.00025	0.00025	0.0015	0.000005	0.00005	0.00001	0.0005	0.00001	5E-07	0.0005
	BS1SF1	-	-	Sinter Feed	250	750	6.82	6.99	0.00001	0.27	0.0037	1.5E-06	0.0017	0.0011	0.828	0.00007	0.0004	0.00008	0.0005	0.00001	0.000054	0.002
	BS1SF2	-	-		250	750	6.79	7.04	0.00001	0.18	0.0006	0.000005	0.0019	0.00025	0.619	0.00012	0.0004	0.00004	0.0005	0.00001	0.000018	0.004
	BS1SF3	-	-		250	750	6.80	6.92	0.00001	0.15	0.0021	1.5E-06	0.002	0.00025	0.533	0.00013	0.0003	0.00005	0.0005	0.00001	0.000015	0.002
	BS2LC1	-	-	Lump Concentrate	250	750	6.97	6.95	0.000005	0.005	0.0001	1.5E-06	0.00025	0.00025	0.011	0.00005	0.00005	0.00001	0.0005	0.00001	5E-07	0.0005
	BS2LC2	-	-		250	750	7.05	7.00	0.000005	0.005	0.0002	1.5E-06	0.00025	0.00025	0.0015	0.00001	0.00005	0.00001	0.0005	0.00001	5E-07	0.0005
	BS2LC3	-	-		250	750	7.32	7.03	0.000005	0.01	0.0005	0.000016	0.00025	0.00025	0.0015	0.00005	0.0002	0.00004	0.0005	0.00001	0.000004	0.0005
	BS2CSF1	-	-	Coarse Sinter Feed	250	750	6.72	6.95	0.000005	0.005	0.0003	1.5E-06	0.0007	0.00025	0.021	0.000005	0.0001	0.00001	0.0005	0.00001	5E-07	0.003
	BS2CSF2	-	-		250	750	6.68	6.71	0.000005	0.005	0.0001	1.5E-06	0.0005	0.00025	0.019	0.000005	0.00005	0.00001	0.0005	0.00001	5E-07	0.0005
	BS2CSF3	-	-		250	750	6.65	6.78	0.00001	0.005	0.0001	1.5E-06	0.0006	0.00025	0.022	0.000005	0.00005	0.00001	0.0005	0.00001	5E-07	0.0005
	BS2FSF1	-	-	Fines Sinter Feed	250	750	6.83	6.93	0.00002	0.1	0.001	1.5E-06	0.0032	0.0005	0.59	0.00002	0.0004	0.00011	0.0005	0.00001	0.00001	0.004
	BS2FSF2	-	-		250	750	6.87	6.91	0.00001	0.08	0.0009	1.5E-06	0.003	0.0007	0.702	0.00002	0.0003	0.00013	0.0005	0.00001	0.000014	0.001
	BS2FSF3	-	-		250	750	6.91	6.75	0.00001	0.1	0.0023	1.5E-06	0.0034	0.0008	0.722	0.00002	0.0003	0.00023	0.0005	0.00001	0.000013	0.004
	BS2T1	-	-	Tailings	250	750	7.19	7.09	0.00001	0.22	0.0011	1.5E-06	0.0036	0.001	0.72	0.00017	0.0005	0.00016	0.0005	0.00001	0.000042	0.001
	BS2T2	-	-		250	750	7.26	7.01	0.00002	0.26	0.0024	1.5E-06	0.0041	0.0006	0.797	0.00014	0.0005	0.00045	0.0005	0.00001	0.000027	0.002
	BS2T3	-	-		250	750	7.27	7.18	0.00002	0.25	0.0013	1.5E-06	0.0039	0.0007	0.811	0.0002	0.0004	0.00021	0.0005	0.00001	0.000039	0.001

Notes: See text for lithology describtion. Values below detection limit from certificates of analyses (CoA) are reported here as a half of detection limit. See CoA for details

ATTACHMENT 4

CONCENTRATIONS OF SELECTED ELEMENTS IN MATERIALS EXPOSED DURING THE JOYCE LAKE PROJECT

Attachment 4: Concentrations of Selected Elements in Materials Exposed During the Joyce Lake Project.

Hole	Sample ID	Sample Taken		Lithological Unit	Ag	As	Ba	Bi	Cd	Co	Cr	Cu	Mn	Mo	Ni	Pb	Sb	Sb	Se	Sr	Ti	Tl	U	V	Zn
					ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
				ACUC, µg/g	53	4.8	628	0.16	0.09	17.3	92	28	368	1.1	47	17	0.4	0.4	0.09	320	2563	0.9	2.7	97	67
		From	To	ACUC, 10 x ug/g	530	48	6280	1.6	0.9	173	920	280	3678	11	470	170	4	4	0.9	3200	25632	9	27	970	670
Joy-11-07	492067	12	15	LMH	0.06	16	19	0.045	0.03	2.1	88	2.2	1800	2.8	3.7	2.8	< 0.8	0.4	0.35	110	160	0.01	1.2	80	8.6
Joy-11-07	492088	60	63	LMH	0.1	15	36	0.045	0.06	4.8	54	1.8	1500	4.8	11	2.4	< 0.8	0.4	0.35	31	590	0.01	2	180	10
Joy-11-10	492220	72	75	LMH	0.04	52	71	0.045	0.01	3.4	59	20	4500	4.7	10	2.9	2.3	2.3	0.35	6.8	34	0.08	1.7	46	17
Joy-11-16	492503	27	30	LMH	0.03	8.9	13	0.045	0.04	3.5	71	9.8	5800	1.9	5.2	1.3	< 0.8	0.4	0.35	4.6	15	0.01	1.5	20	20
Joy-11-16	492507	39	42	LMH	0.05	19	33	0.045	0.07	6.9	160	18	12000	7.1	10	2.2	1.1	1.1	0.35	13	37	0.02	4.6	40	27
Joy-11-25	501070	21	24	LMH	0.04	13	23	0.045	0.06	2.7	46	16	3900	3.8	7.1	4.4	< 0.8	0.4	3.1	100	210	0.01	1.3	120	32
Joy-11-35	502197	30	33	LMH	0.2	19	33	0.12	0.09	0.35	43	19	630	8.1	8.2	12	< 0.8	0.4	9.9	140	520	0.09	3.5	220	23
Joy-11-40	502385	18	21	LMH	0.07	13	22	0.045	0.04	4.5	92	11	2300	3.7	9.8	3.8	< 0.8	0.4	0.35	45	250	0.04	2.2	120	24
Joy-11-07	492098	84	87	LRC	0.22	22	38	0.14	0.11	5.6	55	9.8	970	9.3	22	15	< 0.8	0.4	3.2	270	570	0.01	3.5	270	33
Joy-11-10	492233	108	111	LRC	0.04	29	1200	0.045	0.02	7.1	38	4	10000	5.2	5.8	3.8	< 0.8	0.4	0.35	28	260	0.01	2.4	170	57
Joy-11-27	501164	93	96	LRC	0.11	30	33	0.045	0.08	3.8	48	3.4	1200	8	16	3.5	< 0.8	0.4	2.4	210	370	0.04	1.9	200	23
Joy-11-40	502390	30	33	LRC	0.36	34	33	0.16	0.11	1.6	48	12	520	13	7.1	9.4	< 0.8	0.4	4.1	280	3000	0.07	7.2	420	14
Joy-11-41	502433	111	114	LRC	0.08	18	23	0.045	0.06	7.1	48	2.1	6100	4.2	3.9	1.3	< 0.8	0.4	0.35	110	230	0.01	1.6	170	15
Joy-11-41	502447	150	153	LRC	0.08	13	290	0.045	0.12	16	53	6.8	29000	8.7	8.5	10	< 0.8	0.4	3.5	230	520	0.01	2.2	180	24
Joy-12-73	A00154554	3	6	LRC	0.02	12	310	0.045	0.15	28	210	21	28000	7.6	10	2.4	1.2	1.2	0.35	29	37	0.12	0.91	72	26
Joy-12-76	A00154658	84	87	LRC	0.17	16	37	0.045	0.04	1.3	47	8	830	9.1	6	6.9	1	1	0.35	59	570	0.04	2.5	240	11
Joy-12-93	A00115627	51	54	LRC	0.005	17	16	0.045	0.01	2.2	170	1.8	1300	2.7	4.3	1.7	1.2	1.2	0.35	6.9	52	0.01	1.8	73	6.9
Joy-12-93	A00115631	63	66	LRC	0.005	26	12	0.045	0.01	2.8	130	1.7	1100	2.2	4.2	2.1	1.7	1.7	0.35	4.7	45	0.01	1.5	66	5.4
Joy-12-93	A00115634	72	75	LRC	0.005	36	17	0.045	0.02	1.7	43	1.5	1400	2.1	2.3	2.3	3.1	3.1	0.35	8.3	59	0.01	1.8	63	7.6
Joy-11-10	492197	12	15	RC	0.01	14	16	0.045	0.03	1.6	120	1.7	1100	1.8	5.2	2.1	< 0.8	0.4	0.35	7.2	52	0.01	0.83	41	7.7
Joy-11-10	492211	48	51	RC	0.005	32	8.4	0.045	0.04	8	96	2.2	1200	2.5	4.1	1.4	1.3	1.3	0.35	3.1	43	0.01	0.71	55	6.9
Joy-11-15	492448	3	6	RC	0.1	39	110	0.045	0.16	3.7	63	16	1800	2	11	3.9	1.2	1.2	0.35	55	690	0.12	2.1	110	40
Joy-11-15	492459	33	36	RC	0.02	21	19	0.045	0.02	0.84	96	4.3	990	1.2	3.6	2.8	< 0.8	0.4	0.35	200	92	0.01	0.61	53	15
Joy-11-15	492463	45	48	RC	0.005	12	14	0.045	0.02	2.2	130	2.1	940	4.1	6.8	1.6	< 0.8	0.4	0.35	4.1	26	0.01	0.78	41	7.9
Joy-11-23	501013	2	3	RC	0.02	22	32	0.045	0.03	3.8	190	2.5	1200	3.1	6.8	1.1	< 0.8	0.4	0.9	48	350	0.01	0.7	28	8.3
Joy-11-23	501023	27	30	RC	0.005	23	19	0.045	0.04	1.2	87	4.4	1500	1.3	3.4	2.1	< 0.8	0.4	0.35	140	350	0.01	1.6	60	9
Joy-11-27	501132	6	9	RC	0.06	28	25	0.045	0.01	1.7	93	7.4	1000	3	9.4	1.6	0.9	0.9	0.35	9.2	110	0.02	0.94	50	10
Joy-11-27	501141	30	33	RC	0.005	22	8.7	0.045	0.01	1.6	98	1.7	1000	2.2	4.6	2.2	0.8	0.8	0.35	3.93	46	0.01	1.3	43	6.8
Joy-11-41	502396	12	15	RC	0.02	21	11	0.045	0.01	2.4	86	1.6	1100	1.2	3.1	2.3	1.5	1.5	0.35	4.1	80	0.01	0.48	66	5.4
Joy-11-41	502405	36	39	RC	0.02	46	24	0.045	0.03	2.7	42	28	2500	2.9	4.3	4	3.6	3.6	0.35	7.55	100	0.03	2.8	130	36
Joy-11-15	492491	120	123	RS	0.04	8.9	11	0.045	0.05	5.4	130	3.6	810	5.1	25	58	< 0.8	0.4	10	83	210	0.01	1	98	18
Joy-11-16	492535	117	120	RS	0.21	25	47	0.14	0.09	13	63	8.9	740	13	19	36	< 0.8	0.4	220	130	850	0.13	3.7	330	11
Joy-11-27	501168	102	105	RS	0.23	32	23	0.15	0.21	11	43	22	20000	12	19	5.3	0.9	0.9	3.9	14	460	0.18	5.1	340	24
Joy-11-41	502449	156	159	RS	0.43	30	40	0.37	0.09	43	67	32	1100	7.7	30	1100	< 0.8	0.4	510	48	750	0.05	3.4	340	9.6
Joy-12-104	A00117616	147	150	RS	0.27	18	35	0.18	0.12	2.2	50	14	800	14	7.5	11	1	1	8	260	520	0.01	4.3	340	12
Joy-12-106	A00117745	114	117	RS	0.28	15	130	0.15	0.09	0.67	43	6.5	620	15	6.2	7.3	< 0.8	0.4	13	360	630	0.03	3.8	290	26
Joy-12-65	A00154370	72	75	RS	0.49	32	230	0.21	0.31	19	57	15	15000	17	27	8	0.8	0.8	3.2	21	1000	0.21	6.3	290	33
Joy-12-67	A00154404	84	87	RS	0.19	17	40	0.11	0.1	1.4	45	11	740	14	7.2	6.5	< 0.8	0.4	5.8	220	560	0.1	3.7	310	11
Joy-12-70	A00154488	90	93	RS	0.2	29	70	0.11	0.15	11	55	22	15000	9.7	18	6	< 0.8	0.4	2.8	24	910	0.1	3.8	320	20
Joy-12-72	A00154552	81	84	RS	0.31	24	29	0.13	0.2	14	100	93	24000	16	16	7.7	< 0.8	0.4	2.4	110	1000	0.16	4.1	350	19
Joy-12-74	A00154585	54	57	RS	0.005	5.5	8.1	0.045	0.01	5.1	94	4	5900	3.2	9.3	1.2	< 0.8	0.4	1.7	4	37	0.01	0.44	33	9.2
Joy-12-74	A00154590	66	69	RS	0.12	23	20	0.15	0.06	1.4	40	5.5	660	7.7	6.1	5.7	< 0.8	0.4	7.5	150	630	0.18	3.3	190	9.7
Joy-12-74	A00154594	78	81	RS	0.21	29	8.9	0.14	0.09	9.6	81	16	680	8.9	13	5.5	< 0.8	0.4	2.2	25	450	0.16	3.1	280	18
Joy-12-81	A00154791	60	63	RS	0.35	45	97	0.16	0.23	13	210	42	450	18	25	12	< 0.8	0.4	6.6	480	610	0.17	3.3	320	16

Notes: See text for lithology describtion. Values below detection limit from certificates of analyses (CoA) are reported here as a half of detection limit. See CoA for details

Attachment 4: Concentrations of Selected Elements in Materials Exposed During the Joyce Lake Project.

Hole	Sample ID	Sample Taken		Lithological Unit	Ag	As	Ba	Bi	Cd	Co	Cr	Cu	Mn	Mo	Ni	Pb	Sb	Sb	Se	Sr	Ti	Tl	U	V	Zn
					ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
				ACUC, µg/g	53	4.8	628	0.16	0.09	17.3	92	28	368	1.1	47	17	0.4	0.4	0.09	320	2563	0.9	2.7	97	67
		From	To	ACUC, 10 x ug/g	530	48	6280	1.6	0.9	173	920	280	3678	11	470	170	4	4	0.9	3200	25632	9	27	970	670
Joy-12-80	A00154749	36	39	UMH	0.08	27	71	0.045	0.05	2.6	91	4.7	2200	1.3	5.4	2.8	< 0.8	0.4	0.35	160	1300	0.01	1.3	64	20
Joy-12-62	A00154201	0	3	OB	0.23	12	220	0.045	0.23	10	53	16	17000	5.8	12	7.5	1	1	0.35	83	1100	0.21	3.9	240	23
Joy-12-62	A00154202	3	6	OB	0.03	11	31	0.045	0.03	4.2	50	8.5	1200	7.7	16	5.1	< 0.8	0.4	0.35	20	300	0.07	2	160	15
Joy-12-68	A00154330	0	3	OB	0.35	13	160	0.045	0.55	6.4	64	21	3000	3.4	16	7.2	0.8	0.8	0.35	80	780	0.15	2.1	89	35
Joy-12-68	A00154331	3	6	OB	0.48	11	390	0.1	0.72	10	86	31	1400	3.7	29	11	1.6	1.6	0.35	70	2000	0.43	3.1	110	76
Joy-12-70	A00154454	0	3	OB	0.37	14	470	0.13	0.73	12	120	76	1300	10	37	12	2	2	0.35	69	2300	0.52	3.8	110	88
Joy-12-70	A00154455	3	6	OB	0.27	24	210	0.045	0.42	7.9	78	34	1100	4.9	20	6.9	1.4	1.4	0.35	61	1100	0.22	2.7	81	57
Joy-12-79	A00154705	0	3	OB	0.03	22	340	0.045	0.08	7.7	120	11	2800	4.7	15	3.6	0.8	0.8	0.35	310	650	0.1	2.2	63	6.2
Joy-12-79	A00154706	3	6	OB	0.005	12	230	0.045	0.02	5.4	150	14	1600	4.2	9.5	2.6	< 0.8	0.4	0.35	130	420	0.07	2.1	39	5.6
Joy-12-83	A00154792	0	3	OB	0.13	20	31	0.045	0.01	2.9	130	11	460	2.1	5.4	3.9	< 0.8	0.4	0.35	16	300	0.02	0.76	20	6.9
Joy-12-83	A00154793	3	6	OB	0.005	30	22	0.045	0.01	5.5	140	17	500	4.5	7.5	3.1	< 0.8	0.4	0.35	15	510	0.01	0.95	27	11
Joy-12-85	A00115554	0	6	OB	0.16	22	28	0.045	0.01	8.1	140	1400	1100	4.3	16	1.7	< 0.8	0.4	0.35	15	150	0.03	1.5	31	14
Joy-12-85	A00115555	6	9	OB	0.005	21	14	0.045	0.01	13	190	3.9	550	2.7	11	1.5	< 0.8	0.4	0.35	51	90	0.01	0.99	27	2
Overburden surficial samples	OV-1	0	0.3	OB	0.26	14	470	0.12	0.84	13	67	39	1400	3.7	43	14	2	2	1.1	67	2249	0.55	3.9	110	97
	OV-2	0	0.3	OB	0.06	15	440	0.045	0.87	14	67	37	1700	3.7	38	13	1.9	1.9	0.35	62	2376	0.53	3.6	110	97
	OV-4	0	0.3	OB	0.1	14	450	0.11	0.7	14	66	35	1700	3.7	33	14	1.9	1.9	0.8	58	2228	0.62	4	120	93
	OV-7	0	0.3	OB	0.07	11	440	0.1	0.38	9.9	66	14	1000	2.9	23	13	1.6	1.6	0.35	57	2397	0.52	3	110	66
	OV-9	0	0.3	OB	0.15	11	440	0.045	0.37	12	66	17	1200	3.6	23	13	1.7	1.7	0.7	59	2256	0.51	3.1	120	70
	OV-10	0	0.3	OB	0.02	13	270	0.045	0.65	11	70	9.6	1800	2.4	15	9.7	1	1	0.35	49	1389	0.32	1.9	76	66
	OV-11	0	0.3	OB	0.005	12	420	0.09	0.69	13	87	25	1500	2.9	29	13	1.6	1.6	1.1	59	2114	0.52	3.3	100	100
	OV-13	0	0.3	OB	0.005	11	430	0.045	0.88	13	80	22	1200	2.7	27	12	1.5	1.5	0.35	58	2179	0.48	3.1	100	86
	OV-21	0	0.3	OB	0.005	14	400	0.045	0.41	12	78	31	1300	2.9	33	13	1.6	1.6	0.35	85	2104	0.47	3.3	110	85
	OV-23	0	0.3	OB	0.01	15	370	0.045	0.38	12	76	14	1400	3.2	22	11	1.6	1.6	0.35	49	1857	0.44	3.3	120	69
	OV-25	0	0.3	OB	0.02	14	390	0.045	0.29	8.1	72	11	1100	3	19	9.7	1.3	1.3	0.35	43	1783	0.49	2.6	94	54
Products from Metallurgical testing	BS1LC1	-	-	Lump Concentrate	0.03	28	10	0.045	0.02	2.1	31	1.3	1200	2.8	1.1	1.5	1.8	1.8	0.35	6.3	11	0.01	1.9	43	0.35
	BS1LC2	-	-		0.01	35	12	0.045	0.01	2.5	22	0.6	1400	2.9	< 0.1	1.2	2.1	2.1	0.35	6.6	16	0.01	2.4	44	0.35
	BS1LC3	-	-		0.01	35	9.7	0.045	0.01	2.4	21	3.0	1300	3.0	3.2	1.7	1.9	1.9	0.35	5.6	10	0.01	2.2	47	3.2
	BS1SF1	-	-	Sinter Feed	0.01	57	24	0.045	0.03	3.2	12	3.7	1900	3.7	3.3	1.9	3.0	3	0.35	9.7	63	0.03	3.4	55	4.4
	BS1SF2	-	-		0.01	56	20	0.045	0.03	3.2	12	1.0	1700	3.7	1.7	1.6	3.0	3	0.35	9.2	58	0.02	3.6	53	0.35
	BS1SF3	-	-		0.005	53	17	0.045	0.01	3.0	13	0.9	1700	3.5	0.6	1.6	2.9	2.9	0.35	8.3	37	0.01	3.4	51	0.35
	BS2LC1	-	-	Lump Concentrate	0.02	35	51	0.045	0.01	2.6	26	1.0	950	3.0	0.9	2.1	2.1	2.1	0.35	25	110	0.04	2.5	79	2.4
	BS2LC2	-	-		0.005	28	25	0.045	0.01	2.7	23	0.8	1100	3.0	1.6	1.4	1.6	1.6	0.35	16	66	0.03	2.2	78	1.1
	BS2LC3	-	-		0.02	28	29	0.045	0.01	2.9	26	4.2	960	2.8	4.2	1.9	1.7	1.7	0.35	13	88	0.03	2.3	63	8.5
	BS2CSF1	-	-	Coarse Sinter Feed	0.01	54	34	0.045	0.01	3.0	17	1.0	1300	3.2	1.0	2.4	2.9	2.9	0.35	21	96	0.02	3.9	88	1.7
	BS2CSF2	-	-		0.02	56	33	0.045	0.02	3.0	18	1.0	1500	3.4	1.8	2.3	3.1	3.1	0.35	18	90	0.03	4.2	91	3
	BS2CSF3	-	-		0.01	56	31	0.045	0.03	2.7	17	2.8	1300	3.3	0.5	2.2	3.0	3	0.35	18	87	0.03	3.8	91	1.7
	BS2FSF1	-	-	Fines Sinter Feed	0.08	67	57	0.44	0.05	6.2	23	2.6	1500	3.4	2.9	4.8	3.2	3.2	0.35	48	160	0.03	4.1	120	6.7
	BS2FSF2	-	-		0.06	66	57	0.22	0.04	5.3	23	3.3	1500	3.6	4.1	4.5	3.2	3.2	0.35	47	160	0.03	4.2	120	5.5
	BS2FSF3	-	-		0.08	73	59	0.31	0.04	6.9	23	2.7	1600	3.5	3.3	12	3.4	3.4	0.35	51	170	0.03	4.3	120	5.2
	BS2T1	-	-	Tailings	0.23	60	180	1.1	0.06	11	33	6.2	1600	3.2	9.8	11	3.0	3	1.6	170	270	0.04	3.6	130	25
	BS2T2	-	-		0.36	60	170	1	0.07	9.5	33	8.3	1500	3.1	35	11	3.0	3	1	170	270	0.04	3.4	120	69
	BS2T3	-	-		0.24	59	180	1.1	0.07	9.7	34	8.6	1600	3.3	24	11	3.0	3	1.6	180	270	0.04	3.6	130	48

Notes: See text for lithology describtion. Values below detection limit from certificates of analyses (CoA) are reported here as a half of detection limit. See CoA for details

ATTACHMENT 5

CERTIFICATES OF ANALYSES

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Modified ABA

February-19-13

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 18 December 2012
LR Report: **CA11230-DEC12**
Reference: MLD-ARD Assesment of Joyce Lake
PO#P M120008

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
3: Analysis Approval Date		19-Feb-13	19-Feb-13	19-Feb-13	19-Feb-13	19-Feb-13	19-Feb-13	19-Feb-13	19-Feb-13
4: Analysis Approval Time		15:19	15:19	15:19	15:19	15:19	15:19	15:19	15:19
5: 492067	Date:N/A	6.90	1	2.10	20.00	0.10	0.10	19.04	0.97
6: 492069	Date:N/A	6.60	1	1.99	20.00	0.10	0.10	19.39	1.01
7: 492078	Date:N/A	6.42	1	2.03	20.00	0.10	0.10	19.20	1.01
8: 492084	Date:N/A	6.06	1	2.03	20.00	0.10	0.10	19.33	1.03
9: 492088	Date:N/A	6.55	1	2.01	20.00	0.10	0.10	19.41	1.06
10: 492092	Date:N/A	5.61	1	2.01	20.00	0.10	0.10	19.32	0.96
11: 492094	Date:N/A	5.98	1	2.05	20.00	0.10	0.10	19.50	1.06
12: 492218	Date:N/A	5.78	1	2.10	20.00	0.10	0.10	19.32	0.99
13: 492220	Date:N/A	6.01	1	2.00	20.00	0.10	0.10	19.44	1.06
14: 492225	Date:N/A	5.50	1	1.96	20.00	0.10	0.10	19.32	1.07
15: 492497	Date:N/A	6.45	1	2.04	20.00	0.10	0.10	19.01	1.11
16: 492507	Date:N/A	6.43	1	2.10	20.00	0.10	0.10	18.06	1.16
17: 492513	Date:N/A	6.29	1	2.02	20.00	0.10	0.10	18.87	1.07
18: 492518	Date:N/A	6.27	1	2.00	20.00	0.10	0.10	19.23	1.09
19: 492493	Date:N/A	6.00	1	2.04	20.00	0.10	0.10	19.00	1.09
20: 492503	Date:N/A	7.01	1	2.00	20.00	0.10	0.10	19.07	1.04

OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Modified ABA

LR Report : **CA11230-DEC12**

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
21: 501064	Date:N/A	6.14	1	2.01	20.00	0.10	0.10	18.64	1.00
22: 501065	Date:N/A	6.15	1	1.98	20.00	0.10	0.10	19.32	0.99
23: 501068	Date:N/A	5.96	1	2.06	20.00	0.10	0.10	19.25	1.03
24: 501070	Date:N/A	6.26	1	2.03	20.00	0.10	0.10	19.35	1.07
25: 502189	Date:N/A	6.53	1	2.04	20.00	0.10	0.10	19.02	1.13
26: 502194	Date:N/A	5.91	1	2.04	20.00	0.10	0.10	19.22	1.09
27: 502196	Date:N/A	5.80	1	2.06	20.00	0.10	0.10	18.98	0.97
28: 502197	Date:N/A	5.46	1	2.02	20.00	0.10	0.10	19.21	0.98
29: 502198	Date:N/A	5.21	1	2.05	20.00	0.10	0.10	19.46	1.03
30: 502381	Date:N/A	6.63	1	2.04	20.00	0.10	0.10	19.35	1.05
31: 502383	Date:N/A	6.31	1	2.05	20.00	0.10	0.10	19.18	1.08
32: 502385	Date:N/A	6.51	1	2.10	20.00	0.10	0.10	18.82	0.93
33: 502409	Date:N/A	6.02	1	2.00	20.00	0.10	0.10	19.32	0.95
34: 502413	Date:N/A	6.05	1	2.09	20.00	0.10	0.10	19.50	0.96
35: 502416	Date:N/A	5.69	1	2.13	20.00	0.10	0.10	19.35	1.10
36: 492098	Date:N/A	5.92	1	2.00	20.00	0.10	0.10	18.86	0.90
37: 492099	Date:N/A	5.28	1	2.04	20.00	0.10	0.10	18.63	0.86
38: 492100	Date:N/A	4.69	1	2.09	20.00	0.10	0.10	19.49	0.94
39: 492194	Date:N/A	6.33	1	2.07	20.00	0.10	0.10	19.04	0.96
40: 492197	Date:N/A	6.43	1	2.12	20.00	0.10	0.10	19.09	0.98
41: 492200	Date:N/A	6.61	1	2.08	20.00	0.10	0.10	19.01	0.97
42: 492204	Date:N/A	6.39	1	2.14	20.00	0.10	0.10	19.19	0.95
43: 492208	Date:N/A	6.70	1	2.03	20.00	0.10	0.10	18.52	0.95
44: 492211	Date:N/A	5.67	1	2.07	20.00	0.10	0.10	19.18	0.99
45: 492215	Date:N/A	5.51	1	2.08	20.00	0.10	0.10	19.34	0.99
46: 492217	Date:N/A	5.80	1	2.06	20.00	0.10	0.10	19.31	0.98
47: 492231	Date:N/A	5.81	1	2.04	20.00	0.10	0.10	19.36	1.02
48: 492233	Date:N/A	5.66	1	2.04	20.00	0.10	0.10	19.33	0.97
49: 492234	Date:N/A	5.83	1	2.03	20.00	0.10	0.10	19.11	0.96
50: 492236	Date:N/A	6.02	1	2.09	20.00	0.10	0.10	19.46	1.03
51: 492463	Date:N/A	6.58	1	2.09	20.00	0.10	0.10	19.51	0.99
52: 492465	Date:N/A	6.18	1	2.05	20.00	0.10	0.10	19.26	0.98
53: 492467	Date:N/A	6.20	1	2.15	20.00	0.10	0.10	19.37	1.02
54: 492469	Date:N/A	6.37	1	2.03	20.00	0.10	0.10	19.15	0.95

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Modified ABA

LR Report : **CA11230-DEC12**

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
55: 492448	Date:N/A	6.80	1	2.05	20.00	0.10	0.10	19.05	1.12
56: 492451	Date:N/A	6.42	1	2.07	20.00	0.10	0.10	19.49	1.08
57: 492453	Date:N/A	6.36	1	2.15	20.00	0.10	0.10	19.13	1.08
58: 492456	Date:N/A	6.49	1	2.00	20.00	0.10	0.10	19.53	1.09
59: 492459	Date:N/A	6.52	1	2.04	20.00	0.10	0.10	19.15	0.99
60: 492461	Date:N/A	6.43	1	2.04	20.00	0.10	0.10	19.50	1.07
61: 492485	Date:N/A	6.09	1	2.09	20.00	0.10	0.10	19.58	1.14
62: 492489	Date:N/A	5.75	1	2.05	20.00	0.10	0.10	19.74	1.09
63: 501013	Date:N/A	6.74	1	2.06	20.00	0.10	0.10	19.50	1.07
64: 501015	Date:N/A	7.01	1	2.10	20.00	0.10	0.10	19.27	1.07
65: 501018	Date:N/A	6.42	1	2.08	20.00	0.10	0.10	19.40	1.09
66: 501021	Date:N/A	5.88	1	2.07	20.00	0.10	0.10	19.64	1.12
67: 501023	Date:N/A	6.21	1	2.06	20.00	0.10	0.10	19.52	1.10
68: 501073	Date:N/A	6.20	1	2.09	20.00	0.10	0.10	19.43	1.11
69: 501074	Date:N/A	5.72	1	2.04	20.00	0.10	0.10	19.76	1.13
70: 501076	Date:N/A	4.96	1	2.03	20.00	0.10	0.10	19.60	1.03
71: 501132	Date:N/A	5.93	1	2.04	20.00	0.10	0.10	19.41	1.06
72: 501134	Date:N/A	6.59	1	2.02	20.00	0.10	0.10	19.35	1.11
73: 501136	Date:N/A	6.36	1	2.08	20.00	0.10	0.10	19.43	1.13
74: 501139	Date:N/A	6.33	1	2.06	20.00	0.10	0.10	19.46	1.11
75: 501141	Date:N/A	6.34	1	2.05	20.00	0.10	0.10	19.40	1.05
76: 501143	Date:N/A	6.36	1	2.03	20.00	0.10	0.10	19.49	1.06
77: 501159	Date:N/A	5.89	1	2.06	20.00	0.10	0.10	19.60	1.14
78: 501161	Date:N/A	6.29	1	2.03	20.00	0.10	0.10	19.53	1.14
79: 501164	Date:N/A	6.44	1	2.00	20.00	0.10	0.10	19.59	1.19
80: 501165	Date:N/A	5.90	1	2.01	20.00	0.10	0.10	19.81	1.14
81: 502388	Date:N/A	6.08	1	2.06	20.00	0.10	0.10	19.65	1.05
82: 502389	Date:N/A	6.22	1	2.08	20.00	0.10	0.10	19.67	1.13
83: 502390	Date:N/A	5.17	1	2.01	20.00	0.10	0.10	20.00	1.14
84: 502391	Date:N/A	5.76	1	2.02	20.00	0.10	0.10	19.74	1.12
85: 502392	Date:N/A	6.09	1	2.03	20.00	0.10	0.10	19.50	1.13
86: 502393	Date:N/A	6.28	1	2.08	20.00	0.10	0.10	18.56	1.05
87: 502396	Date:N/A	6.08	1	2.01	20.00	0.10	0.10	19.58	1.04
88: 502398	Date:N/A	6.17	1	2.12	20.00	0.10	0.10	19.46	1.01

SGS Canada Inc.
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Modified ABA

LR Report : **CA11230-DEC12**

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
89: 502400	Date:N/A	6.26	1	2.00	20.00	0.10	0.10	19.54	1.07
90: 502402	Date:N/A	5.99	1	2.01	20.00	0.10	0.10	19.29	1.03
91: 502405	Date:N/A	5.89	1	2.03	20.00	0.10	0.10	19.44	1.05
92: 502408	Date:N/A	5.90	1	2.02	20.00	0.10	0.10	19.52	1.10
93: 502424	Date:N/A	5.83	1	2.11	20.00	0.10	0.10	19.60	1.14
94: 502429	Date:N/A	5.69	1	2.06	20.00	0.10	0.10	19.30	1.18
95: 502433	Date:N/A	5.59	1	2.05	20.00	0.10	0.10	19.62	1.07
96: 502438	Date:N/A	5.64	1	2.03	20.00	0.10	0.10	19.34	1.09
97: 502441	Date:N/A	5.67	1	2.04	20.00	0.10	0.10	19.43	1.01
98: 502446	Date:N/A	5.92	1	2.07	20.00	0.10	0.10	19.61	1.09
99: 502447	Date:N/A	6.10	1	2.12	20.00	0.10	0.10	19.36	1.16
100: A00117785	Date:N/A	7.80	1	2.03	20.00	0.10	0.10	18.29	1.17
101: A00117788	Date:N/A	6.61	1	2.07	20.00	0.10	0.10	19.42	1.10
102: A00117790	Date:N/A	6.47	1	2.01	20.00	0.10	0.10	19.60	1.05
103: A00117792	Date:N/A	6.40	1	2.03	20.00	0.10	0.10	19.34	1.04
104: A00117794	Date:N/A	6.87	1	2.07	20.00	0.10	0.10	19.23	1.08
105: A00117796	Date:N/A	7.16	1	2.08	20.00	0.10	0.10	19.24	1.07
106: A00117824	Date:N/A	6.14	1	2.03	20.00	0.10	0.10	19.52	1.13
107: A00154857	Date:N/A	7.47	1	2.00	20.00	0.10	0.10	19.07	1.10
108: A00154858	Date:N/A	6.99	1	1.99	20.00	0.10	0.10	19.06	1.04
109: A00154859	Date:N/A	5.78	1	2.04	20.00	0.10	0.10	19.12	1.02
110: A00154860	Date:N/A	5.56	1	2.04	20.00	0.10	0.10	18.94	0.90
111: A00154878	Date:N/A	5.41	1	2.06	20.00	0.10	0.10	19.18	0.99
112: A00154881	Date:N/A	5.90	1	2.00	20.00	0.10	0.10	19.31	1.03
113: A00154884	Date:N/A	6.02	1	1.98	20.00	0.10	0.10	19.32	1.01
114: A00115836	Date:N/A	5.80	1	2.04	20.00	0.10	0.10	18.96	0.98
115: A00115840	Date:N/A	5.48	1	1.98	20.00	0.10	0.10	18.81	0.91
116: A00115842	Date:N/A	5.45	1	2.01	20.00	0.10	0.10	19.31	1.00
117: A00154738	Date:N/A	5.21	1	2.02	20.00	0.10	0.10	19.01	0.92
118: A00154740	Date:N/A	6.10	1	2.02	20.00	0.10	0.10	19.40	0.96
119: A00154741	Date:N/A	5.88	1	2.02	20.00	0.10	0.10	19.26	0.91
120: A00154743	Date:N/A	5.78	1	2.00	20.00	0.10	0.10	19.08	0.92
121: A00154745	Date:N/A	5.88	1	2.01	20.00	0.10	0.10	19.51	0.98
122: A00154747	Date:N/A	5.96	1	2.00	20.00	0.10	0.10	19.57	0.99

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Modified ABA

LR Report : **CA11230-DEC12**

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
123: A00154748	Date:N/A	6.00	1	2.04	20.00	0.10	0.10	19.60	0.99
124: A00154749	Date:N/A	5.77	1	1.95	20.00	0.10	0.10	19.30	1.00
125: 492491	Date:N/A	6.74	1	2.03	20.00	0.10	0.10	18.22	0.93
126: 492492	Date:N/A	4.30	1	1.99	20.00	0.10	0.10	19.33	1.02
127: 492536	Date:N/A	4.73	1	2.11	20.00	0.10	0.10	19.70	1.01
128: 492535	Date:N/A	4.69	1	2.02	20.00	0.10	0.10	19.45	1.02
129: 501061	Date:N/A	6.17	1	1.97	20.00	0.10	0.10	19.37	1.01
130: 501063	Date:N/A	4.47	1	2.07	20.00	0.10	0.10	19.46	0.99
131: 501166	Date:N/A	5.49	1	2.00	20.00	0.10	0.10	19.45	1.00
132: 501168	Date:N/A	6.10	1	2.02	64.20	0.10	0.10	46.13	1.86
133: 502208	Date:N/A	5.26	1	2.00	20.00	0.10	0.10	19.14	1.02
134: 502209	Date:N/A	5.53	1	2.01	27.30	0.10	0.10	22.32	1.50
139: 502448	Date:N/A	4.01	1	2.10	20.00	0.10	0.10	18.75	1.09
140: 502449	Date:N/A	5.91	1	2.00	20.00	0.10	0.10	19.23	0.98
141: A00115861	Date:N/A	4.90	1	2.06	20.00	0.10	0.10	19.50	1.00
146: A00117614	Date:N/A	5.79	1	2.05	20.00	0.10	0.10	18.94	0.92
147: A00117615	Date:N/A	5.90	1	2.03	20.00	0.10	0.10	18.91	0.94
148: A00117616	Date:N/A	5.98	1	1.95	20.00	0.10	0.10	18.47	0.93
149: A00117617	Date:N/A	4.81	1	2.02	20.00	0.10	0.10	18.60	0.96
150: A00117704	Date:N/A	6.10	1	2.09	20.00	0.10	0.10	18.85	0.98
151: A00117744	Date:N/A	6.30	1	2.06	20.00	0.10	0.10	19.39	1.05
152: A00117745	Date:N/A	5.99	1	1.99	20.00	0.10	0.10	19.49	1.03
153: A00117827	Date:N/A	6.29	1	2.00	20.00	0.10	0.10	19.00	1.04
154: A00117828	Date:N/A	5.43	1	2.12	20.00	0.10	0.10	19.60	1.07
155: A00117829	Date:N/A	5.49	1	2.09	20.00	0.10	0.10	19.66	1.01
156: A00154370	Date:N/A	5.73	1	1.96	20.00	0.10	0.10	17.64	1.84
157: A00154371	Date:N/A	5.75	1	1.95	28.20	0.10	0.10	17.67	1.80
158: A00154372	Date:N/A	5.09	1	2.05	20.00	0.10	0.10	18.02	1.27
159: A00154329	Date:N/A	3.89	1	2.00	20.00	0.10	0.10	20.35	1.16
160: A00154404	Date:N/A	4.90	1	2.00	20.00	0.10	0.10	18.92	0.98
161: A00154405	Date:N/A	4.00	1	2.03	20.00	0.10	0.10	19.59	0.96
162: A00154485	Date:N/A	5.45	1	2.03	20.00	0.10	0.10	18.48	1.13
163: A00154486	Date:N/A	4.92	1	1.96	20.00	0.10	0.10	19.15	1.13
164: A00154488	Date:N/A	5.31	1	2.00	28.50	0.10	0.10	18.72	1.89

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Modified ABA

LR Report : **CA11230-DEC12**

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
165: A00154548	Date:N/A	4.19	1	1.98	20.00	0.10	0.10	19.05	0.97
166: A00154549	Date:N/A	4.00	1	1.98	20.00	0.10	0.10	19.62	1.02
167: A00154551	Date:N/A	3.76	1	2.02	20.00	0.10	0.10	19.46	1.09
168: A00154552	Date:N/A	6.04	1	1.99	65.40	0.10	0.10	46.71	1.77
169: A00154563	Date:N/A	3.59	3	2.05	20.00	0.10	0.10	19.47	1.04
170: A00154564	Date:N/A	4.17	1	1.99	20.00	0.10	0.10	19.13	1.03
171: A00154584	Date:N/A	6.05	1	2.05	20.00	0.10	0.10	17.79	0.88
172: A00154585	Date:N/A	6.23	1	2.00	20.00	0.10	0.10	17.95	0.96
173: A00154586	Date:N/A	5.71	1	1.97	20.00	0.10	0.10	18.49	1.04
174: A00154588	Date:N/A	5.59	1	2.04	20.00	0.10	0.10	18.72	0.99
175: A00154589	Date:N/A	5.68	1	2.03	20.00	0.10	0.10	18.58	0.99
176: A00154590	Date:N/A	5.74	1	1.98	20.00	0.10	0.10	17.76	0.84
177: A00154591	Date:N/A	5.40	1	2.04	20.00	0.10	0.10	18.63	0.97
178: A00154592	Date:N/A	5.48	1	2.05	20.00	0.10	0.10	18.35	0.93
179: A00154593	Date:N/A	3.62	1	2.05	20.00	0.10	0.10	18.51	0.95
180: A00154594	Date:N/A	4.05	1	2.02	20.00	0.10	0.10	18.70	0.91
181: A00154661	Date:N/A	5.82	1	1.97	20.00	0.10	0.10	18.46	1.00
182: A00154663	Date:N/A	5.83	1	1.98	20.00	0.10	0.10	18.75	1.06
183: A00154790	Date:N/A	3.76	1	1.97	20.00	0.10	0.10	19.01	0.99
184: A00154791	Date:N/A	3.44	1	2.01	20.00	0.10	0.10	19.59	1.00
186: A00154946	Date:N/A	6.37	3	2.06	47.51	0.10	0.10	30.60	1.98
187: A00115843	Date:N/A	6.41	3	1.97	63.90	0.10	0.10	44.18	1.84
188: A00154554	Date:N/A	5.68	1	1.97	20.00	0.10	0.10	18.07	0.99
189: A00154556	Date:N/A	5.30	1	2.02	20.00	0.10	0.10	18.71	1.00
190: A00154558	Date:N/A	5.10	1	2.00	20.00	0.10	0.10	18.89	0.99
191: A00154560	Date:N/A	5.18	1	1.96	20.00	0.10	0.10	18.79	1.01
192: A00154658	Date:N/A	6.45	1	1.97	20.00	0.10	0.10	19.52	1.11
193: A00154660	Date:N/A	6.38	1	2.06	20.00	0.10	0.10	19.86	1.02
194: A00115624	Date:N/A	4.40	1	1.96	20.00	0.10	0.10	19.66	0.99
195: A00115626	Date:N/A	4.47	1	1.95	20.00	0.10	0.10	19.70	0.95
196: A00115627	Date:N/A	4.52	1	2.02	20.00	0.10	0.10	19.42	0.91
197: A00115628	Date:N/A	4.55	1	1.95	20.00	0.10	0.10	18.96	0.86
198: A00115629	Date:N/A	4.46	1	1.95	20.00	0.10	0.10	20.00	0.99
199: A00115630	Date:N/A	7.37	1	2.02	20.00	0.10	0.10	19.11	1.04

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Modified ABA

LR Report : **CA11230-DEC12**

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
200: A00115631	Date:N/A	7.40	1	2.02	20.00	0.10	0.10	19.28	1.02
202: A00115633	Date:N/A	4.49	1	2.01	20.00	0.10	0.10	20.00	1.00
203: A00115634	Date:N/A	4.76	1	2.05	20.00	0.10	0.10	19.61	0.89
204: 492222	Date:N/A	5.92	1	2.10	20.00	0.10	0.10	19.26	1.02

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Modified ABA

February-19-13

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 18 December 2012
LR Report: **CA11230-DEC12**
Reference: MLD-ARD Assesment of Joyce Lake
PO#P M120008

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
3: Analysis Approval Date	19-Feb-13	---	---	---	01-Feb-13	---	01-Feb-13	01-Feb-13	31-Jan-13
4: Analysis Approval Time	15:19	---	---	---	12:03	---	11:56	12:03	16:05
5: 492067	2.3	0.31	1.99	7.42	0.008	< 0.01	< 0.01	0.026	0.025
6: 492069	1.5	0.31	1.19	4.84	0.005	< 0.01	< 0.01	0.015	0.020
7: 492078	2.0	0.31	1.69	6.45	0.006	< 0.01	< 0.01	0.012	0.010
8: 492084	1.7	0.31	1.39	5.48	< 0.005	< 0.01	< 0.01	0.011	0.020
9: 492088	1.5	0.31	1.19	4.84	0.005	< 0.01	< 0.01	0.019	0.035
10: 492092	1.7	0.31	1.39	5.48	0.007	< 0.01	< 0.01	0.018	0.040
11: 492094	1.2	0.31	0.89	3.87	0.010	0.01	< 0.01	0.019	0.045
12: 492218	1.6	0.31	1.29	5.16	< 0.005	< 0.01	< 0.01	0.012	< 0.005
13: 492220	1.4	0.31	1.09	4.52	0.006	< 0.01	< 0.01	0.012	< 0.005
14: 492225	1.7	0.31	1.39	5.48	0.006	< 0.01	< 0.01	0.020	0.020
15: 492497	2.4	0.31	2.09	7.74	0.009	< 0.01	< 0.01	0.016	0.020
16: 492507	4.6	0.31	4.29	14.8	0.007	< 0.01	< 0.01	0.025	0.030
17: 492513	2.8	0.31	2.49	9.03	< 0.005	< 0.01	< 0.01	0.019	0.050
18: 492518	1.9	0.31	1.59	6.13	< 0.005	< 0.01	< 0.01	0.018	0.030
19: 492493	2.4	0.31	2.09	7.74	0.008	< 0.01	< 0.01	0.218	0.070
20: 492503	2.3	0.31	1.99	7.42	0.009	< 0.01	< 0.01	0.021	0.025

OnLine LIMS

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Modified ABA

LR Report : CA11230-DEC12

Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
21: 501064	3.4	0.31	3.09	10.9	0.032	0.02	0.01	0.050	0.020
22: 501065	1.7	0.94	0.76	1.81	0.067	0.04	0.03	0.060	0.040
23: 501068	1.8	0.31	1.49	5.81	0.008	< 0.01	< 0.01	0.038	0.045
24: 501070	1.6	0.31	1.29	5.16	0.012	0.01	< 0.01	0.035	0.065
25: 502189	2.4	0.31	2.09	7.74	0.007	< 0.01	< 0.01	0.032	0.025
26: 502194	1.9	0.31	1.59	6.13	0.005	< 0.01	< 0.01	0.018	0.020
27: 502196	2.5	0.31	2.19	8.06	0.010	0.01	< 0.01	0.544	0.035
28: 502197	2.0	0.31	1.69	6.45	0.020	0.02	< 0.01	0.897	0.265
29: 502198	1.3	1.88	-0.58	0.69	0.097	0.04	0.06	1.24	0.120
30: 502381	1.6	0.31	1.29	5.16	< 0.005	< 0.01	< 0.01	0.018	0.020
31: 502383	2.0	0.31	1.69	6.45	< 0.005	< 0.01	< 0.01	0.018	0.030
32: 502385	2.8	0.31	2.49	9.03	< 0.005	< 0.01	< 0.01	0.027	0.040
33: 502409	1.7	0.31	1.39	5.48	< 0.005	< 0.01	< 0.01	0.015	0.010
34: 502413	1.2	0.31	0.89	3.87	< 0.005	< 0.01	< 0.01	0.011	0.015
35: 502416	1.5	0.31	1.19	4.84	< 0.005	< 0.01	< 0.01	0.014	0.050
36: 492098	2.8	0.31	2.49	9.03	0.015	0.02	< 0.01	0.427	0.050
37: 492099	3.4	15.9	-12.5	0.21	0.640	0.13	0.51	1.67	0.050
38: 492100	1.2	29.7	-28.5	0.04	1.16	0.21	0.95	1.84	0.065
39: 492194	2.3	0.31	1.99	7.42	0.015	0.02	< 0.01	0.029	0.035
40: 492197	2.1	0.31	1.79	6.77	0.006	< 0.01	< 0.01	0.026	0.030
41: 492200	2.4	0.31	2.09	7.74	0.009	< 0.01	< 0.01	0.017	0.025
42: 492204	1.9	0.31	1.59	6.13	< 0.005	< 0.01	< 0.01	0.014	0.030
43: 492208	3.6	0.31	3.29	11.6	< 0.005	< 0.01	< 0.01	0.035	0.140
44: 492211	2.0	0.31	1.69	6.45	< 0.005	< 0.01	< 0.01	0.014	0.030
45: 492215	1.6	0.31	1.29	5.16	< 0.005	< 0.01	< 0.01	0.009	0.015
46: 492217	1.7	0.31	1.39	5.48	< 0.005	< 0.01	< 0.01	0.012	0.020
47: 492231	1.6	0.31	1.29	5.16	< 0.005	< 0.01	< 0.01	0.015	0.025
48: 492233	1.6	0.31	1.29	5.16	< 0.005	< 0.01	< 0.01	0.018	0.030
49: 492234	2.2	0.31	1.89	7.10	< 0.005	< 0.01	< 0.01	0.026	0.025
50: 492236	1.3	0.31	0.99	4.19	< 0.005	< 0.01	< 0.01	0.018	0.040
51: 492463	1.2	0.31	0.89	3.87	0.005	< 0.01	< 0.01	0.017	0.020
52: 492465	1.8	0.31	1.49	5.81	< 0.005	< 0.01	< 0.01	0.014	0.020
53: 492467	1.5	0.31	1.19	4.84	< 0.005	< 0.01	< 0.01	0.012	0.015
54: 492469	2.1	0.31	1.79	6.77	< 0.005	< 0.01	< 0.01	0.020	0.020

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Modified ABA

LR Report : **CA11230-DEC12**

Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
55: 492448	2.3	0.31	1.99	7.42	0.008	< 0.01	< 0.01	0.076	0.025
56: 492451	1.2	0.31	0.89	3.87	< 0.005	< 0.01	< 0.01	0.015	0.020
57: 492453	2.0	0.31	1.69	6.45	< 0.005	< 0.01	< 0.01	0.014	0.025
58: 492456	1.2	0.31	0.89	3.87	< 0.005	< 0.01	< 0.01	0.014	0.025
59: 492459	2.1	0.31	1.79	6.77	0.007	< 0.01	< 0.01	0.024	0.055
60: 492461	1.2	0.31	0.89	3.87	< 0.005	< 0.01	< 0.01	0.017	0.020
61: 492485	1.0	0.31	0.69	3.23	< 0.005	< 0.01	< 0.01	0.026	0.035
62: 492489	0.60	0.31	0.29	1.94	0.006	< 0.01	< 0.01	0.023	0.035
63: 501013	1.2	0.31	0.89	3.87	0.006	< 0.01	< 0.01	0.023	0.020
64: 501015	1.7	0.31	1.39	5.48	< 0.005	< 0.01	< 0.01	0.011	0.015
65: 501018	1.4	0.31	1.09	4.52	0.009	< 0.01	< 0.01	0.019	0.020
66: 501021	0.90	0.31	0.59	2.90	0.016	0.02	< 0.01	0.022	0.010
67: 501023	1.2	0.31	0.89	3.87	0.006	< 0.01	< 0.01	0.015	0.020
68: 501073	1.4	0.31	1.09	4.52	0.010	0.01	< 0.01	0.157	0.040
69: 501074	0.60	0.31	0.29	1.94	0.015	0.02	< 0.01	0.658	0.065
70: 501076	1.0	13.8	-12.8	0.07	0.447	< 0.01	0.44	1.20	0.075
71: 501132	1.5	0.31	1.19	4.84	0.005	< 0.01	< 0.01	0.092	0.020
72: 501134	1.6	0.31	1.29	5.16	< 0.005	< 0.01	< 0.01	0.043	0.020
73: 501136	1.4	0.31	1.09	4.52	< 0.005	< 0.01	< 0.01	0.019	0.030
74: 501139	1.3	0.31	0.99	4.19	< 0.005	< 0.01	< 0.01	0.035	0.025
75: 501141	1.5	0.31	1.19	4.84	< 0.005	< 0.01	< 0.01	0.016	0.025
76: 501143	1.3	0.31	0.99	4.19	0.005	< 0.01	< 0.01	0.019	0.030
77: 501159	1.0	0.31	0.69	3.23	0.009	< 0.01	< 0.01	0.028	0.045
78: 501161	1.1	0.31	0.79	3.55	< 0.005	< 0.01	< 0.01	0.112	0.050
79: 501164	1.0	0.31	0.69	3.23	0.018	0.02	< 0.01	0.512	0.060
80: 501165	0.50	6.25	-5.75	0.08	0.236	0.04	0.20	0.930	0.080
81: 502388	0.90	0.31	0.59	2.90	0.006	< 0.01	< 0.01	0.068	0.050
82: 502389	0.80	0.31	0.49	2.58	0.012	0.01	< 0.01	0.129	0.050
83: 502390	0	4.06	-4.06	0.00	0.218	0.09	0.13	1.45	0.070
84: 502391	0.60	0.31	0.29	1.92	0.044	0.03	0.01	0.815	0.075
85: 502392	1.2	2.19	-0.99	0.55	0.094	0.02	0.07	0.543	0.085
86: 502393	3.4	0.31	3.09	10.9	0.027	0.02	0.01	0.118	0.025
87: 502396	1.0	0.31	0.69	3.23	< 0.005	< 0.01	< 0.01	0.012	0.025
88: 502398	1.3	0.31	0.99	4.19	< 0.005	< 0.01	< 0.01	0.017	0.025

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Modified ABA

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Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
89: 502400	1.1	0.31	0.79	3.55	< 0.005	< 0.01	< 0.01	0.014	0.020
90: 502402	1.8	0.31	1.49	5.81	< 0.005	< 0.01	< 0.01	0.018	0.020
91: 502405	1.4	0.31	1.09	4.52	< 0.005	< 0.01	< 0.01	0.016	0.025
92: 502408	1.2	0.31	0.89	3.87	< 0.005	< 0.01	< 0.01	0.019	0.025
93: 502424	1.0	0.31	0.69	3.23	0.005	< 0.01	< 0.01	0.022	0.030
94: 502429	1.7	0.31	1.39	5.48	< 0.005	< 0.01	< 0.01	0.022	0.025
95: 502433	0.90	0.31	0.59	2.90	0.009	< 0.01	< 0.01	0.026	0.040
96: 502438	1.6	0.31	1.29	5.16	0.007	< 0.01	< 0.01	0.015	0.035
97: 502441	1.4	0.31	1.09	4.52	0.015	0.02	< 0.01	0.019	0.055
98: 502446	0.90	0.31	0.59	2.90	0.016	0.02	< 0.01	0.020	0.065
99: 502447	1.5	0.31	1.19	4.84	0.010	0.01	< 0.01	0.051	0.055
100: A00117785	4.2	0.31	3.89	13.5	0.008	< 0.01	< 0.01	0.089	0.105
101: A00117788	1.4	0.31	1.09	4.52	0.006	< 0.01	< 0.01	0.031	0.025
102: A00117790	1.0	0.31	0.69	3.23	0.007	< 0.01	< 0.01	0.023	0.030
103: A00117792	1.6	0.31	1.29	5.16	< 0.005	< 0.01	< 0.01	0.025	0.035
104: A00117794	1.9	0.31	1.59	6.13	< 0.005	< 0.01	< 0.01	0.051	0.030
105: A00117796	1.8	0.31	1.49	5.81	0.005	< 0.01	< 0.01	0.040	0.025
106: A00117824	1.2	0.31	0.89	3.87	0.006	< 0.01	< 0.01	0.030	0.050
107: A00154857	2.3	0.31	1.99	7.42	0.008	< 0.01	< 0.01	0.072	0.025
108: A00154858	2.4	0.31	2.09	7.74	0.007	< 0.01	< 0.01	0.338	0.020
109: A00154859	2.2	0.31	1.89	7.10	0.007	< 0.01	< 0.01	0.242	0.030
110: A00154860	2.6	0.31	2.29	8.39	0.005	< 0.01	< 0.01	0.100	0.020
111: A00154878	2.0	0.31	1.69	6.45	0.007	< 0.01	< 0.01	0.015	0.025
112: A00154881	1.7	0.31	1.39	5.48	0.012	0.01	< 0.01	0.039	0.045
113: A00154884	1.7	0.31	1.39	5.48	0.016	0.02	< 0.01	0.499	0.065
114: A00115836	2.5	0.31	2.19	8.06	0.011	0.01	< 0.01	0.288	0.070
115: A00115840	3.0	0.31	2.69	9.68	0.016	0.02	< 0.01	0.306	0.070
116: A00115842	1.7	9.06	-7.36	0.19	0.439	0.15	0.29	0.859	0.075
117: A00154738	2.5	0.31	2.19	8.06	0.007	< 0.01	< 0.01	0.030	0.020
118: A00154740	1.5	0.31	1.19	4.84	0.016	0.02	< 0.01	0.107	0.025
119: A00154741	1.8	0.31	1.49	5.81	0.014	0.01	< 0.01	0.020	0.025
120: A00154743	2.3	0.31	1.99	7.42	0.007	< 0.01	< 0.01	0.018	0.025
121: A00154745	1.2	0.31	0.89	3.87	0.016	0.02	< 0.01	0.227	0.020
122: A00154747	1.1	0.31	0.79	3.55	0.016	0.02	< 0.01	0.068	0.020

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Modified ABA

LR Report : **CA11230-DEC12**

Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
123: A00154748	1.0	0.31	0.69	3.23	0.027	0.03	< 0.01	0.031	0.020
124: A00154749	1.8	0.31	1.49	5.81	0.012	0.01	< 0.01	0.025	0.015
125: 492491	4.4	0.31	4.09	14.2	0.012	0.01	< 0.01	0.264	0.045
126: 492492	1.7	13.1	-11.4	0.13	0.592	0.17	0.42	1.08	0.085
127: 492536	0.70	18.4	-17.7	0.04	0.664	0.07	0.59	1.20	0.065
128: 492535	1.4	12.8	-11.4	0.11	0.542	0.13	0.41	1.53	0.080
129: 501061	1.6	0.62	0.98	2.56	0.033	0.01	0.02	1.17	0.065
130: 501063	1.3	27.8	-26.5	0.05	0.922	0.03	0.89	1.22	0.070
131: 501166	1.4	9.06	-7.66	0.15	0.487	0.20	0.29	0.934	0.085
132: 501168	45	35.9	8.76	1.24	1.17	0.02	1.15	4.23	0.100
133: 502208	2.2	15.9	-13.7	0.14	0.584	0.07	0.51	1.37	0.060
134: 502209	12	21.6	-9.16	0.58	0.791	0.10	0.69	1.61	0.065
139: 502448	3.0	0.31	2.69	9.68	0.010	0.01	< 0.01	0.035	0.045
140: 502449	1.9	0.31	1.59	6.13	0.506	0.51	< 0.01	1.07	0.095
141: A00115861	1.2	21.9	-20.7	0.05	0.862	0.16	0.70	1.07	0.050
146: A00117614	2.6	0.31	2.29	8.39	0.017	0.02	< 0.01	0.031	0.055
147: A00117615	2.7	0.31	2.39	8.71	0.012	0.01	< 0.01	0.033	0.040
148: A00117616	3.9	0.31	3.59	12.5	0.028	0.02	0.01	1.34	0.075
149: A00117617	3.5	14.7	-11.2	0.24	0.501	0.03	0.47	1.18	0.080
150: A00117704	2.8	0.31	2.49	9.03	0.008	< 0.01	< 0.01	0.811	0.095
151: A00117744	1.5	0.31	1.19	4.84	0.014	0.01	< 0.01	0.719	0.055
152: A00117745	1.3	0.31	0.99	4.16	0.024	0.01	0.01	1.50	0.060
153: A00117827	2.5	0.31	2.19	8.06	0.006	< 0.01	< 0.01	0.034	0.055
154: A00117828	1.0	15.9	-14.9	0.06	0.670	0.16	0.51	1.05	0.060
155: A00117829	0.80	25.9	-25.1	0.03	0.849	0.02	0.83	1.10	0.065
156: A00154370	6.0	58.1	-52.1	0.10	2.10	0.24	1.86	1.44	0.065
157: A00154371	27	80.6	-53.6	0.33	2.65	0.07	2.58	3.06	0.110
158: A00154372	4.8	28.1	-23.3	0.17	0.964	0.06	0.90	0.875	0.045
159: A00154329	0	71.2	-71.2	0.00	2.38	0.10	2.28	1.57	0.060
160: A00154404	2.7	4.69	-1.99	0.58	0.208	0.06	0.15	1.22	0.050
161: A00154405	1.0	23.1	-22.1	0.04	0.837	0.10	0.74	1.21	0.055
162: A00154485	3.7	11.2	-7.55	0.33	0.498	0.14	0.36	0.658	0.045
163: A00154486	2.2	32.5	-30.3	0.07	1.08	0.04	1.04	1.04	0.055
164: A00154488	24	32.8	-8.31	0.75	1.15	0.10	1.05	1.97	0.075

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Modified ABA

LR Report : **CA11230-DEC12**

Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
165: A00154548	2.4	41.2	-38.8	0.06	1.32	< 0.01	1.32	1.33	0.065
166: A00154549	1.0	33.8	-32.8	0.03	1.20	0.12	1.08	1.16	0.075
167: A00154551	1.3	42.5	-41.2	0.03	1.40	0.04	1.36	1.20	0.105
168: A00154552	47	31.2	15.8	1.50	1.06	0.06	1.00	3.52	0.095
169: A00154563	1.3	29.4	-28.1	0.04	1.06	0.12	0.94	1.27	0.070
170: A00154564	2.2	21.2	-19.0	0.10	0.920	0.24	0.68	1.10	0.060
171: A00154584	5.4	0.31	5.09	17.4	0.022	0.02	< 0.01	0.100	0.050
172: A00154585	5.1	0.31	4.79	16.5	0.019	0.02	< 0.01	0.181	0.055
173: A00154586	3.8	0.31	3.49	12.3	0.008	< 0.01	< 0.01	0.111	0.065
174: A00154588	3.1	0.31	2.79	9.92	0.031	0.02	0.01	0.139	0.080
175: A00154589	3.5	0.31	3.19	11.3	0.012	0.01	< 0.01	0.087	0.045
176: A00154590	5.7	0.31	5.39	18.2	0.030	0.02	0.01	0.392	0.050
177: A00154591	3.4	3.44	-0.04	0.99	0.151	0.04	0.11	0.711	0.065
178: A00154592	4.0	5.94	-1.94	0.67	0.227	0.04	0.19	0.500	0.060
179: A00154593	3.6	22.2	-18.6	0.16	0.750	0.04	0.71	0.691	0.070
180: A00154594	3.2	31.9	-28.7	0.10	1.11	0.09	1.02	1.05	0.065
181: A00154661	3.9	5.94	-2.04	0.66	0.225	0.04	0.19	0.307	0.060
182: A00154663	3.2	46.9	-43.7	0.07	1.70	0.20	1.50	0.805	0.060
183: A00154790	2.5	15.3	-12.8	0.16	0.668	0.18	0.49	1.15	0.060
184: A00154791	1.0	53.1	-52.1	0.02	1.73	0.03	1.70	2.40	0.095
186: A00154946	41	14.4	26.6	2.85	0.524	0.06	0.46	2.88	0.095
187: A00115843	50	25.6	24.5	1.96	0.893	0.07	0.82	4.94	0.130
188: A00154554	4.9	0.31	4.59	15.8	0.009	< 0.01	< 0.01	0.164	0.030
189: A00154556	3.2	0.31	2.89	10.3	0.009	< 0.01	< 0.01	0.078	0.045
190: A00154558	2.8	0.31	2.49	9.03	0.009	< 0.01	< 0.01	0.095	0.030
191: A00154560	3.1	0.31	2.79	10.0	0.016	0.02	< 0.01	0.454	0.055
192: A00154658	1.2	0.31	0.89	3.87	0.015	0.02	< 0.01	0.101	0.045
193: A00154660	0.40	0.31	0.09	1.29	0.006	< 0.01	< 0.01	0.057	0.055
194: A00115624	0.90	0.31	0.59	2.90	0.006	< 0.01	< 0.01	0.065	0.010
195: A00115626	0.80	0.31	0.49	2.58	0.009	< 0.01	< 0.01	0.044	0.010
196: A00115627	1.4	0.31	1.09	4.52	0.007	< 0.01	< 0.01	0.085	0.015
197: A00115628	2.7	0.31	2.39	8.71	0.007	< 0.01	< 0.01	0.047	0.010
198: A00115629	0.0	0.31	-0.31	0.00	0.010	0.01	< 0.01	0.034	0.015
199: A00115630	2.2	0.31	1.89	7.10	0.006	< 0.01	< 0.01	0.056	0.060

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Modified ABA

LR Report : **CA11230-DEC12**

Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
200: A00115631	1.8	0.31	1.49	5.81	0.006	< 0.01	< 0.01	0.059	0.055
202: A00115633	0.0	0.31	-0.31	0.00	0.011	0.01	< 0.01	0.029	< 0.005
203: A00115634	1.0	0.31	0.69	3.23	0.006	< 0.01	< 0.01	0.020	< 0.005
204: 492222	1.8	0.62	1.18	2.88	0.035	0.02	0.02	0.028	0.040

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OnLine LIMS

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February-15-13

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 18 December 2012
LR Report: **CA11231-DEC12**
Reference: ML-ARD Assessment-Joyce Lake
PO#P M120008

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Ag µg/g	Al µg/g	As µg/g	Ba µg/g	Be µg/g	Bi µg/g	Ca µg/g	Cd µg/g	Co µg/g	Cr µg/g
3: Analysis Approval Date	13-Feb-13	14-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13	14-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13
4: Analysis Approval Time	09:14	19:45	09:14	09:14	09:14	09:14	19:45	09:14	09:14	09:14
5: 492067	0.06	4700	16	19	1.2	< 0.09	170	0.03	2.1	88
6: 492088	0.10	4400	15	36	1.2	< 0.09	160	0.06	4.8	54
7: 492220	0.04	1100	52	71	1.3	< 0.09	55	< 0.02	3.4	59
8: 492507	0.05	1000	19	33	1.1	< 0.09	110	0.07	6.9	160
9: 492503	0.03	600	8.9	13	0.70	< 0.09	130	0.04	3.5	71
10: 501070	0.04	2800	13	23	1.2	< 0.09	130	0.06	2.7	46
11: 502197	0.20	6000	19	33	1.8	0.12	130	0.09	0.35	43
12: 502385	0.07	2600	13	22	1.2	< 0.09	130	0.04	4.5	92
13: 492098	0.22	5200	22	38	3.9	0.14	120	0.11	5.6	55
14: 492197	0.01	1000	14	16	1.1	< 0.09	140	0.03	1.6	120
15: 492211	< 0.01	1200	32	8.4	0.66	< 0.09	86	0.04	8.0	96
16: 492233	0.04	3000	29	1200	1.6	< 0.09	76	0.02	7.1	38
17: 492463	< 0.01	860	12	14	0.95	< 0.09	64	0.02	2.2	130
18: 492448	0.10	14000	39	110	1.2	< 0.09	1100	0.16	3.7	63
19: 492459	0.02	2500	21	19	0.78	< 0.09	280	0.02	0.84	96

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LR Report : **CA11231-DEC12**

Sample ID	Ag µg/g	Al µg/g	As µg/g	Ba µg/g	Be µg/g	Bi µg/g	Ca µg/g	Cd µg/g	Co µg/g	Cr µg/g
20: 501013	0.02	3600	22	32	1.3	< 0.09	86	0.03	3.8	190
21: 501023	< 0.01	3200	23	19	1.0	< 0.09	130	0.04	1.2	87
22: 501132	0.06	2600	28	25	0.88	< 0.09	94	< 0.02	1.7	93
23: 501141	< 0.01	1200	22	8.7	0.78	< 0.09	86	< 0.02	1.6	98
24: 501164	0.11	3900	30	33	1.0	< 0.09	120	0.08	3.8	48
25: 502390	0.36	14000	34	33	1.3	0.16	140	0.11	1.6	48
26: 502396	0.02	1400	21	11	0.94	< 0.09	84	< 0.02	2.4	86
27: 502405	0.02	2800	46	24	1.5	< 0.09	67	0.03	2.7	42
28: 502433	0.08	3800	18	23	0.86	< 0.09	67	0.06	7.1	48
29: 502447	0.08	4700	13	290	2.2	< 0.09	94	0.12	16	53
30: A00154749	0.08	11000	27	71	1.2	< 0.09	140	0.05	2.6	91
31: 492491	0.04	1200	8.9	11	3.8	< 0.09	66	0.05	5.4	130
32: 492535	0.21	7400	25	47	2.4	0.14	140	0.09	13	63
33: 501168	0.23	6700	32	23	2.1	0.15	1200	0.21	11	43
35: 502449	0.43	6100	30	40	2.4	0.37	120	0.09	43	67
37: A00117616	0.27	6300	18	35	1.6	0.18	160	0.12	2.2	50
38: A00117745	0.28	6900	15	130	1.4	0.15	150	0.09	0.67	43
39: A00154370	0.49	25000	32	230	3.0	0.21	200	0.31	19	57
40: A00154404	0.19	6100	17	40	1.7	0.11	110	0.10	1.4	45
41: A00154488	0.20	7100	29	70	1.8	0.11	470	0.15	11	55
42: A00154552	0.31	13000	24	29	1.3	0.13	1000	0.20	14	100
43: A00154585	< 0.01	770	5.5	8.1	1.5	< 0.09	83	< 0.02	5.1	94
44: A00154590	0.12	4700	23	20	2.3	0.15	77	0.06	1.4	40
45: A00154594	0.21	5300	29	8.9	1.5	0.14	95	0.09	9.6	81
46: A00154791	0.35	7300	45	97	1.6	0.16	180	0.23	13	210
47: A00154554	0.02	1100	12	310	2.0	< 0.09	100	0.15	28	210
48: A00154558	0.17	5800	16	37	1.2	< 0.09	140	0.04	1.3	47
49: A00115627	< 0.01	1300	17	16	1.4	< 0.09	98	< 0.02	2.2	170
50: A00115631	< 0.01	1100	26	12	0.91	< 0.09	470	< 0.02	2.8	130
51: A00115634	< 0.01	1700	36	17	1.3	< 0.09	62	0.02	1.7	43

OnLine LIMS

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LR Report : **CA11231-DEC12**

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February-15-13

Labec Century Iron Ore Inc
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Phone: 514-228-5034
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Date Rec. : 18 December 2012
LR Report: **CA11231-DEC12**
Reference: ML-ARD Assessment-Joyce Lake
PO#P M120008

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Cu µg/g	Fe µg/g	K µg/g	Li µg/g	Mg µg/g	Mn µg/g	Mo µg/g	Na µg/g	Ni µg/g	P µg/g
3: Analysis Approval Date	13-Feb-13	14-Feb-13	14-Feb-13	13-Feb-13	14-Feb-13	14-Feb-13	13-Feb-13	14-Feb-13	13-Feb-13	14-Feb-13
4: Analysis Approval Time	09:14	19:45	19:45	09:14	19:46	19:46	09:14	19:46	09:14	19:46
5: 492067	2.2	660000	410	< 2	170	1800	2.8	200	3.7	210
6: 492088	1.8	380000	180	3	170	1500	4.8	130	11	640
7: 492220	20	660000	150	< 2	38	4500	4.7	110	10	270
8: 492507	18	480000	710	< 2	100	12000	7.1	96	10	310
9: 492503	9.8	320000	460	< 2	86	5800	1.9	110	5.2	270
10: 501070	16	350000	230	< 2	72	3900	3.8	88	7.1	780
11: 502197	19	440000	130	< 2	60	630	8.1	71	8.2	710
12: 502385	11	410000	210	2	95	2300	3.7	87	9.8	440
13: 492098	9.8	310000	130	2	52	970	9.3	94	22	1500
14: 492197	1.7	400000	170	< 2	110	1100	1.8	120	5.2	120
15: 492211	2.2	360000	150	3	66	1200	2.5	120	4.1	150
16: 492233	4.0	390000	230	< 2	87	10000	5.2	140	5.8	340
17: 492463	2.1	390000	150	2	57	940	4.1	120	6.8	180
18: 492448	16	370000	4700	6	1800	1800	2.0	1900	11	400
19: 492459	4.3	350000	140	2	160	990	1.2	110	3.6	250

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LR Report : **CA11231-DEC12**

Sample ID	Cu µg/g	Fe µg/g	K µg/g	Li µg/g	Mg µg/g	Mn µg/g	Mo µg/g	Na µg/g	Ni µg/g	P µg/g
20: 501013	2.5	410000	180	3	120	1200	3.1	150	6.8	68
21: 501023	4.4	470000	130	< 2	98	1500	1.3	98	3.4	240
22: 501132	7.4	320000	250	3	100	1000	3.0	110	9.4	220
23: 501141	1.7	390000	150	< 2	62	1000	2.2	110	4.6	140
24: 501164	3.4	400000	120	< 2	37	1200	8.0	98	16	3600
25: 502390	12	360000	130	7	370	520	13	310	7.1	940
26: 502396	1.6	360000	160	< 2	55	1100	1.2	150	3.1	190
27: 502405	28	630000	130	< 2	56	2500	2.9	70	4.3	370
28: 502433	2.1	420000	340	< 2	44	6100	4.2	100	3.9	240
29: 502447	6.8	360000	760	3	37	29000	8.7	150	8.5	560
30: A00154749	4.7	350000	130	< 2	130	2200	1.3	99	5.4	610
31: 492491	3.6	400000	120	3	38	810	5.1	100	25	730
32: 492535	8.9	390000	170	4	81	740	13	100	19	780
33: 501168	22	300000	130	6	5700	20000	12	100	19	1300
35: 502449	32	350000	220	3	64	1100	7.7	130	30	770
37: A00117616	14	300000	92	4	110	800	14	73	7.5	730
38: A00117745	6.5	360000	180	4	80	620	15	160	6.2	840
39: A00154370	15	310000	1500	38	2700	15000	17	70	27	1740
40: A00154404	11	360000	130	6	70	740	14	59	7.2	860
41: A00154488	22	360000	250	10	1400	15000	9.7	76	18	880
42: A00154552	93	280000	120	15	6100	24000	16	100	16	860
43: A00154585	4.0	350000	480	3	58	5900	3.2	140	9.3	440
44: A00154590	5.5	390000	340	2	73	660	7.7	250	6.1	630
45: A00154594	16	290000	67	3	89	680	8.9	44	13	860
46: A00154791	42	150000	110	7	130	450	18	120	25	1000
47: A00154554	21	340000	1700	4	63	28000	7.6	79	10	330
48: A00154558	8.0	440000	170	< 2	90	830	9.1	120	6.0	550
49: A00115627	1.8	370000	130	< 2	50	1300	2.7	50	4.3	120
50: A00115631	1.7	350000	110	< 2	290	1100	2.2	44	4.2	120
51: A00115634	1.5	340000	110	< 2	53	1400	2.1	50	2.3	350

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LR Report : **CA11231-DEC12**

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February-15-13

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Fax:514-228-5643

Date Rec. : 18 December 2012
LR Report: **CA11231-DEC12**
Reference: ML-ARD Assessment-Joyce Lake
PO#P M120008

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Pb µg/g	Sb µg/g	Se µg/g	Sn µg/g	Sr µg/g	Ti µg/g	Tl µg/g	U µg/g	V µg/g	Y µg/g	Zn µg/g
3: Analysis Approval Date	13-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13	13-Feb-13
4: Analysis Approval Time	09:15	09:16	09:16	09:16	09:16	09:16	09:16	09:17	09:17	09:17	09:17
5: 492067	2.8	< 0.8	< 0.7	0.7	110	160	< 0.02	1.2	80	3.8	8.6
6: 492088	2.4	< 0.8	< 0.7	0.7	31	590	< 0.02	2.0	180	17	10
7: 492220	2.9	2.3	< 0.7	1.7	6.8	34	0.08	1.7	46	9.7	17
8: 492507	2.2	1.1	< 0.7	0.9	13	37	0.02	4.6	40	5.7	27
9: 492503	1.3	< 0.8	< 0.7	< 0.5	4.6	15	< 0.02	1.5	20	6.8	20
10: 501070	4.4	< 0.8	3.1	< 0.5	100	210	< 0.02	1.3	120	19	32
11: 502197	12	< 0.8	9.9	0.7	140	520	0.09	3.5	220	30	23
12: 502385	3.8	< 0.8	< 0.7	0.6	45	250	0.04	2.2	120	20	24
13: 492098	15	< 0.8	3.2	1.8	270	570	< 0.02	3.5	270	55	33
14: 492197	2.1	< 0.8	< 0.7	0.6	7.2	52	< 0.02	0.83	41	4.4	7.7
15: 492211	1.4	1.3	< 0.7	< 0.5	3.10	43	< 0.02	0.71	55	1.9	6.9
16: 492233	3.8	< 0.8	< 0.7	0.7	28	260	< 0.02	2.4	170	23	57
17: 492463	1.6	< 0.8	< 0.7	< 0.5	4.1	26	< 0.02	0.78	41	5.2	7.9
18: 492448	3.9	1.2	< 0.7	0.6	55	690	0.12	2.1	110	7.4	40
19: 492459	2.8	< 0.8	< 0.7	< 0.5	200	92	< 0.02	0.61	53	3.8	15

OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA11231-DEC12**

Sample ID	Pb µg/g	Sb µg/g	Se µg/g	Sn µg/g	Sr µg/g	Ti µg/g	Tl µg/g	U µg/g	V µg/g	Y µg/g	Zn µg/g
20: 501013	1.1	< 0.8	0.9	0.6	48	350	< 0.02	0.70	28	2.9	8.3
21: 501023	2.1	< 0.8	< 0.7	0.5	140	350	< 0.02	1.6	60	3.1	9.0
22: 501132	1.6	0.9	< 0.7	0.6	9.2	110	0.02	0.94	50	2.9	10
23: 501141	2.2	0.8	< 0.7	0.5	3.93	46	< 0.02	1.3	43	2.5	6.8
24: 501164	3.5	< 0.8	2.4	0.7	210	370	0.04	1.9	200	22	23
25: 502390	9.4	< 0.8	4.1	1.1	280	3000	0.07	7.2	420	21	14
26: 502396	2.3	1.5	< 0.7	< 0.5	4.1	80	< 0.02	0.48	66	3.8	5.4
27: 502405	4.0	3.6	< 0.7	< 0.5	7.55	100	0.03	2.8	130	6.6	36
28: 502433	1.3	< 0.8	< 0.7	< 0.5	110	230	< 0.02	1.6	170	12	15
29: 502447	10	< 0.8	3.5	0.5	230	520	< 0.02	2.2	180	19	24
30: A00154749	2.8	< 0.8	< 0.7	< 0.5	160	1300	< 0.02	1.3	64	7.4	20
31: 492491	58	< 0.8	10	< 0.5	83	210	< 0.02	1.00	98	17	18
32: 492535	36	< 0.8	220	< 0.5	130	850	0.13	3.7	330	23	11
33: 501168	5.3	0.9	3.9	< 0.5	14	460	0.18	5.1	340	28	24
35: 502449	1100	< 0.8	510	< 0.5	48	750	0.05	3.4	340	21	9.6
37: A00117616	11	1.0	8.0	0.6	260	520	< 0.02	4.3	340	32	12
38: A00117745	7.3	< 0.8	13	< 0.5	360	630	0.03	3.8	290	27	26
39: A00154370	8.0	0.8	3.2	2.0	21	1000	0.21	6.3	290	34	33
40: A00154404	6.5	< 0.8	5.8	< 0.5	220	560	0.10	3.7	310	23	11
41: A00154488	6.0	< 0.8	2.8	< 0.5	24	910	0.10	3.8	320	21	20
42: A00154552	7.7	< 0.8	2.4	1.1	110	1000	0.16	4.1	350	30	19
43: A00154585	1.2	< 0.8	1.7	< 0.5	4.0	37	< 0.02	0.44	33	14	9.2
44: A00154590	5.7	< 0.8	7.5	< 0.5	150	630	0.18	3.3	190	15	9.7
45: A00154594	5.5	< 0.8	2.2	0.5	25	450	0.16	3.1	280	22	18
46: A00154791	12	< 0.8	6.6	0.5	480	610	0.17	3.3	320	51	16
47: A00154554	2.4	1.2	< 0.7	< 0.5	29	37	0.12	0.91	72	17	26
48: A00154558	6.9	1.0	< 0.7	< 0.5	59	570	0.04	2.5	240	12	11
49: A00115627	1.7	1.2	< 0.7	< 0.5	6.9	52	< 0.02	1.8	73	2.8	6.9
50: A00115631	2.1	1.7	< 0.7	0.5	4.7	45	< 0.02	1.5	66	2.9	5.4
51: A00115634	2.3	3.1	< 0.7	< 0.5	8.3	59	< 0.02	1.8	63	3.4	7.6

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LR Report : **CA11231-DEC12**

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Phone: 705-652-2000 FAX: 705-652-6365

SFE Leach (3:1 ratio filter 0.45µ 24hr)

January-29-13

Labec Century Iron Ore Inc
Attn : Ricky Chan

170 University Avenue,Suite 602, Toronto
Canada, M5H 3B3
Phone: 416-977-3188 Ex 105, Fax:416-977-8002

Date Rec. : 18 December 2012
LR Report: **CA11232-DEC12**
Reference: ML-ARD Assessment-Joyce Lake
PO#P M120008

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Sample weight g	Volume D.I. Water mL	Initial pH units	Final pH units	Hg mg/L	Ag mg/L	Al mg/L	As mg/L	Ba mg/L	B mg/L	Be mg/L	Bi mg/L
3: Analysis Approval Date		21-Jan-13	21-Jan-13	21-Jan-13	21-Jan-13	23-Jan-13	28-Jan-13	22-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13
4: Analysis Approval Time		12:01	12:01	12:01	12:01	15:59	10:22	09:39	10:23	10:23	10:23	10:23	10:23
5: 492067	Date:N/A	250	750	7.30	7.45	< 0.00001	< 0.00001	0.02	0.0016	0.00041	0.0247	< 0.00002	< 0.00001
6: 492078	Date:N/A	250	750	7.02	6.95	0.00004	< 0.00001	< 0.01	0.0002	0.00008	0.102	< 0.00002	< 0.00001
7: 492088	Date:N/A	250	750	8.09	7.64	< 0.00001	< 0.00001	0.03	0.0010	0.00115	0.0428	< 0.00002	< 0.00001
8: 492094	Date:N/A	250	750	6.42	6.34	< 0.00001	< 0.00001	< 0.01	0.0003	0.00159	0.0847	< 0.00002	< 0.00001
9: 492220	Date:N/A	250	750	5.01	5.38	0.00001	< 0.00001	0.01	< 0.0002	0.00319	0.148	0.00013	< 0.00001
10: 492225	Date:N/A	250	750	6.10	5.93	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00035	0.117	0.00003	< 0.00001
11: 492507	Date:N/A	250	750	6.43	6.72	0.00001	< 0.00001	0.01	0.0003	0.00002	0.0421	< 0.00002	< 0.00001
12: 492518	Date:N/A	250	750	5.74	5.89	0.00001	< 0.00001	< 0.01	< 0.0002	0.00006	0.0938	< 0.00002	< 0.00001
13: 492503	Date:N/A	250	750	7.90	7.73	< 0.00001	< 0.00001	< 0.01	0.0009	0.00028	0.0297	0.00004	< 0.00001
14: 501065	Date:N/A	250	750	5.87	6.47	0.00001	< 0.00001	< 0.01	0.0002	0.00159	0.0916	< 0.00002	< 0.00001
15: 501070	Date:N/A	250	750	6.00	6.27	0.00001	< 0.00001	< 0.01	0.0003	0.00005	0.0773	< 0.00002	< 0.00001
16: 502194	Date:N/A	250	750	6.08	6.30	0.00006	< 0.00001	0.01	0.0002	0.00008	0.0765	0.00002	< 0.00001
17: 502197	Date:N/A	250	750	5.32	5.57	< 0.00001	< 0.00001	< 0.01	0.0007	0.00113	0.142	0.00004	< 0.00001
18: 502381	Date:N/A	250	750	7.25	7.44	0.00009	< 0.00001	0.03	0.0006	0.00011	0.0929	< 0.00002	< 0.00001
19: 502385	Date:N/A	250	750	6.87	6.66	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00005	0.0835	< 0.00002	< 0.00001
20: 502413	Date:N/A	250	750	6.12	6.22	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00229	0.106	0.00003	< 0.00001
21: 492098	Date:N/A	250	750	6.13	6.10	< 0.00001	< 0.00001	0.01	0.0008	0.00094	0.0435	< 0.00002	< 0.00001
22: 492100	Date:N/A	250	750	4.03	4.12	< 0.00001	0.00001	0.07	0.0015	0.109	0.0249	0.00142	< 0.00001
23: 492197	Date:N/A	250	750	6.26	7.10	< 0.00001	< 0.00001	0.02	0.0004	0.00698	0.0469	< 0.00002	< 0.00001
24: 492204	Date:N/A	250	750	6.22	6.73	0.00001	< 0.00001	0.01	0.0002	0.00565	0.0442	< 0.00002	< 0.00001

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : CA11232-DEC12

Sample ID	Sample Date & Time	Sample weight g	Volume D.I. Water mL	Initial pH units	Final pH units	Hg mg/L	Ag mg/L	Al mg/L	As mg/L	Ba mg/L	B mg/L	Be mg/L	Bi mg/L
25: 492211	Date:N/A	250	750	5.27	6.00	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00476	0.0589	< 0.00002	< 0.00001
26: 492217	Date:N/A	250	750	4.99	5.47	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00641	0.0644	0.00006	< 0.00001
27: 492233	Date:N/A	250	750	5.62	5.91	0.00003	< 0.00001	< 0.01	< 0.0002	0.00225	0.126	0.00003	< 0.00001
28: 492236	Date:N/A	250	750	5.72	6.11	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00217	0.142	< 0.00002	< 0.00001
29: 492465	Date:N/A	250	750	5.91	6.09	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00121	0.0756	0.00002	< 0.00001
30: 492469	Date:N/A	250	750	6.49	6.91	< 0.00001	< 0.00001	0.02	0.0003	0.00100	0.0486	< 0.00002	< 0.00001
31: 492451	Date:N/A	250	750	6.19	6.30	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00059	0.0629	< 0.00002	< 0.00001
32: 492456	Date:N/A	250	750	6.47	6.91	0.00001	< 0.00001	0.02	0.0003	0.00116	0.0290	< 0.00002	< 0.00001
33: 492461	Date:N/A	250	750	6.36	6.66	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00145	0.0647	< 0.00002	< 0.00001
34: 492489	Date:N/A	250	750	5.97	6.15	0.00001	< 0.00001	0.02	0.0003	0.00159	0.118	0.00004	< 0.00001
35: 501015	Date:N/A	250	750	6.45	7.33	< 0.00001	< 0.00001	< 0.01	0.0007	0.281	0.0335	< 0.00002	< 0.00001
36: 501021	Date:N/A	250	750	6.01	6.34	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.0129	0.0269	< 0.00002	< 0.00001
37: 501073	Date:N/A	250	750	5.85	5.91	0.00024	< 0.00001	0.01	< 0.0002	0.00124	0.0565	< 0.00002	< 0.00001
38: 501076	Date:N/A	250	750	3.72	4.05	< 0.00001	< 0.00001	0.34	0.0033	0.120	0.107	0.00219	< 0.00001
39: 501134	Date:N/A	250	750	6.26	6.75	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00352	0.0347	< 0.00002	< 0.00001
40: 501139	Date:N/A	250	750	6.31	6.72	< 0.00001	< 0.00001	0.01	< 0.0002	0.00538	0.0440	< 0.00002	< 0.00001
41: 501143	Date:N/A	250	750	6.39	6.77	0.00001	< 0.00001	< 0.01	< 0.0002	0.00315	0.0330	< 0.00002	< 0.00001
42: 501161	Date:N/A	250	750	6.20	6.37	< 0.00001	0.00001	< 0.01	0.0003	0.00226	0.0462	< 0.00002	< 0.00001
43: 501165	Date:N/A	250	750	5.10	5.38	< 0.00001	0.00001	< 0.01	0.0011	0.0135	0.0438	0.00003	< 0.00001
44: 502389	Date:N/A	250	750	5.86	5.88	< 0.00001	0.00001	< 0.01	< 0.0002	0.00114	0.0560	< 0.00002	< 0.00001
45: 502391	Date:N/A	250	750	4.99	5.21	< 0.00001	0.00001	< 0.01	0.0002	0.00141	0.0093	< 0.00002	< 0.00001
46: 502393	Date:N/A	250	750	6.02	6.47	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00689	0.0343	< 0.00002	< 0.00001
47: 502398	Date:N/A	250	750	6.04	6.04	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00062	0.0724	< 0.00002	< 0.00001
48: 502402	Date:N/A	250	750	5.92	6.02	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00091	0.0880	< 0.00002	< 0.00001
49: 502408	Date:N/A	250	750	5.67	5.85	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00074	0.0784	0.00002	< 0.00001
50: 502429	Date:N/A	250	750	5.73	5.90	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00009	0.0739	0.00002	< 0.00001
51: 502438	Date:N/A	250	750	5.20	5.56	< 0.00001	< 0.00001	0.01	< 0.0002	0.00007	0.124	0.00010	< 0.00001
52: 502446	Date:N/A	250	750	5.95	6.04	0.00006	< 0.00001	< 0.01	< 0.0002	0.00008	0.113	0.00003	< 0.00001
53: A00117785	Date:N/A	250	750	8.16	8.42	< 0.00001	0.00002	0.03	0.0009	0.00336	0.0292	< 0.00002	< 0.00001
54: A00117790	Date:N/A	250	750	7.22	7.16	< 0.00001	0.00001	0.02	0.0005	0.00028	0.0453	< 0.00002	< 0.00001
55: A00117794	Date:N/A	250	750	8.32	8.04	0.00002	0.00004	0.44	0.0052	0.00056	0.0402	0.00002	0.00004
56: A00117824	Date:N/A	250	750	6.51	6.41	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00137	0.0614	< 0.00002	< 0.00001
57: A00154858	Date:N/A	250	750	5.23	5.84	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00762	0.0725	0.00002	< 0.00001
58: A00154860	Date:N/A	250	750	4.84	5.28	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.0117	0.0730	0.00007	< 0.00001
60: A00115836	Date:N/A	250	750	5.21	5.49	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.0150	0.0645	0.00004	< 0.00001
61: A00115842	Date:N/A	250	750	4.73	5.05	< 0.00001	< 0.00001	< 0.01	0.0018	0.0150	0.0170	0.00007	< 0.00001
62: A00154740	Date:N/A	250	750	5.64	5.82	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00245	0.0383	< 0.00002	< 0.00001
63: A00154743	Date:N/A	250	750	6.32	6.43	< 0.00001	< 0.00001	0.02	< 0.0002	0.00057	0.0159	< 0.00002	< 0.00001
64: A00154747	Date:N/A	250	750	6.12	6.17	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00718	0.0444	< 0.00002	< 0.00001
65: A00154749	Date:N/A	250	750	6.10	6.17	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00208	0.0487	< 0.00002	< 0.00001

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Sample ID	Sample Date & Time	Sample weight g	Volume D.I. Water mL	Initial pH units	Final pH units	Hg mg/L	Ag mg/L	Al mg/L	As mg/L	Ba mg/L	B mg/L	Be mg/L	Bi mg/L
66: 492492	Date:N/A	250	750	3.29	3.55	< 0.00001	< 0.00001	0.83	0.0081	0.119	0.195	0.0316	< 0.00001
67: 492535	Date:N/A	250	750	3.92	4.15	< 0.00001	< 0.00001	0.07	0.0063	0.0954	0.254	0.00746	< 0.00001
68: 501063	Date:N/A	250	750	3.93	4.17	< 0.00001	< 0.00001	0.15	0.0022	0.101	0.0514	0.00149	< 0.00001
69: 501168	Date:N/A	250	750	6.11	6.22	0.00002	< 0.00001	< 0.01	0.0010	0.0134	0.0499	0.00005	< 0.00001
70: 502209	Date:N/A	250	750	5.58	6.03	< 0.00001	< 0.00001	< 0.01	0.0011	0.0281	0.0534	< 0.00002	< 0.00001
73: 502449	Date:N/A	250	750	3.26	3.31	< 0.00001	0.00003	5.73	0.0627	0.0543	0.206	0.08396	< 0.00001
76: A00117614	Date:N/A	250	750	6.06	6.29	< 0.00001	< 0.00001	0.01	< 0.0002	0.00078	0.0983	< 0.00002	< 0.00001
77: A00117616	Date:N/A	250	750	6.43	6.56	0.00014	< 0.00001	0.72	0.0044	0.00397	0.514	0.00018	0.00013
78: A00117704	Date:N/A	250	750	7.05	6.53	< 0.00001	0.00005	< 0.01	0.0011	0.00148	0.163	0.00002	< 0.00001
79: A00117745	Date:N/A	250	750	6.59	7.03	0.00006	0.00018	0.13	0.0022	0.00043	0.0903	< 0.00002	0.00015
80: A00117828	Date:N/A	250	750	5.38	5.36	< 0.00001	0.00007	< 0.01	0.0014	0.0286	0.0700	0.00003	< 0.00001
81: A00154370	Date:N/A	250	750	5.03	5.61	< 0.00001	< 0.00001	< 0.01	0.0007	0.0388	0.0446	0.00006	< 0.00001
82: A00154372	Date:N/A	250	750	4.16	4.93	< 0.00001	< 0.00001	< 0.01	0.0005	0.0427	0.104	0.00045	< 0.00001
83: A00154404	Date:N/A	250	750	4.10	4.49	< 0.00001	0.00001	0.03	0.0012	0.0517	0.0804	0.00054	< 0.00001
84: A00154485	Date:N/A	250	750	4.63	5.18	0.00003	0.00014	< 0.01	0.0002	0.0797	0.159	0.00015	< 0.00001
85: A00154488	Date:N/A	250	750	5.40	5.96	0.00005	0.00006	< 0.01	0.0002	0.0461	0.0362	< 0.00002	< 0.00001
86: A00154549	Date:N/A	250	750	3.53	3.77	< 0.00001	0.00004	0.93	0.0012	0.0524	0.0539	0.0278	< 0.00001
87: A00154552	Date:N/A	250	750	5.88	6.09	< 0.00001	< 0.00001	< 0.01	0.0002	0.00958	0.0192	0.00023	< 0.00001
88: A00154564	Date:N/A	250	750	3.54	3.83	< 0.00001	< 0.00001	3.79	0.0012	0.06458	0.159	0.0196	< 0.00001
89: A00154585	Date:N/A	250	750	5.32	5.52	0.00003	< 0.00001	0.06	< 0.0002	0.00098	0.0298	0.00070	0.00001
90: A00154588	Date:N/A	250	750	4.67	5.05	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.0150	0.0891	0.00024	< 0.00001
91: A00154590	Date:N/A	250	750	4.96	5.16	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.0148	0.117	0.00021	< 0.00001
92: A00154592	Date:N/A	250	750	4.52	4.75	< 0.00001	< 0.00001	0.02	0.0009	0.0250	0.0373	0.00047	< 0.00001
93: A00154594	Date:N/A	250	750	3.73	3.85	< 0.00001	0.00002	1.33	0.0006	0.0696	0.0415	0.0164	< 0.00001
94: A00154663	Date:N/A	250	750	3.77	4.08	< 0.00001	0.00002	5.90	0.0016	0.0600	0.0530	0.00874	< 0.00001
95: A00154791	Date:N/A	250	750	3.23	3.35	< 0.00001	0.00005	6.67	0.0034	0.0535	0.0315	0.0468	< 0.00001
96: A00154946	Date:N/A	250	750	6.00	6.24	0.00005	< 0.00001	< 0.01	0.0003	0.0146	0.0241	0.00047	< 0.00001
97: A00154554	Date:N/A	250	750	5.47	5.76	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00146	0.0672	0.00027	< 0.00001
98: A00154558	Date:N/A	250	750	4.44	4.77	< 0.00001	< 0.00001	0.01	< 0.0002	0.0132	0.0680	0.00029	< 0.00001
99: A00154658	Date:N/A	250	750	6.49	6.51	0.00002	0.00001	0.01	< 0.0002	0.0767	0.0389	< 0.00002	< 0.00001
100: A00115624	Date:N/A	250	750	4.71	5.29	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.0107	0.0536	0.00008	< 0.00001
101: A00115627	Date:N/A	250	750	4.97	5.59	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00819	0.0572	0.00003	< 0.00001
102: A00115629	Date:N/A	250	750	4.83	5.29	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.0398	0.0796	0.00007	< 0.00001
103: A00115631	Date:N/A	250	750	4.93	5.35	< 0.00001	< 0.00001	< 0.01	< 0.0002	0.00871	0.0690	0.00007	< 0.00001
104: A00115634	Date:N/A	250	750	4.73	5.01	< 0.00001	0.00002	< 0.01	< 0.0002	0.00344	0.0741	0.00016	< 0.00001

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA11232-DEC12**

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

January-29-13

Labec Century Iron Ore Inc
Attn : Ricky Chan

170 University Avenue,Suite 602, Toronto
Canada, M5H 3B3
Phone: 416-977-3188 Ex 105, Fax:416-977-8002

Date Rec. : 18 December 2012
LR Report: **CA11232-DEC12**
Reference: ML-ARD Assessment-Joyce Lake
PO#P M120008

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Ca mg/L	Cd mg/L	Co mg/L	Cr mg/L	Cu mg/L	Fe mg/L	K mg/L	Li mg/L	Mg mg/L	Mn mg/L	Mo mg/L	Na mg/L
3: Analysis Approval Date	22-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13	22-Jan-13	22-Jan-13	28-Jan-13	22-Jan-13	25-Jan-13	28-Jan-13	22-Jan-13
4: Analysis Approval Time	09:52	10:24	10:24	10:24	10:24	09:53	09:53	10:24	09:53	12:29	10:25	09:53
5: 492067	3.12	0.000011	0.000171	< 0.0005	< 0.0005	0.181	1.13	0.001	1.39	0.0040	0.00013	0.74
6: 492078	0.73	0.000007	0.000014	< 0.0005	0.0006	0.008	0.405	0.013	0.353	0.0021	< 0.00001	0.68
7: 492088	0.02	< 0.000003	0.000033	< 0.0005	0.0012	2.69	0.286	0.001	0.018	0.0159	< 0.00001	4.15
8: 492094	0.20	0.000003	0.000123	< 0.0005	< 0.0005	0.006	0.875	0.009	0.197	0.178	< 0.00001	0.43
9: 492220	0.48	0.000012	0.000320	< 0.0005	0.0005	< 0.003	0.290	0.012	0.259	0.890	< 0.00001	0.12
10: 492225	3.04	0.000003	0.000473	< 0.0005	< 0.0005	< 0.003	0.395	0.018	2.30	0.595	< 0.00001	0.23
11: 492507	1.02	< 0.000003	0.000073	< 0.0005	< 0.0005	< 0.003	0.172	0.002	0.600	0.0653	< 0.00001	0.12
12: 492518	0.14	< 0.000003	0.000423	< 0.0005	< 0.0005	< 0.003	0.446	0.002	0.174	0.0841	< 0.00001	0.21
13: 492503	4.95	< 0.000003	0.000086	0.0005	0.0015	2.91	0.071	0.003	2.39	0.0527	< 0.00001	0.14
14: 501065	3.80	0.000004	0.000024	< 0.0005	< 0.0005	< 0.003	0.538	0.003	2.14	0.0540	< 0.00001	0.20
15: 501070	0.77	< 0.000003	0.000014	< 0.0005	< 0.0005	< 0.003	0.557	0.005	0.445	0.0089	< 0.00001	0.21
16: 502194	0.37	< 0.000003	0.000008	< 0.0005	< 0.0005	0.020	0.479	0.002	0.217	0.0008	< 0.00001	0.25
17: 502197	0.11	0.000004	0.000083	< 0.0005	< 0.0005	< 0.003	0.501	0.002	0.060	0.0076	< 0.00001	0.26
18: 502381	1.22	0.000008	0.000020	0.0012	< 0.0005	0.512	0.516	0.002	0.793	0.0093	0.00003	0.48
19: 502385	0.37	0.000004	0.000027	< 0.0005	< 0.0005	0.004	0.494	0.003	0.182	0.0032	< 0.00001	0.21
20: 502413	0.30	< 0.000003	0.000116	< 0.0005	< 0.0005	< 0.003	0.142	0.023	0.209	0.297	< 0.00001	0.11
21: 492098	0.10	0.000011	0.000084	< 0.0005	< 0.0005	0.126	1.42	0.003	0.112	0.162	0.00017	0.30
22: 492100	12.7	0.000261	0.0809	< 0.0005	0.0326	0.013	2.69	0.011	12.5	35.8	0.00001	0.49
23: 492197	4.51	< 0.000003	0.000357	< 0.0005	< 0.0005	0.038	0.430	0.003	1.90	0.0525	0.00003	0.95
24: 492204	1.75	< 0.000003	0.000787	< 0.0005	< 0.0005	0.014	0.298	0.002	0.761	0.192	< 0.00001	0.35

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA11232-DEC12**

Sample ID	Ca mg/L	Cd mg/L	Co mg/L	Cr mg/L	Cu mg/L	Fe mg/L	K mg/L	Li mg/L	Mg mg/L	Mn mg/L	Mo mg/L	Na mg/L
25: 492211	1.26	0.000010	0.00164	< 0.0005	< 0.0005	< 0.003	0.159	0.004	0.835	0.352	< 0.00001	0.10
26: 492217	0.34	0.000011	0.00120	< 0.0005	< 0.0005	< 0.003	0.266	0.008	0.153	0.630	< 0.00001	0.11
27: 492233	0.31	< 0.000003	0.000475	< 0.0005	< 0.0005	< 0.003	0.977	0.008	0.313	0.392	< 0.00001	0.27
28: 492236	0.18	< 0.000003	0.000169	< 0.0005	< 0.0005	< 0.003	0.843	0.005	0.234	0.223	< 0.00001	0.23
29: 492465	0.26	< 0.000003	0.000220	< 0.0005	< 0.0005	< 0.003	0.214	0.003	0.198	0.0702	< 0.00001	0.15
30: 492469	1.67	< 0.000003	0.000052	< 0.0005	< 0.0005	0.681	0.155	0.004	1.42	0.170	< 0.00001	0.12
31: 492451	0.40	< 0.000003	0.000047	< 0.0005	< 0.0005	0.023	0.339	0.003	0.240	0.0481	0.00002	0.19
32: 492456	1.73	< 0.000003	0.000158	< 0.0005	< 0.0005	0.542	0.328	0.001	0.946	0.229	< 0.00001	0.22
33: 492461	0.46	< 0.000003	0.000371	< 0.0005	< 0.0005	0.053	0.188	0.008	0.316	0.256	< 0.00001	0.12
34: 492489	0.25	< 0.000003	0.000302	< 0.0005	< 0.0005	0.090	0.613	0.010	0.256	0.340	< 0.00001	0.27
35: 501015	2.60	< 0.000003	0.000203	< 0.0005	< 0.0005	0.034	0.214	0.001	1.03	0.0589	0.00018	0.20
36: 501021	1.03	< 0.000003	0.000005	< 0.0005	< 0.0005	< 0.003	0.522	0.001	0.661	0.0002	< 0.00001	0.25
37: 501073	0.42	< 0.000003	0.000589	< 0.0005	< 0.0005	< 0.003	0.412	0.014	0.204	0.128	< 0.00001	0.14
38: 501076	6.94	0.000362	0.136	< 0.0005	0.0167	0.075	2.70	0.017	4.57	19.9	< 0.00001	0.34
39: 501134	2.62	0.000003	0.00250	< 0.0005	< 0.0005	< 0.003	0.468	0.006	0.908	0.462	0.00004	0.18
40: 501139	2.13	< 0.000003	0.000732	< 0.0005	< 0.0005	0.004	0.417	0.009	0.859	0.145	< 0.00001	0.18
41: 501143	3.02	< 0.000003	0.000035	< 0.0005	< 0.0005	0.007	0.465	0.003	1.14	0.0143	< 0.00001	0.18
42: 501161	0.24	0.000003	0.00540	< 0.0005	< 0.0005	0.211	1.08	0.006	0.203	0.408	< 0.00001	0.23
43: 501165	3.01	0.000046	0.00463	< 0.0005	< 0.0005	< 0.003	1.58	0.016	3.14	5.05	< 0.00001	0.31
44: 502389	0.31	< 0.000003	0.000078	< 0.0005	< 0.0005	< 0.003	0.644	0.006	0.148	0.0322	< 0.00001	0.24
45: 502391	0.71	0.000005	0.00198	< 0.0005	< 0.0005	< 0.003	0.462	0.007	0.359	0.103	< 0.00001	0.19
46: 502393	0.94	0.000014	0.00205	< 0.0005	< 0.0005	< 0.003	0.286	0.015	0.876	1.94	< 0.00001	0.11
47: 502398	0.14	< 0.000003	0.000050	< 0.0005	< 0.0005	< 0.003	0.257	0.012	0.072	0.0194	< 0.00001	0.11
48: 502402	0.20	< 0.000003	0.000009	< 0.0005	< 0.0005	< 0.003	0.320	0.005	0.132	0.0124	< 0.00001	0.11
49: 502408	0.10	< 0.000003	0.000073	< 0.0005	< 0.0005	< 0.003	0.185	0.007	0.066	0.0826	< 0.00001	0.14
50: 502429	0.61	< 0.000003	0.00191	< 0.0005	< 0.0005	< 0.003	0.260	0.006	0.503	2.63	< 0.00001	0.11
51: 502438	0.23	< 0.000003	0.00355	< 0.0005	< 0.0005	< 0.003	0.427	0.048	0.227	0.995	< 0.00001	0.15
52: 502446	0.36	< 0.000003	0.000802	< 0.0005	< 0.0005	< 0.003	0.544	0.018	0.377	0.695	< 0.00001	0.20
53: A00117785	12.6	< 0.000003	0.000160	< 0.0005	0.0006	0.049	2.35	0.005	1.48	0.0068	0.0132	3.08
54: A00117790	0.71	< 0.000003	0.000037	0.0010	< 0.0005	2.49	0.538	0.002	0.410	0.0068	0.00031	1.71
55: A00117794	0.05	0.000007	0.00106	0.0017	0.0034	47.1	0.058	< 0.001	0.020	0.270	0.00161	4.60
56: A00117824	0.07	< 0.000003	0.000364	< 0.0005	< 0.0005	0.039	0.714	0.006	0.071	0.0821	0.00003	2.12
57: A00154858	2.35	0.000023	0.00143	< 0.0005	0.0023	< 0.003	0.771	0.004	1.41	2.35	0.00230	0.25
58: A00154860	2.01	0.000031	0.000964	< 0.0005	0.0024	< 0.003	0.953	0.007	1.28	1.93	0.00267	0.31
60: A00115836	2.64	0.000057	0.00448	< 0.0005	0.0010	< 0.003	1.14	0.006	1.19	4.36	0.00055	0.32
61: A00115842	2.22	0.000132	0.0149	< 0.0005	0.0015	< 0.003	1.44	0.016	1.81	6.53	0.00011	0.59
62: A00154740	0.57	0.000055	0.000271	< 0.0005	< 0.0005	< 0.003	0.609	0.002	0.316	0.412	0.00001	0.65
63: A00154743	0.12	< 0.000003	0.000218	0.0006	0.0007	0.108	0.520	< 0.001	0.101	0.0081	0.00003	5.26
64: A00154747	0.46	< 0.000003	0.000110	< 0.0005	< 0.0005	< 0.003	0.469	< 0.001	0.376	0.104	< 0.00001	0.28
65: A00154749	0.47	< 0.000003	0.000008	< 0.0005	< 0.0005	0.021	0.510	< 0.001	0.389	0.0034	< 0.00001	0.30

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA11232-DEC12**

Sample ID	Ca mg/L	Cd mg/L	Co mg/L	Cr mg/L	Cu mg/L	Fe mg/L	K mg/L	Li mg/L	Mg mg/L	Mn mg/L	Mo mg/L	Na mg/L
66: 492492	12.0	0.000773	0.752	0.0007	0.0569	0.684	2.23	0.013	8.74	27.5	0.00002	0.31
67: 492535	5.50	0.000314	0.243	< 0.0005	0.0148	0.020	2.34	0.008	6.01	10.2	0.00002	0.43
68: 501063	17.6	0.000520	0.106	< 0.0005	0.0511	0.020	2.57	0.016	13.7	30.6	0.00021	0.30
69: 501168	11.7	0.000123	0.0633	< 0.0005	0.0008	0.012	1.01	0.017	25.2	46.8	0.00040	0.29
70: 502209	7.81	0.000107	0.0348	< 0.0005	< 0.0005	0.005	2.89	0.006	8.97	27.2	0.00002	0.38
73: 502449	15.5	0.001587	4.08	0.0358	2.20	2.88	2.57	0.084	13.6	86.4	0.00033	0.43
76: A00117614	0.08	< 0.000003	0.000168	< 0.0005	< 0.0005	0.067	1.89	0.015	0.060	0.0404	< 0.00001	1.61
77: A00117616	0.29	0.000144	0.000766	0.0030	0.0050	38.0	0.192	0.006	0.043	0.139	0.00411	24.8
78: A00117704	0.13	0.000003	0.000169	< 0.0005	< 0.0005	0.327	2.25	0.005	0.128	0.0801	0.00003	1.20
79: A00117745	< 0.02	0.000022	0.000710	0.0008	0.0037	10.4	0.449	0.002	0.008	0.0307	0.00046	3.70
80: A00117828	3.12	0.000024	0.00770	< 0.0005	0.0009	0.046	3.14	0.006	3.18	5.09	< 0.00001	4.37
81: A00154370	23.7	0.000837	0.213	< 0.0005	0.0009	0.144	7.14	0.119	20.7	325	0.00003	0.52
82: A00154372	14.2	0.000272	0.128	< 0.0005	0.0087	0.027	5.03	0.024	11.6	60.6	< 0.00001	0.55
83: A00154404	4.34	0.000388	0.0197	< 0.0005	0.0054	0.016	5.93	0.014	3.33	10.1	< 0.00001	0.76
84: A00154485	6.74	0.000182	0.0598	< 0.0005	0.0009	0.019	9.42	0.017	4.26	23.6	< 0.00001	3.92
85: A00154488	19.8	0.000184	0.0744	< 0.0005	0.0007	0.031	4.04	0.023	31.7	111	0.00001	3.97
86: A00154549	10.4	0.00118	0.257	< 0.0005	0.125	0.211	6.73	0.019	13.0	28.9	< 0.00001	3.81
87: A00154552	7.27	0.000160	0.0345	< 0.0005	0.0016	0.032	1.30	0.048	27.5	71.2	< 0.00001	0.24
88: A00154564	5.02	0.00105	0.139	0.0011	0.0820	0.199	3.75	0.037	1.96	9.87	0.00067	0.64
89: A00154585	1.61	0.000048	0.0234	0.0006	0.0213	0.376	1.84	0.005	0.537	29.0	0.00262	0.24
90: A00154588	0.96	0.000060	0.00443	< 0.0005	0.0016	0.005	5.35	0.013	0.755	2.03	0.00092	0.80
91: A00154590	0.54	0.000057	0.00225	< 0.0005	0.0007	< 0.003	4.91	0.010	0.655	1.19	0.00024	0.62
92: A00154592	1.51	0.000236	0.0176	< 0.0005	0.0078	0.005	1.47	0.033	1.81	3.98	0.00004	0.22
93: A00154594	5.93	0.00110	0.276	0.0007	0.308	0.122	2.89	0.021	7.93	21.9	0.00002	0.37
94: A00154663	13.5	0.00138	0.245	0.0009	0.134	0.084	5.05	0.097	13.6	89.9	< 0.00001	2.79
95: A00154791	13.0	0.0166	0.774	0.0163	2.00	2.33	2.53	0.030	9.14	38.0	0.00003	6.83
96: A00154946	10.4	0.000270	0.0441	< 0.0005	0.0189	0.019	1.50	0.020	22.2	73.3	0.00003	0.32
97: A00154554	2.82	0.000046	0.0550	< 0.0005	0.0112	0.015	1.39	0.015	0.994	35.3	< 0.00001	0.30
98: A00154558	4.03	0.000086	0.00205	< 0.0005	0.0027	< 0.003	1.71	0.009	2.04	0.208	< 0.00001	0.41
99: A00154658	1.34	0.000100	0.00423	< 0.0005	0.0009	< 0.003	3.08	0.019	1.68	5.08	< 0.00001	6.27
100: A00115624	0.60	0.000024	0.00208	< 0.0005	0.0007	< 0.003	0.478	0.002	0.258	6.11	< 0.00001	0.35
101: A00115627	0.79	0.000015	0.00483	< 0.0005	< 0.0005	< 0.003	0.363	0.002	0.292	7.98	< 0.00001	0.27
102: A00115629	0.31	0.000014	0.000926	< 0.0005	< 0.0005	< 0.003	1.70	0.005	0.215	1.76	< 0.00001	0.98
103: A00115631	0.45	0.000010	0.00115	< 0.0005	< 0.0005	< 0.003	0.455	0.006	0.303	3.39	< 0.00001	0.43
104: A00115634	0.27	0.000008	0.000199	< 0.0005	< 0.0005	< 0.003	0.522	0.003	0.239	1.38	< 0.00001	0.14

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA11232-DEC12**

Brian Graham B.Sc.
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Environmental Services, Analytical

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Labec Century Iron Ore Inc
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January-29-13

Date Rec. : 18 December 2012
LR Report: **CA11232-DEC12**
Reference: ML-ARD Assessment-Joyce Lake
PO#P M120008

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Ni mg/L	Pb mg/L	Sb mg/L	Se mg/L	Sn mg/L	Sr mg/L	Ti mg/L	Tl mg/L	U mg/L	V mg/L	W mg/L	Y mg/L	Zn mg/L
3: Analysis Approval Date	28-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13	22-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13	28-Jan-13
4: Analysis Approval Time	10:25	10:25	10:25	10:25	10:25	09:54	10:26	10:26	10:26	10:26	10:26	10:26	10:26
5: 492067	0.0003	0.00003	< 0.0002	< 0.001	0.00004	0.0205	0.0002	< 0.00002	0.000031	0.00006	0.00003	0.000061	< 0.001
6: 492078	0.0001	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0003	< 0.0001	< 0.00002	0.000003	< 0.00003	< 0.00003	0.000004	0.003
7: 492088	< 0.0001	0.00015	< 0.0002	0.002	0.00003	0.0001	0.0005	< 0.00002	0.000008	0.00018	0.00028	0.000013	0.001
8: 492094	0.0004	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0022	< 0.0001	0.00003	0.000002	< 0.00003	< 0.00003	0.000009	< 0.001
9: 492220	0.0147	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0192	< 0.0001	< 0.00002	0.000013	< 0.00003	< 0.00003	0.000068	0.030
10: 492225	0.0079	0.00008	< 0.0002	< 0.001	0.00001	0.0140	< 0.0001	< 0.00002	0.000011	< 0.00003	< 0.00003	0.000012	0.003
11: 492507	0.0006	0.00002	< 0.0002	< 0.001	0.00001	0.0012	< 0.0001	< 0.00002	0.000006	< 0.00003	< 0.00003	0.000001	< 0.001
12: 492518	0.0003	< 0.00002	< 0.0002	< 0.001	0.00007	0.0015	< 0.0001	< 0.00002	0.000006	< 0.00003	< 0.00003	0.000004	< 0.001
13: 492503	0.0004	0.00037	< 0.0002	< 0.001	< 0.00001	0.0004	< 0.0001	< 0.00002	0.000049	< 0.00003	0.00022	0.000071	0.004
14: 501065	0.0005	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0276	< 0.0001	< 0.00002	0.000003	< 0.00003	< 0.00003	0.000002	< 0.001
15: 501070	< 0.0001	0.00004	< 0.0002	0.003	< 0.00001	0.0091	< 0.0001	< 0.00002	0.000002	< 0.00003	< 0.00003	0.000002	< 0.001
16: 502194	0.0002	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0017	< 0.0001	< 0.00002	0.000002	< 0.00003	< 0.00003	0.000003	< 0.001
17: 502197	< 0.0001	< 0.00002	< 0.0002	0.002	< 0.00001	0.0009	< 0.0001	0.00005	0.000002	< 0.00003	< 0.00003	0.000005	< 0.001
18: 502381	< 0.0001	0.00002	< 0.0002	< 0.001	< 0.00001	0.0018	0.0003	< 0.00002	0.000010	0.00011	< 0.00003	0.000079	< 0.001
19: 502385	0.0002	0.00003	< 0.0002	< 0.001	< 0.00001	0.0016	< 0.0001	< 0.00002	0.000002	< 0.00003	< 0.00003	0.000002	0.001
20: 502413	0.0003	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0071	< 0.0001	< 0.00002	0.000002	< 0.00003	< 0.00003	< 0.000001	< 0.001
21: 492098	< 0.0001	< 0.00002	< 0.0002	0.007	0.00001	0.0010	< 0.0001	0.00002	0.000016	0.00006	< 0.00003	0.000396	< 0.001
22: 492100	0.0604	0.00007	< 0.0002	0.019	0.00001	0.0747	0.0006	0.00024	0.000021	< 0.00003	< 0.00003	0.00142	0.099
23: 492197	< 0.0001	< 0.00002	< 0.0002	< 0.001	0.00002	0.0232	< 0.0001	< 0.00002	0.000009	< 0.00003	< 0.00003	0.000012	< 0.001
24: 492204	0.0019	< 0.00002	< 0.0002	< 0.001	0.00001	0.0158	< 0.0001	< 0.00002	0.000002	< 0.00003	< 0.00003	0.000002	0.004

OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA11232-DEC12**

Sample ID	Ni mg/L	Pb mg/L	Sb mg/L	Se mg/L	Sn mg/L	Sr mg/L	Ti mg/L	Tl mg/L	U mg/L	V mg/L	W mg/L	Y mg/L	Zn mg/L
25: 492211	0.0038	< 0.00002	< 0.0002	< 0.001	0.00001	0.0085	< 0.0001	< 0.00002	0.000001	< 0.00003	< 0.00003	0.000004	0.001
26: 492217	0.0049	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0100	< 0.0001	< 0.00002	0.000004	0.00008	< 0.00003	0.000010	0.057
27: 492233	0.0004	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0043	< 0.0001	< 0.00002	0.000005	< 0.00003	< 0.00003	0.000002	< 0.001
28: 492236	0.0001	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0020	< 0.0001	< 0.00002	0.000003	< 0.00003	< 0.00003	< 0.000001	0.001
29: 492465	0.0004	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0023	< 0.0001	< 0.00002	0.000008	< 0.00003	< 0.00003	0.000002	< 0.001
30: 492469	0.0002	< 0.00002	0.0002	< 0.001	< 0.00001	0.0068	< 0.0001	< 0.00002	0.000021	< 0.00003	< 0.00003	0.000013	< 0.001
31: 492451	0.0009	< 0.00002	< 0.0002	< 0.001	0.00063	0.0033	< 0.0001	< 0.00002	0.000002	< 0.00003	< 0.00003	0.000006	< 0.001
32: 492456	0.0001	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0234	< 0.0001	< 0.00002	0.000011	0.00004	< 0.00003	0.000021	< 0.001
33: 492461	0.0019	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0045	< 0.0001	< 0.00002	0.000002	< 0.00003	< 0.00003	0.000001	< 0.001
34: 492489	0.0003	< 0.00002	< 0.0002	< 0.001	0.00002	0.0011	0.0002	< 0.00002	0.000004	0.00005	< 0.00003	0.000011	0.001
35: 501015	0.0005	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0947	0.0002	< 0.00002	0.000007	< 0.00003	0.00004	0.000010	< 0.001
36: 501021	0.0001	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0143	< 0.0001	< 0.00002	0.000003	< 0.00003	< 0.00003	0.000001	< 0.001
37: 501073	0.0020	< 0.00002	< 0.0002	0.002	< 0.00001	0.0036	< 0.0001	< 0.00002	< 0.000001	< 0.00003	< 0.00003	0.000001	< 0.001
38: 501076	0.0831	0.00007	< 0.0002	0.027	< 0.00001	0.107	0.0003	0.00048	0.000091	< 0.00003	< 0.00003	0.00421	0.068
39: 501134	0.0068	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0159	< 0.0001	0.00005	0.000003	< 0.00003	< 0.00003	0.000039	0.001
40: 501139	0.0007	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0177	< 0.0001	< 0.00002	0.000004	< 0.00003	< 0.00003	0.000006	0.001
41: 501143	0.0002	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0139	< 0.0001	< 0.00002	0.000007	< 0.00003	< 0.00003	0.000001	0.002
42: 501161	0.0011	< 0.00002	< 0.0002	< 0.001	0.00004	0.0020	0.0001	0.00002	0.000001	0.00007	0.00007	0.000049	< 0.001
43: 501165	0.0058	< 0.00002	< 0.0002	0.008	< 0.00001	0.0193	< 0.0001	0.00037	< 0.000001	< 0.00003	< 0.00003	0.000009	0.004
44: 502389	< 0.0001	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0029	< 0.0001	0.00004	< 0.000001	< 0.00003	< 0.00003	< 0.000001	< 0.001
45: 502391	0.0010	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0061	< 0.0001	0.00021	< 0.000001	< 0.00003	< 0.00003	0.000001	< 0.001
46: 502393	0.0216	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0110	< 0.0001	0.00002	0.000002	< 0.00003	< 0.00003	0.000003	0.002
47: 502398	0.0006	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0010	< 0.0001	< 0.00002	< 0.000001	< 0.00003	< 0.00003	< 0.000001	< 0.001
48: 502402	< 0.0001	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0014	< 0.0001	< 0.00002	< 0.000001	< 0.00003	< 0.00003	0.000001	< 0.001
49: 502408	0.0004	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0010	< 0.0001	< 0.00002	0.000003	< 0.00003	< 0.00003	< 0.000001	< 0.001
50: 502429	0.0126	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0042	< 0.0001	< 0.00002	0.000004	< 0.00003	< 0.00003	0.000004	< 0.001
51: 502438	0.0027	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0076	< 0.0001	< 0.00002	0.000007	< 0.00003	< 0.00003	0.000014	0.001
52: 502446	0.0004	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0087	< 0.0001	< 0.00002	< 0.000001	< 0.00003	< 0.00003	< 0.000001	< 0.001
53: A00117785	0.0002	< 0.00002	0.0002	< 0.001	< 0.00001	0.0639	0.0001	< 0.00002	0.000585	0.00008	0.0124	0.000007	< 0.001
54: A00117790	0.0001	< 0.00002	0.0002	< 0.001	0.00001	0.0032	0.0002	< 0.00002	0.000019	0.00018	0.00038	0.000042	< 0.001
55: A00117794	< 0.0001	0.00026	0.0004	0.001	< 0.00001	0.0022	0.0044	< 0.00002	0.000232	0.00350	0.00168	0.000360	0.002
56: A00117824	0.0006	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0003	< 0.0001	< 0.00002	< 0.000001	< 0.00003	0.00004	0.000009	< 0.001
57: A00154858	0.0032	0.00004	< 0.0002	< 0.001	0.00002	0.0268	< 0.0001	< 0.00002	0.000009	0.00003	< 0.00003	0.000016	0.008
58: A00154860	0.0025	0.00003	< 0.0002	< 0.001	0.00002	0.0203	< 0.0001	0.00002	0.000015	< 0.00003	< 0.00003	0.000050	0.008
60: A00115836	0.0062	< 0.00002	< 0.0002	< 0.001	0.00004	0.0230	< 0.0001	0.00004	0.000001	0.00004	< 0.00003	0.000012	0.004
61: A00115842	0.0211	< 0.00002	< 0.0002	0.045	< 0.00001	0.0208	< 0.0001	0.00050	0.000001	< 0.00003	< 0.00003	0.000039	0.008
62: A00154740	0.0018	< 0.00002	< 0.0002	< 0.001	0.00004	0.0135	< 0.0001	0.00003	0.000004	< 0.00003	< 0.00003	0.000001	0.002
63: A00154743	0.0007	0.00002	< 0.0002	< 0.001	< 0.00001	0.0016	0.0020	0.00004	0.000006	0.00010	0.00006	0.000038	< 0.001
64: A00154747	0.0004	< 0.00002	< 0.0002	< 0.001	0.00004	0.0050	< 0.0001	< 0.00002	< 0.000001	0.00004	< 0.00003	0.000001	0.002
65: A00154749	< 0.0001	< 0.00002	< 0.0002	< 0.001	0.00004	0.0031	< 0.0001	< 0.00002	< 0.000001	< 0.00003	< 0.00003	0.000002	0.002

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LR Report : **CA11232-DEC12**

Sample ID	Ni mg/L	Pb mg/L	Sb mg/L	Se mg/L	Sn mg/L	Sr mg/L	Ti mg/L	Tl mg/L	U mg/L	V mg/L	W mg/L	Y mg/L	Zn mg/L
66: 492492	0.198	0.00053	< 0.0002	0.062	< 0.00001	0.158	0.0004	0.00025	0.000734	< 0.00003	0.00003	0.0127	0.154
67: 492535	0.198	0.00012	< 0.0002	0.166	< 0.00001	0.0499	0.0002	0.00081	0.000130	< 0.00003	< 0.00003	0.00175	0.032
68: 501063	0.0937	< 0.00002	< 0.0002	0.042	0.00005	0.0921	0.0005	0.00023	0.000065	< 0.00003	< 0.00003	0.00234	0.080
69: 501168	0.0385	< 0.00002	< 0.0002	0.016	< 0.00001	0.0344	0.0001	0.00026	0.000025	< 0.00003	< 0.00003	0.000058	0.006
70: 502209	0.0263	< 0.00002	< 0.0002	0.018	< 0.00001	0.0686	0.0002	0.00016	0.000008	< 0.00003	< 0.00003	0.000042	0.004
73: 502449	2.66	0.920	< 0.0002	1.95	< 0.00001	0.109	0.0006	0.00013	0.006425	0.00005	0.00005	0.160	0.239
76: A00117614	0.0007	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0014	0.0002	< 0.00002	0.000003	0.00007	< 0.00003	0.000010	< 0.001
77: A00117616	0.0027	0.00094	< 0.0002	0.024	0.00013	0.0138	0.0526	< 0.00002	0.000778	0.0490	0.00041	0.00532	0.010
78: A00117704	0.0002	0.00004	< 0.0002	0.004	< 0.00001	0.0003	0.0003	0.00002	0.000006	0.00009	< 0.00003	0.000062	0.005
79: A00117745	0.0038	0.00028	0.0021	0.022	0.00002	0.0005	0.0053	< 0.00002	0.000030	0.00269	0.00029	0.000340	0.002
80: A00117828	0.0076	0.00024	< 0.0002	0.015	< 0.00001	0.0129	0.0002	0.00010	< 0.000001	< 0.00003	< 0.00003	0.000035	0.003
81: A00154370	0.146	< 0.00002	< 0.0002	0.015	< 0.00001	0.0940	0.0004	0.00003	0.000014	0.00007	< 0.00003	0.000704	0.049
82: A00154372	0.0858	< 0.00002	< 0.0002	0.009	< 0.00001	0.0830	0.0002	< 0.00002	0.000015	< 0.00003	< 0.00003	0.00111	0.049
83: A00154404	0.0216	< 0.00002	< 0.0002	0.023	0.00004	0.0659	0.0001	0.00074	0.000007	< 0.00003	< 0.00003	0.000261	0.035
84: A00154485	0.0396	< 0.00002	< 0.0002	0.006	0.00002	0.0614	0.0001	0.00005	0.000004	< 0.00003	< 0.00003	0.000376	0.015
85: A00154488	0.0331	< 0.00002	< 0.0002	0.005	0.00002	0.0506	< 0.0001	0.00009	0.000008	0.00005	< 0.00003	0.000106	0.011
86: A00154549	0.177	0.00013	< 0.0002	0.003	0.00002	0.0505	0.0003	0.00259	0.000277	< 0.00003	< 0.00003	0.0221	0.186
87: A00154552	0.0300	< 0.00002	< 0.0002	0.006	0.00001	0.0349	0.0002	0.00024	0.000009	0.00015	< 0.00003	0.000299	0.006
88: A00154564	0.111	0.00032	< 0.0002	0.011	< 0.00001	0.0964	0.0001	0.00072	0.000685	< 0.00003	< 0.00003	0.0538	0.178
89: A00154585	0.0139	0.00003	< 0.0002	< 0.001	0.00003	0.0251	0.0002	< 0.00002	0.000104	0.00022	< 0.00003	0.00374	0.017
90: A00154588	0.0069	< 0.00002	< 0.0002	< 0.001	0.00013	0.0192	< 0.0001	0.00029	0.000013	< 0.00003	< 0.00003	0.000236	0.018
91: A00154590	0.0047	< 0.00002	< 0.0002	0.005	0.00011	0.0174	< 0.0001	0.00055	0.000005	< 0.00003	< 0.00003	0.000068	0.006
92: A00154592	0.0474	< 0.00002	< 0.0002	0.008	< 0.00001	0.0371	< 0.0001	0.00037	0.000029	< 0.00003	< 0.00003	0.00105	0.029
93: A00154594	0.209	0.00016	< 0.0002	0.003	0.00004	0.0379	0.0002	0.00143	0.000849	< 0.00003	< 0.00003	0.0597	0.179
94: A00154663	0.151	0.00027	< 0.0002	0.006	< 0.00001	0.0871	0.0003	0.00056	0.00534	< 0.00003	< 0.00003	0.0580	0.136
95: A00154791	0.430	0.00015	< 0.0002	0.063	0.00004	0.224	0.0001	0.00247	0.00184	< 0.00003	< 0.00003	0.109	0.514
96: A00154946	0.0319	< 0.00002	< 0.0002	0.004	0.00001	0.0759	< 0.0001	0.00009	0.000052	0.00006	< 0.00003	0.00127	0.008
97: A00154554	0.0067	< 0.00002	< 0.0002	< 0.001	0.00005	0.0514	< 0.0001	< 0.00002	0.000022	0.00015	< 0.00003	0.000538	0.006
98: A00154558	0.0048	0.00002	< 0.0002	< 0.001	0.00013	0.0244	< 0.0001	0.00024	0.000029	0.00007	< 0.00003	0.000240	0.007
99: A00154658	0.0055	< 0.00002	< 0.0002	0.002	0.00001	0.0153	< 0.0001	0.00059	0.000022	0.00006	< 0.00003	0.000069	0.004
100: A00115624	0.0118	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0155	< 0.0001	< 0.00002	0.000014	< 0.00003	< 0.00003	0.000093	0.013
101: A00115627	0.0085	< 0.00002	< 0.0002	< 0.001	0.00002	0.0158	< 0.0001	< 0.00002	0.000007	< 0.00003	< 0.00003	0.000055	0.011
102: A00115629	0.0046	< 0.00002	< 0.0002	< 0.001	< 0.00001	0.0095	< 0.0001	0.00013	0.000009	< 0.00003	< 0.00003	0.000029	0.002
103: A00115631	0.0061	< 0.00002	< 0.0002	< 0.001	0.00004	0.0110	< 0.0001	< 0.00002	0.000015	< 0.00003	< 0.00003	0.000043	0.005
104: A00115634	0.0035	< 0.00002	< 0.0002	< 0.001	0.00004	0.0080	< 0.0001	< 0.00002	0.000025	< 0.00003	< 0.00003	0.000056	0.003

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA11232-DEC12**

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Modified ABA

November-22-12

Labec Century Iron Ore Inc
Attn : Ricky Chan

170 University Avenue,Suite 602
Toronto, ON
M5H 3B3, Canada

Phone: 416-977-3188 Ex 105
Fax:416-977-8002

Date Rec. : 02 November 2012
LR Report: **CA10129-NOV12**
Reference: ML-ARD Assessment-Joyce Lake

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
3: Analysis Approval Date		22-Nov-12	22-Nov-12	22-Nov-12	22-Nov-12	22-Nov-12	22-Nov-12	22-Nov-12	22-Nov-12
4: Analysis Approval Time		08:33	08:33	08:33	08:33	08:33	08:33	08:33	08:33
5: A00115844	11-Aug-12	6.68	1	2.04	20.00	0.10	0.10	18.25	1.36
6: A00154082	11-Aug-12	5.41	1	2.06	20.00	0.10	0.10	18.82	0.97
7: A00154201	11-Aug-12	6.05	1	2.00	20.00	0.10	0.10	18.68	1.13
8: A00154202	11-Aug-12	5.51	1	2.09	20.00	0.10	0.10	18.73	0.99
9: A00154256	11-Aug-12	7.16	1	2.01	20.00	0.10	0.10	18.35	0.97
10: A00154280	11-Aug-12	7.03	1	2.07	20.00	0.10	0.10	16.86	1.26
11: A00154303	11-Aug-12	7.08	1	2.00	20.00	0.10	0.10	17.83	1.17
12: A00154330	11-Aug-12	5.48	1	1.99	20.00	0.10	0.10	18.79	1.14
13: A00154331	11-Aug-12	7.86	1	2.01	20.00	0.10	0.10	15.21	1.78
14: A00154410	11-Aug-12	4.90	1	2.04	20.00	0.10	0.10	19.28	1.32
15: A00154454	11-Aug-12	6.91	1	2.02	20.00	0.10	0.10	16.77	1.50
16: A00154455	11-Aug-12	6.77	1	1.99	20.00	0.10	0.10	18.25	1.21
17: A00154628	11-Aug-12	6.12	1	2.11	20.00	0.10	0.10	19.44	1.05
18: A00154705	11-Aug-12	6.01	1	2.02	20.00	0.10	0.10	18.98	1.07
19: A00154706	11-Aug-12	6.56	1	2.06	20.00	0.10	0.10	18.66	1.06
20: A00154736	11-Aug-12	6.82	1	2.00	20.00	0.10	0.10	18.76	1.17
21: A00154792	11-Aug-12	6.79	1	2.14	20.00	0.10	0.10	18.68	0.96

OnLine LIMS

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Modified ABA

LR Report : **CA10129-NOV12**

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
22: A00154793	11-Aug-12	5.76	1	2.13	20.00	0.10	0.10	18.61	1.05
23: A00115554	11-Aug-12	7.12	1	2.00	20.00	0.10	0.10	18.43	1.16
24: A00115555	11-Aug-12	5.89	1	1.99	20.00	0.10	0.10	18.66	1.00
25: A00154888	11-Aug-12	5.54	1	2.07	20.00	0.10	0.10	18.62	0.97
26: A00154947	11-Aug-12	6.31	1	2.00	20.00	0.10	0.10	16.41	1.28
27: A00115823	11-Aug-12	7.45	1	2.08	20.00	0.10	0.10	17.79	1.45

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N\ NaOH \times NaOH\ added)}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.01 will be calculated using a 0.01 value.

Sulphur analysis performed following BC ARD Guidelines (Price 1997)

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

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Modified ABA

November-22-12

Labec Century Iron Ore Inc
Attn : Ricky Chan

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Toronto, ON
M5H 3B3, Canada

Phone: 416-977-3188 Ex 105
Fax:416-977-8002

Date Rec. : 02 November 2012
LR Report: **CA10129-NOV12**
Reference: ML-ARD Assessment-Joyce Lake

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
3: Analysis Approval Date	22-Nov-12	---	---	---	08-Nov-12	---	08-Nov-12	08-Nov-12	08-Nov-12
4: Analysis Approval Time	08:33	---	---	---	14:26	---	14:26	14:25	14:25
5: A00115844	4.3	0.31	3.99	13.9	0.035	0.02	0.01	1.16	0.095
6: A00154082	2.9	0.31	2.59	9.35	< 0.005	< 0.01	< 0.01	0.060	0.053
7: A00154201	3.3	0.31	2.99	10.65	0.015	< 0.01	0.01	0.309	0.051
8: A00154202	3.0	0.31	2.69	9.68	0.017	0.02	< 0.01	0.098	0.036
9: A00154256	4.1	0.31	3.79	13.2	0.013	0.01	< 0.01	0.125	0.087
10: A00154280	7.6	0.31	7.29	24.5	0.026	0.03	< 0.01	0.440	0.080
11: A00154303	5.4	0.31	5.09	17.4	0.027	0.03	< 0.01	0.389	0.055
12: A00154330	3.0	3.08	-0.08	0.98	0.159	0.06	0.10	6.76	0.134
13: A00154331	12	2.81	9.09	4.23	0.121	0.03	0.09	0.874	0.295
14: A00154410	1.8	0.31	1.49	5.81	0.054	0.05	< 0.01	30.2	0.116
15: A00154454	8.0	0.87	7.13	9.18	0.024	< 0.01	0.03	0.763	0.068
16: A00154455	4.4	0.31	4.09	14.2	0.037	0.04	< 0.01	0.374	0.044
17: A00154628	1.3	0.31	0.99	4.19	0.006	< 0.01	< 0.01	0.074	0.103
18: A00154705	2.5	0.31	2.19	8.06	0.010	< 0.01	< 0.01	0.041	0.039
19: A00154706	3.3	0.31	2.99	10.6	0.010	< 0.01	< 0.01	0.049	0.026
20: A00154736	3.1	0.31	2.79	10.0	0.007	< 0.01	< 0.01	0.259	0.197
21: A00154792	3.1	0.31	2.79	10.0	< 0.005	< 0.01	< 0.01	0.095	0.014

OnLine LIMS

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Modified ABA

LR Report : **CA10129-NOV12**

Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
22: A00154793	3.3	0.31	2.99	10.6	< 0.005	< 0.01	< 0.01	0.058	0.030
23: A00115554	3.9	0.31	3.59	12.6	0.028	0.03	< 0.01	0.100	0.080
24: A00115555	3.4	0.31	3.09	11.0	0.006	< 0.01	< 0.01	0.019	0.139
25: A00154888	3.3	0.31	2.99	10.6	0.007	< 0.01	< 0.01	0.206	0.023
26: A00154947	9.0	0.71	8.29	12.7	0.043	0.02	0.02	0.442	0.048
27: A00115823	5.3	0.31	4.99	17.1	0.016	< 0.01	< 0.01	0.361	0.100

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N \text{ NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.01 will be calculated using a 0.01 value.

Sulphur analysis performed following BC ARD Guidelines (Price 1997)

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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February-01-13

Labec Century Iron Ore Inc
Attn : Ricky Chan

170 University Avenue,Suite 602, Toronto
Canada, M5H 3B3
Phone: 416-977-3188 Ex 105, Fax:416-977-8002

Date Rec. : 17 January 2013
LR Report: **CA14483-JAN13**
Reference: Re-assays ML-ARD Assessment-Joyce Lake

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: A00154330	6: A00154454
Sample Date & Time			11-Aug-12	11-Aug-12
Sample weight [g]	22-Jan-13	09:56	130	150
Volume D.I. Water [mL]	22-Jan-13	09:56	390	450
Initial pH [units]	22-Jan-13	09:56	5.18	6.80
Final pH [units]	22-Jan-13	09:56	5.32	7.15
Mercury [mg/L]	25-Jan-13	08:53	0.00002	< 0.00001
Silver [mg/L]	25-Jan-13	14:33	0.0002	0.0001
Aluminum [mg/L]	24-Jan-13	16:02	4.23	0.35
Arsenic [mg/L]	25-Jan-13	14:33	0.003	0.003
Barium [mg/L]	25-Jan-13	14:33	0.0238	0.0023
Boron [mg/L]	25-Jan-13	14:33	0.394	0.052
Beryllium [mg/L]	25-Jan-13	14:33	0.0005	< 0.0002
Bismuth [mg/L]	25-Jan-13	14:33	< 0.0001	< 0.0001
Calcium [mg/L]	24-Jan-13	16:02	9.89	1.98
Cadmium [mg/L]	25-Jan-13	14:33	0.00042	0.00005
Cobalt [mg/L]	25-Jan-13	14:33	0.0064	0.0013
Chromium [mg/L]	25-Jan-13	14:33	0.008	< 0.005
Copper [mg/L]	25-Jan-13	14:33	0.015	0.021
Iron [mg/L]	24-Jan-13	16:02	21.3	29.8
Potassium [mg/L]	24-Jan-13	16:02	4.17	0.344
Lithium [mg/L]	25-Jan-13	14:33	0.015	0.045
Magnesium [mg/L]	24-Jan-13	16:02	6.97	0.454
Manganese [mg/L]	25-Jan-13	14:33	7.60	0.109
Manganese [mg/L]	24-Jan-13	16:02	7.57	0.336
Molybdenum [mg/L]	25-Jan-13	14:33	0.0006	0.0019
Sodium [mg/L]	24-Jan-13	16:02	42.4	19.6

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LR Report : **CA14483-JAN13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: A00154330	6: A00154454
Nickel [mg/L]	25-Jan-13	14:33	0.014	0.008
Lead [mg/L]	25-Jan-13	14:33	0.0085	0.0093
Antimony [mg/L]	25-Jan-13	14:33	< 0.002	< 0.002
Selenium [mg/L]	25-Jan-13	14:33	< 0.01	< 0.01
Tin [mg/L]	25-Jan-13	14:33	0.0002	< 0.0001
Strontium [mg/L]	24-Jan-13	16:02	0.0338	0.0049
Titanium [mg/L]	25-Jan-13	14:33	0.042	0.003
Thallium [mg/L]	25-Jan-13	14:33	< 0.0002	< 0.0002
Uranium [mg/L]	25-Jan-13	14:33	0.00227	0.00027
Vanadium [mg/L]	25-Jan-13	14:33	0.0081	0.0018
Tungsten [mg/L]	25-Jan-13	14:33	0.0005	0.0030
Yttrium [mg/L]	25-Jan-13	14:33	0.00101	0.00034
Zinc [mg/L]	25-Jan-13	14:33	0.01	< 0.01

Reassay - original results under CA10131-NOV12

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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February-01-13

Labec Century Iron Ore Inc
Attn : Ricky Chan

170 University Avenue,Suite 602, Toronto
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Phone: 416-977-3188 Ex 105, Fax:416-977-8002

Date Rec. : 17 January 2013
LR Report: **CA14484-JAN13**
Reference: Re-assays ML-ARD Assessment-Joyce Lake

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: A00154330	6: A00154410
Sample Date & Time			11-Aug-12	11-Aug-12
Sulphur (total) [%]	25-Jan-13	15:27	0.133	---
Carbon (total) [%]	25-Jan-13	15:27	---	31.3
Carbonate [%]	25-Jan-13	15:22	---	0.120

Reassay - original results under CA10129-NOV12

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OnLine LIMS

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November-16-12

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Date Rec. : 02 November 2012
LR Report: **CA10130-NOV12**
Reference: ML-ARD Assessment-Joyce Lake

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: A00154201	6: A00154202	7: A00154330	8: A00154331	9: A00154454	10: A00154455	11: A00154705	12: A00154706	13: A00154792	14: A00154793	15: A00115554	16: A00115555
Sample Date & Time			11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12
Silver [µg/g]	12-Nov-12	12:18	0.23	0.03	0.35	0.48	0.37	0.27	0.03	< 0.01	0.13	< 0.01	0.16	< 0.01
Aluminum [µg/g]	15-Nov-12	16:08	18000	2600	17000	47000	56000	26000	7500	5300	3700	3900	3400	1200
Arsenic [µg/g]	12-Nov-12	12:18	12	11	13	11	14	24	22	12	20	30	22	21
Barium [µg/g]	12-Nov-12	12:18	220	31	160	390	470	210	340	230	31	22	28	14
Beryllium [µg/g]	12-Nov-12	12:18	1.9	2.6	1.2	1.5	1.6	1.5	1.1	1.3	1.2	1.6	0.94	1.0
Bismuth [µg/g]	12-Nov-12	12:18	< 0.09	< 0.09	< 0.09	0.10	0.13	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Calcium [µg/g]	15-Nov-12	16:08	650	98	1700	5000	3000	3000	190	310	190	31	230	53
Cadmium [µg/g]	12-Nov-12	12:18	0.23	0.03	0.55	0.72	0.73	0.42	0.08	0.02	< 0.02	< 0.02	< 0.02	< 0.02
Cobalt [µg/g]	12-Nov-12	12:18	10	4.2	6.4	10	12	7.9	7.7	5.4	2.9	5.5	8.1	13
Chromium [µg/g]	12-Nov-12	12:18	53	50	64	86	120	78	120	150	130	140	140	190
Copper [µg/g]	12-Nov-12	12:18	16	8.5	21	31	76	34	11	14	11	17	1400	3.9
Iron [µg/g]	15-Nov-12	16:08	310000	400000	340000	150000	110000	330000	370000	340000	270000	350000	180000	190000
Potassium [µg/g]	15-Nov-12	16:08	5300	230	6500	21000	25000	10000	1000	1400	830	160	1300	110
Lithium [µg/g]	12-Nov-12	12:18	14	< 2	9	24	28	12	3	3	3	2	3	< 2
Magnesium [µg/g]	15-Nov-12	16:09	1700	62	2600	8900	9200	3900	350	510	360	110	570	81
Manganese [µg/g]	12-Nov-12	12:18	17000	1200	3000	1400	1300	1100	2800	1600	460	500	1100	550
Molybdenum [µg/g]	12-Nov-12	12:18	5.8	7.7	3.4	3.7	10	4.9	4.7	4.2	2.1	4.5	4.3	2.7
Sodium [µg/g]	15-Nov-12	16:09	1200	24	1700	5800	7300	4100	230	320	180	38	260	19
Nickel [µg/g]	12-Nov-12	12:19	12	16	16	29	37	20	15	9.5	5.4	7.5	16	11
Phosphorus [µg/g]	15-Nov-12	16:09	500	690	440	430	500	320	340	170	37	48	100	74
Lead [µg/g]	12-Nov-12	12:19	7.5	5.1	7.2	11	12	6.9	3.6	2.6	3.9	3.1	1.7	1.5
Antimony [µg/g]	12-Nov-12	12:19	1.0	< 0.8	0.8	1.6	2.0	1.4	0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8

OnLine LIMS

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LR Report : **CA10130-NOV12**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: A00154201	6: A00154202	7: A00154330	8: A00154331	9: A00154454	10: A00154455	11: A00154705	12: A00154706	13: A00154792	14: A00154793	15: A00115554	16: A00115555
Selenium [µg/g]	12-Nov-12	12:19	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	12-Nov-12	12:19	0.9	0.8	0.8	1.5	1.8	1.7	0.9	0.9	1.5	0.8	0.9	0.6
Strontium [µg/g]	12-Nov-12	12:19	83	20	80	70	69	61	310	130	16	15	15	51
Titanium [µg/g]	12-Nov-12	12:19	1100	300	780	2000	2300	1100	650	420	300	510	150	90
Thallium [µg/g]	12-Nov-12	12:19	0.21	0.07	0.15	0.43	0.52	0.22	0.10	0.07	0.02	< 0.02	0.03	< 0.02
Uranium [µg/g]	12-Nov-12	12:19	3.9	2.0	2.1	3.1	3.8	2.7	2.2	2.1	0.76	0.95	1.5	0.99
Vanadium [µg/g]	12-Nov-12	12:19	240	160	89	110	110	81	63	39	20	27	31	27
Yttrium [µg/g]	12-Nov-12	12:19	13	18	14	14	16	24	4.6	4.2	3.9	3.9	3.7	12
Zinc [µg/g]	12-Nov-12	12:19	23	15	35	76	88	57	6.2	5.6	6.9	11	14	2.0

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OnLine LIMS

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

November-16-12

Labec Century Iron Ore Inc
Attn : Ricky Chan

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Toronto, ON
M5H 3B3, Canada

Phone: 416-977-3188 Ex 105
Fax:416-977-8002

Date Rec. : 02 November 2012
LR Report: **CA10131-NOV12**
Reference: ML-ARD Assessment-Joyce Lake

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: A00154201	6: A00154202	7: A00154330	8: A00154331	9: A00154454	10: A00154455	11: A00154705	12: A00154706	13: A00154792	14: A00154793	15: A00115554	16: A00115555
Sample Date & Time			11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12	11-Aug-12
Sample weight [g]	09-Nov-12	13:01	250	250	250	250	250	250	250	250	215	250	250	250
Volume D.I. Water [mL]	09-Nov-12	13:01	750	750	750	750	750	750	750	750	645	750	750	750
Initial pH [units]	09-Nov-12	13:01	5.6	5.2	5.4	7.3	5.8	5.8	5.4	5.6	5.5	5.4	6.8	6.1
Final pH [units]	09-Nov-12	13:01	5.94	5.78	5.35	7.25	6.21	6.03	5.68	6.14	6.28	5.90	7.32	6.56
Mercury [mg/L]	13-Nov-12	15:49	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Silver [mg/L]	14-Nov-12	13:39	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00059	0.00018	0.00035	0.00012
Aluminum [mg/L]	14-Nov-12	09:35	< 0.01	< 0.01	1.76	0.63	0.02	0.02	0.01	< 0.01	0.02	0.02	0.12	0.03
Arsenic [mg/L]	14-Nov-12	13:39	< 0.0002	0.0003	< 0.0002	0.0021	0.0007	0.0003	< 0.0002	< 0.0002	0.0007	0.0018	0.0007	< 0.0002
Barium [mg/L]	14-Nov-12	13:39	0.00719	0.00575	0.0196	0.00845	0.0187	0.0281	0.00079	0.00178	0.00105	0.00620	0.00222	0.00058
Boron [mg/L]	14-Nov-12	13:39	0.304	0.314	0.846	0.533	0.301	0.241	0.176	0.161	0.107	0.104	0.249	0.0742
Beryllium [mg/L]	14-Nov-12	13:39	< 0.00002	< 0.00002	0.00031	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Bismuth [mg/L]	14-Nov-12	13:39	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	14-Nov-12	09:35	10.5	5.35	9.13	8.27	28.7	21.7	1.33	1.64	1.26	1.27	1.01	1.06
Cadmium [mg/L]	14-Nov-12	13:39	0.000094	0.000039	0.000220	0.000029	0.000652	0.000761	< 0.000003	< 0.000003	< 0.000003	0.000010	0.000028	< 0.000003
Cobalt [mg/L]	14-Nov-12	13:39	0.0136	0.00493	0.007385	0.000331	0.00807	0.00589	0.000192	0.003285	0.000339	0.00241	0.000779	0.000293
Chromium [mg/L]	14-Nov-12	13:39	0.0007	< 0.0005	0.0058	0.0020	0.0009	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	14-Nov-12	13:39	0.0065	0.0048	0.0908	0.0112	0.0209	0.0074	0.0044	0.0043	0.0040	0.0043	0.0688	0.0046
Iron [mg/L]	14-Nov-12	09:35	0.005	< 0.003	8.55	0.959	0.016	0.011	0.006	< 0.003	0.009	< 0.003	5.34	0.258
Potassium [mg/L]	14-Nov-12	09:35	6.66	1.89	4.68	8.18	9.70	6.83	1.27	2.41	0.782	0.513	0.628	0.240
Lithium [mg/L]	14-Nov-12	13:39	0.006	0.003	0.015	0.012	0.017	0.037	0.010	0.005	0.002	0.002	0.053	0.004
Magnesium [mg/L]	14-Nov-12	09:35	6.36	2.25	5.86	4.24	13.2	11.4	0.571	0.856	0.511	0.644	0.412	0.457
Manganese [mg/L]	15-Nov-12	11:07	---	---	9.37	0.150	---	---	0.0720	0.305	0.747	1.40	0.151	0.0329

OnLine LIMS

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA10131-NOV12**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: A00154201	6: A00154202	7: A00154330	8: A00154331	9: A00154454	10: A00154455	11: A00154705	12: A00154706	13: A00154792	14: A00154793	15: A00115554	16: A00115555
Manganese [mg/L]	15-Nov-12	11:07	28.4	10.2	---	---	7.78	6.38	---	---	---	---	---	---
Molybdenum [mg/L]	14-Nov-12	13:40	0.00040	0.00003	0.00028	0.00980	0.00181	0.00024	0.00002	0.00002	0.00003	0.00001	0.00457	0.00003
Sodium [mg/L]	14-Nov-12	09:36	12.3	8.25	18.3	25.4	15.1	13.0	7.23	8.00	8.70	6.53	13.4	9.94
Nickel [mg/L]	14-Nov-12	13:40	0.0114	0.0046	0.0204	0.0020	0.0377	0.0281	0.0044	0.0026	0.0025	0.0064	0.0072	0.0047
Lead [mg/L]	14-Nov-12	13:40	< 0.00002	< 0.00002	0.00102	0.00027	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	0.00008	0.00037	0.00004
Antimony [mg/L]	14-Nov-12	13:40	< 0.0002	< 0.0002	< 0.0002	0.0011	0.0012	0.0004	< 0.0002	0.0002	0.0005	< 0.0002	< 0.0002	0.0002
Selenium [mg/L]	14-Nov-12	13:40	< 0.001	< 0.001	0.005	0.007	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001
Tin [mg/L]	14-Nov-12	13:40	0.00005	0.00002	0.00009	0.00003	0.00008	0.00006	0.00003	0.00001	< 0.00001	0.00037	0.00090	0.00003
Strontium [mg/L]	14-Nov-12	09:36	0.102	0.0573	0.0275	0.0200	0.122	0.0944	0.0121	0.0306	0.0091	0.0195	0.0029	0.0077
Titanium [mg/L]	14-Nov-12	13:40	0.0002	< 0.0001	0.0226	0.0096	0.0004	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0035	0.0003
Thallium [mg/L]	14-Nov-12	13:40	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	14-Nov-12	13:40	0.000015	0.000006	0.00193	0.000372	0.000050	0.000013	0.000002	0.000002	0.000005	0.000001	0.000327	0.000012
Vanadium [mg/L]	14-Nov-12	13:40	0.00008	0.00005	0.00381	0.00245	0.00076	0.00022	0.00008	0.00005	0.00007	< 0.00003	0.00155	0.00007
Tungsten [mg/L]	14-Nov-12	13:40	< 0.00003	< 0.00003	0.00033	0.00007	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	0.00512	< 0.00003
Yttrium [mg/L]	14-Nov-12	13:40	0.000073	0.000002	0.000544	0.000212	0.000263	0.000038	0.000004	0.000004	0.000008	0.000010	0.000259	0.000018
Zinc [mg/L]	14-Nov-12	13:40	0.004	0.002	0.051	0.004	0.003	0.004	< 0.001	< 0.001	< 0.001	0.003	0.033	< 0.001

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OnLine LIMS

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Modified ABA

January-09-13

Labec Century Iron Ore Inc
Attn : Ricky Chan

170 University Avenue,Suite 602, Toronto
Canada, M5H 3B3
Phone: 416-977-3188 Ex 105, Fax:416-977-8002

Date Rec. : 18 December 2012
LR Report: **CA11227-DEC12**
Reference: ML-ARD Assessment - Joyce Lake
PO#P M120008

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
3: Analysis Approval Date		07-Jan-13	07-Jan-13	07-Jan-13		07-Jan-13	07-Jan-13	07-Jan-13	07-Jan-13
4: Analysis Approval Time		15:39	15:39	15:39		15:39	15:39	15:39	15:39
5: OV-1	25-Oct-12 08:30-11:30	7.37	1	1.96	20.00	0.10	0.10	17.76	1.21
6: OV-2	25-Oct-12 08:30-11:30	6.52	1	2.05	20.00	0.10	0.10	18.17	1.19
7: OV-3	25-Oct-12 08:30-11:30	5.53	1	1.97	20.00	0.10	0.10	18.66	1.10
8: OV-4	25-Oct-12 08:30-11:30	5.36	1	1.99	20.00	0.10	0.10	17.99	1.20
9: OV-5	25-Oct-12 08:30-11:30	5.43	1	1.97	20.00	0.10	0.10	17.67	1.16
10: OV-7	25-Oct-12 08:30-11:30	5.09	1	2.01	20.00	0.10	0.10	18.92	1.21
11: OV-8	25-Oct-12 08:30-11:30	5.30	1	2.03	20.00	0.10	0.10	18.81	1.22
12: OV-9	25-Oct-12 08:30-11:30	5.30	1	1.99	20.00	0.10	0.10	19.46	1.19
13: OV-10	25-Oct-12 08:30-11:30	5.15	1	2.07	20.00	0.10	0.10	19.14	1.13
14: OV-11	25-Oct-12 08:30-11:30	5.43	1	1.99	20.00	0.10	0.10	19.63	1.20
15: OV-12	25-Oct-12 08:30-11:30	5.02	1	2.02	20.00	0.10	0.10	20.49	1.26
16: OV-13	25-Oct-12 08:30-11:30	5.47	1	2.01	20.00	0.10	0.10	20.00	1.28
17: OV-14	25-Oct-12 08:30-11:30	5.37	1	1.99	20.00	0.10	0.10	18.50	1.20
18: OV-21	25-Oct-12 08:30-11:30	5.30	1	1.98	20.00	0.10	0.10	19.13	1.19
19: OV-22	25-Oct-12 08:30-11:30	5.27	1	2.04	20.00	0.10	0.10	19.44	1.19
20: OV-23	25-Oct-12 08:30-11:30	5.40	1	2.02	20.00	0.10	0.10	19.12	1.21
21: OV-24	25-Oct-12 08:30-11:30	5.65	1	2.04	20.00	0.10	0.10	19.00	1.26

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LR Report : **CA11227-DEC12**

Sample ID	Sample Date & Time	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=8.3 mL	Final pH units
22: OV-25	25-Oct-12 08:30-11:30	5.14	1	2.00	20.00	0.10	0.10	19.62	1.15
23: OV-20	Date:N/A	5.23	1	1.98	20.00	0.10	0.10	19.00	1.20
24: J-11-31 132.5-133.5	Date:N/A	6.51	4	2.06	106.90	0.10	0.10	74.77	1.90

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Modified ABA

January-09-13

Labec Century Iron Ore Inc
Attn : Ricky Chan

170 University Avenue,Suite 602, Toronto
Canada, M5H 3B3
Phone: 416-977-3188 Ex 105, Fax:416-977-8002

Date Rec. : 18 December 2012
LR Report: **CA11227-DEC12**
Reference: ML-ARD Assessment - Joyce Lake
PO#P M120008

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
3: Analysis Approval Date	07-Jan-13	---	---	---	27-Dec-12	---	02-Jan-13	27-Dec-12	27-Dec-12
4: Analysis Approval Time	15:39	---	---	---	13:18	---	13:22	13:18	13:16
5: OV-1	5.7	0.31	5.39	18.4	0.013	0.01	< 0.01	0.609	0.040
6: OV-2	4.5	0.31	4.19	14.5	0.009	< 0.01	< 0.01	0.224	0.035
7: OV-3	3.4	0.31	3.09	11.0	0.009	< 0.01	< 0.01	0.633	0.045
8: OV-4	5.1	0.31	4.79	16.5	0.021	0.02	< 0.01	0.652	0.055
9: OV-5	5.9	0.31	5.59	19.0	0.008	< 0.01	< 0.01	0.444	0.040
10: OV-7	2.7	0.31	2.39	8.71	0.008	< 0.01	< 0.01	0.951	0.050
11: OV-8	2.9	0.31	2.59	9.35	0.009	< 0.01	< 0.01	0.766	0.045
12: OV-9	1.4	0.31	1.09	4.52	0.009	< 0.01	< 0.01	0.717	0.045
13: OV-10	2.1	0.31	1.79	6.77	0.010	0.01	< 0.01	2.78	0.055
14: OV-11	0.90	0.31	0.59	2.90	0.010	0.01	< 0.01	0.801	0.050
15: OV-12	-1.2	0.31	-1.51	-3.87	0.010	0.01	< 0.01	1.69	0.055
16: OV-13	0.0	0.31	-0.31	0.00	0.010	0.01	< 0.01	0.915	0.050
17: OV-14	3.8	0.31	3.49	12.3	0.010	0.01	< 0.01	0.868	0.055
18: OV-21	2.2	0.31	1.89	7.10	0.010	0.01	< 0.01	0.707	0.045
19: OV-22	1.4	0.31	1.09	4.52	0.010	0.01	< 0.01	0.564	0.030
20: OV-23	2.2	0.31	1.89	7.10	0.012	0.01	< 0.01	0.777	0.040

OnLine LIMS

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Modified ABA

LR Report : **CA11227-DEC12**

Sample ID	NP t CaCO3/1000 t	AP t CaCO3/1000 t	Net NP t CaCO3/1000 t	NP/AP ratio	Sulphur (total) %	Acid Leachable SO4-S %	Sulphide %	Carbon (total) %	Carbonate %
21: OV-24	2.4	0.31	2.09	7.74	0.011	0.01	< 0.01	0.978	0.045
22: OV-25	1.0	0.31	0.69	3.23	0.010	0.01	< 0.01	0.766	0.045
23: OV-20	2.5	0.31	2.19	8.06	0.012	0.01	< 0.01	1.01	0.045
24: J-11-31 132.5-133.5	78	24.4	53.6	3.20	0.838	0.06	0.78	7.05	0.265

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January-09-13

Labec Century Iron Ore Inc
Attn : Ricky Chan

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Canada, M5H 3B3
Phone: 416-977-3188 Ex 105, Fax:416-977-8002

Date Rec. : 18 December 2012
LR Report: **CA11228-DEC12**
Reference: ML-ARD Assessment-Joyce Lake
PO#P M120008

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: OV-1	6: OV-2	7: OV-4	8: OV-7	9: OV-9
Sample Date & Time			25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30
Silver [µg/g]	04-Jan-13	15:49	0.26	0.06	0.10	0.07	0.15
Aluminum [µg/g]	07-Jan-13	11:32	50000	52000	54000	53000	51000
Arsenic [µg/g]	04-Jan-13	15:50	14	15	14	11	11
Barium [µg/g]	04-Jan-13	15:50	470	440	450	440	440
Beryllium [µg/g]	04-Jan-13	15:50	1.6	1.6	1.7	1.5	1.6
Bismuth [µg/g]	04-Jan-13	15:50	0.12	< 0.09	0.11	0.10	< 0.09
Calcium [µg/g]	07-Jan-13	11:32	3000	3000	1900	1700	2100
Cadmium [µg/g]	04-Jan-13	15:50	0.84	0.87	0.70	0.38	0.37
Cobalt [µg/g]	04-Jan-13	15:50	13	14	14	9.9	12
Chromium [µg/g]	04-Jan-13	15:50	67	67	66	66	66
Copper [µg/g]	04-Jan-13	15:50	39	37	35	14	17
Iron [µg/g]	07-Jan-13	11:32	92000	110000	100000	81000	84000
Potassium [µg/g]	07-Jan-13	11:32	27000	27000	27000	27000	28000
Lithium [µg/g]	04-Jan-13	15:50	27	27	30	26	27
Magnesium [µg/g]	07-Jan-13	11:32	9000	9000	8500	7600	7400
Manganese [µg/g]	04-Jan-13	15:50	1400	1700	1700	1000	1200
Molybdenum [µg/g]	04-Jan-13	15:50	3.7	3.7	3.7	2.9	3.6
Sodium [µg/g]	07-Jan-13	11:33	6300	6500	5900	6400	5600
Nickel [µg/g]	04-Jan-13	15:50	43	38	33	23	23
Phosphorus [µg/g]	07-Jan-13	11:33	480	440	340	380	430
Lead [µg/g]	04-Jan-13	15:50	14	13	14	13	13

OnLine LIMS

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LR Report : **CA11228-DEC12**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: OV-1	6: OV-2	7: OV-4	8: OV-7	9: OV-9
Antimony [µg/g]	04-Jan-13	15:50	2.0	1.9	1.9	1.6	1.7
Selenium [µg/g]	04-Jan-13	15:50	1.1	< 0.7	0.8	< 0.7	0.7
Tin [µg/g]	04-Jan-13	15:50	1.7	1.6	1.5	1.5	1.4
Strontium [µg/g]	04-Jan-13	15:50	67	62	58	57	59
Titanium [µg/g]	04-Jan-13	15:50	2249	2376	2228	2397	2256
Thallium [µg/g]	04-Jan-13	15:50	0.55	0.53	0.62	0.52	0.51
Uranium [µg/g]	04-Jan-13	15:50	3.9	3.6	4.0	3.0	3.1
Vanadium [µg/g]	04-Jan-13	15:50	110	110	120	110	120
Yttrium [µg/g]	04-Jan-13	15:50	17	17	14	13	13
Zinc [µg/g]	04-Jan-13	15:50	97	97	93	66	70

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January-09-13

Labec Century Iron Ore Inc
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Phone: 416-977-3188 Ex 105, Fax:416-977-8002

Date Rec. : 18 December 2012
LR Report: **CA11228-DEC12**
Reference: ML-ARD Assessment-Joyce Lake
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CERTIFICATE OF ANALYSIS
Final Report

Analysis	10: OV-10	11: OV-11	12: OV-13	13: OV-21	14: OV-23	15: OV-25
Sample Date & Time	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30
Silver [µg/g]	0.02	< 0.01	< 0.01	< 0.01	0.01	0.02
Aluminum [µg/g]	30000	50000	53000	50000	43000	41000
Arsenic [µg/g]	13	12	11	14	15	14
Barium [µg/g]	270	420	430	400	370	390
Beryllium [µg/g]	1.3	1.5	1.6	1.6	1.6	1.5
Bismuth [µg/g]	< 0.09	0.09	< 0.09	< 0.09	< 0.09	< 0.09
Calcium [µg/g]	1200	1800	2100	1900	1400	1300
Cadmium [µg/g]	0.65	0.69	0.88	0.41	0.38	0.29
Cobalt [µg/g]	11	13	13	12	12	8.1
Chromium [µg/g]	70	87	80	78	76	72
Copper [µg/g]	9.6	25	22	31	14	11
Iron [µg/g]	170000	92000	79000	130000	160000	110000
Potassium [µg/g]	14000	24000	27000	23000	22000	25000
Lithium [µg/g]	17	29	31	27	25	24
Magnesium [µg/g]	3700	7700	7600	7500	6500	5300
Manganese [µg/g]	1800	1500	1200	1300	1400	1100
Molybdenum [µg/g]	2.4	2.9	2.7	2.9	3.2	3.0
Sodium [µg/g]	2600	6600	5700	5200	4400	3000
Nickel [µg/g]	15	29	27	33	22	19
Phosphorus [µg/g]	410	330	360	340	430	480
Lead [µg/g]	9.7	13	12	13	11	9.7

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LR Report : **CA11228-DEC12**

Analysis	10: OV-10	11: OV-11	12: OV-13	13: OV-21	14: OV-23	15: OV-25
Antimony [µg/g]	1.0	1.6	1.5	1.6	1.6	1.3
Selenium [µg/g]	< 0.7	1.1	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	1.0	1.4	1.1	2.9	1.2	1.2
Strontium [µg/g]	49	59	58	85	49	43
Titanium [µg/g]	1389	2114	2179	2104	1857	1783
Thallium [µg/g]	0.32	0.52	0.48	0.47	0.44	0.49
Uranium [µg/g]	1.9	3.3	3.1	3.3	3.3	2.6
Vanadium [µg/g]	76	100	100	110	120	94
Yttrium [µg/g]	8.5	13	13	11	13	12
Zinc [µg/g]	66	100	86	85	69	54

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

January-16-13

Labec Century Iron Ore Inc
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Phone: 416-977-3188 Ex 105, Fax:416-977-8002

Date Rec. : 18 December 2012
LR Report: **CA11229-DEC12**
Reference: ML-ARD Assessment-Joyce Lake
PO#P M120008

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: OV-1	6: OV-2	7: OV-4	8: OV-7	9: OV-9
Sample Date & Time			25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30
Sample weight [g]	11-Jan-13	15:51	250	250	250	250	250
Volume D.I. Water [mL]	11-Jan-13	15:51	750	750	750	750	750
Initial pH [units]	11-Jan-13	15:51	6.22	6.25	5.91	5.52	5.32
Final pH [units]	11-Jan-13	15:51	6.71	6.75	5.68	5.67	5.57
Mercury [mg/L]	10-Jan-13	13:46	0.00068	< 0.00001	0.00001	< 0.00001	< 0.00001
Silver [mg/L]	11-Jan-13	13:22	0.00016	0.00007	< 0.00001	0.00040	0.00014
Aluminum [mg/L]	14-Jan-13	15:22	7.94	4.62	2.21	1.07	1.05
Arsenic [mg/L]	11-Jan-13	13:22	0.0090	0.0077	0.0064	0.0016	0.0006
Barium [mg/L]	11-Jan-13	13:22	0.124	0.0846	0.0124	0.00267	0.00131
Boron [mg/L]	11-Jan-13	13:22	0.851	0.710	0.704	0.469	0.373
Beryllium [mg/L]	11-Jan-13	13:22	0.00116	0.00063	0.00012	0.00002	< 0.00002
Bismuth [mg/L]	11-Jan-13	13:22	0.00011	0.00006	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	14-Jan-13	15:22	3.61	1.52	0.61	0.55	0.21
Cadmium [mg/L]	11-Jan-13	13:22	0.000860	0.000621	0.000148	0.000007	0.000008
Cobalt [mg/L]	11-Jan-13	13:22	0.00692	0.00496	0.00142	0.000535	0.000424
Chromium [mg/L]	11-Jan-13	13:22	0.0320	0.0205	0.0033	0.0015	0.0014
Copper [mg/L]	11-Jan-13	13:22	0.0410	0.0286	0.0059	0.0021	0.0007
Iron [mg/L]	14-Jan-13	15:22	11.0	5.92	1.22	1.44	1.28
Potassium [mg/L]	14-Jan-13	15:22	1.71	0.946	0.307	0.428	0.201
Lithium [mg/L]	11-Jan-13	13:23	0.017	0.010	0.001	< 0.001	< 0.001
Magnesium [mg/L]	14-Jan-13	15:22	3.52	1.45	0.191	0.106	0.053

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA11229-DEC12**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: OV-1	6: OV-2	7: OV-4	8: OV-7	9: OV-9
Manganese [mg/L]	11-Jan-13	13:23	0.582	0.474	0.182	0.0582	0.0561
Molybdenum [mg/L]	14-Jan-13	15:22	0.0181	0.0119	0.00343	0.00028	0.00022
Sodium [mg/L]	14-Jan-13	15:22	40.7	22.9	22.1	20.2	17.9
Nickel [mg/L]	11-Jan-13	13:23	0.0219	0.0140	0.0016	0.0003	0.0002
Lead [mg/L]	11-Jan-13	13:23	0.00708	0.00544	0.00146	0.00099	0.00062
Antimony [mg/L]	11-Jan-13	13:23	0.0014	0.0011	0.0014	0.0011	0.0005
Selenium [mg/L]	11-Jan-13	13:23	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Tin [mg/L]	11-Jan-13	13:23	0.00037	0.00023	< 0.00001	0.00016	0.00003
Strontium [mg/L]	14-Jan-13	15:22	0.0109	0.0064	0.0022	0.0008	0.0002
Titanium [mg/L]	11-Jan-13	13:23	0.452	0.347	0.0722	0.0109	0.0152
Thallium [mg/L]	11-Jan-13	13:23	0.00016	0.00009	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	11-Jan-13	13:23	0.00447	0.00210	0.000686	0.000061	0.000063
Vanadium [mg/L]	11-Jan-13	13:23	0.0580	0.0355	0.00440	0.00098	0.00077
Tungsten [mg/L]	11-Jan-13	13:23	0.00022	0.00012	< 0.00003	< 0.00003	0.00004
Yttrium [mg/L]	11-Jan-13	13:23	0.0133	0.00850	0.000983	0.000185	0.000141
Zinc [mg/L]	11-Jan-13	13:23	0.114	0.075	0.011	0.003	0.001

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

SGS Canada Inc.
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SFE Leach (3:1 ratio filter 0.45µ 24hr)

January-16-13

Labec Century Iron Ore Inc
Attn : Ricky Chan

170 University Avenue,Suite 602, Toronto
Canada, M5H 3B3
Phone: 416-977-3188 Ex 105, Fax:416-977-8002

Date Rec. : 18 December 2012
LR Report: **CA11229-DEC12**
Reference: ML-ARD Assessment-Joyce Lake
PO#P M120008

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	10: OV-10	11: OV-11	12: OV-13	13: OV-21	14: OV-23	15: OV-25
Sample Date & Time	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30	25-Oct-12 08:30-11:30
Sample weight [g]	250	250	250	250	250	250
Volume D.I. Water [mL]	750	750	750	750	750	750
Initial pH [units]	5.41	5.55	5.53	5.63	5.55	5.87
Final pH [units]	5.33	5.69	5.82	5.62	5.96	5.48
Mercury [mg/L]	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001	< 0.00001
Silver [mg/L]	0.00046	0.00006	0.00005	0.00006	0.00005	0.00007
Aluminum [mg/L]	2.40	1.12	2.26	3.01	2.67	2.19
Arsenic [mg/L]	0.0103	0.0019	0.0005	0.0012	0.0013	0.0019
Barium [mg/L]	0.0314	0.00113	0.00383	0.00890	0.00894	0.0115
Boron [mg/L]	1.12	0.305	0.467	0.659	0.545	0.940
Beryllium [mg/L]	0.00021	< 0.00002	0.00007	0.00009	0.00008	0.00009
Bismuth [mg/L]	0.00017	< 0.00001	< 0.00001	0.00005	< 0.00001	0.00004
Calcium [mg/L]	1.58	0.07	0.55	0.53	0.68	0.99
Cadmium [mg/L]	0.000384	0.000011	0.000111	0.000092	0.000060	0.000025
Cobalt [mg/L]	0.00322	0.000307	0.00147	0.00141	0.00233	0.00207
Chromium [mg/L]	0.0114	0.0013	0.0023	0.0027	0.0028	0.0038
Copper [mg/L]	0.0056	0.0009	0.0014	0.0041	0.0026	0.0020
Iron [mg/L]	6.30	0.382	2.42	2.55	3.44	5.73
Potassium [mg/L]	0.845	0.252	0.258	0.301	0.384	0.354
Lithium [mg/L]	0.005	< 0.001	< 0.001	< 0.001	0.001	0.002
Magnesium [mg/L]	0.374	0.030	0.125	0.238	0.236	0.287

OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
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SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA11229-DEC12**

Analysis	10: OV-10	11: OV-11	12: OV-13	13: OV-21	14: OV-23	15: OV-25
Manganese [mg/L]	0.706	0.0323	0.180	0.180	0.336	0.336
Molybdenum [mg/L]	0.00302	0.00035	0.00016	0.00151	0.00014	0.00122
Sodium [mg/L]	48.0	17.3	24.9	25.5	21.4	32.1
Nickel [mg/L]	0.0038	0.0004	0.0007	0.0011	0.0009	0.0012
Lead [mg/L]	0.00464	0.00040	0.00129	0.00164	0.00233	0.00362
Antimony [mg/L]	0.0024	0.0006	0.0005	0.0010	0.0006	0.0011
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Tin [mg/L]	0.00024	0.00005	0.00005	< 0.00001	0.00006	< 0.00001
Strontium [mg/L]	0.0021	0.0002	0.0006	0.0007	0.0010	0.0018
Titanium [mg/L]	0.340	0.0101	0.0308	0.0451	0.0302	0.0511
Thallium [mg/L]	0.00003	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	0.000848	0.000090	0.000170	0.000371	0.000208	0.000311
Vanadium [mg/L]	0.0233	0.00096	0.00208	0.00244	0.00292	0.00689
Tungsten [mg/L]	0.00041	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	0.00271	0.000160	0.000321	0.000574	0.000504	0.000516
Zinc [mg/L]	0.026	0.002	0.004	0.009	0.005	0.006

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SGS Canada Inc.
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Modified ABA

March-01-13

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 12 February 2013
LR Report: **CA10284-FEB13**
Reference: ML-ARD Assessment - Joyce Lake PM120008

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: Lump Concentrate 1 BS1LC1	6: Lump Concentrate 2 BS1LC2	7: Lump Concentrate 3 BS1LC3	8: Sinter Feed 1 BS1SF1	9: Sinter Feed 2 BS1SF2	10: Sinter Feed 3 BS1SF3	11: Lump Concentrate 1 BS2LC1	12: Lump Concentrate 2 BS2LC2
Sample Date & Time			Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Paste pH [units]	25-Feb-13	10:21	6.96	6.78	6.63	6.73	6.69	6.73	6.70	6.61
Fizz Rate [---]	25-Feb-13	10:21	1	1	1	1	1	1	1	1
Sample weight [g]	25-Feb-13	10:21	2.04	1.99	2.02	2.00	2.00	2.00	2.05	1.98
HCl added [mL]	25-Feb-13	10:21	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	25-Feb-13	10:21	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	25-Feb-13	10:21	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to pH=8.3 [mL]	25-Feb-13	10:21	19.68	19.76	19.68	19.44	19.52	19.60	19.61	19.76
Final pH [units]	25-Feb-13	10:21	1.11	1.01	0.98	0.96	0.98	0.99	0.96	1.02
NP [t CaCO3/1000 t]	25-Feb-13	10:21	0.80	0.60	0.80	1.4	1.2	1.0	0.90	0.60
AP [t CaCO3/1000 t]	---	---	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Net NP [t CaCO3/1000 t]	---	---	0.49	0.29	0.49	1.09	0.89	0.69	0.59	0.29
NP/AP [ratio]	---	---	2.58	1.94	2.58	4.52	3.87	3.23	2.90	1.94
Sulphur (total) [%]	20-Feb-13	14:41	0.006	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Acid Leachable SO4-S [%]	---	---	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphide [%]	20-Feb-13	14:41	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbon (total) [%]	20-Feb-13	14:13	0.011	0.009	0.008	0.017	0.018	0.012	0.016	0.013
Carbonate [%]	20-Feb-13	14:13	0.010	< 0.005	< 0.005	0.015	0.010	0.010	0.010	< 0.005

OnLine LIMS

SGS Canada Inc.
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Modified ABA

LR Report : **CA10284-FEB13**

Brian Graham B.Sc.
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OnLine LIMS

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Modified ABA

March-01-13

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 12 February 2013
LR Report: **CA10284-FEB13**
Reference: ML-ARD Assessment - Joyce Lake PM120008

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	13: Lump Concentrate 3 BS2LC3	14: Coarse Sinter Feed 1 BS2CSF1	15: Coarse Sinter Feed 2 BS2CSF2	16: Coarse Sinter Feed 3 BS2CSF3	17: Fines Sinter Feed 1 BS2FSF1	18: Fines Sinter Feed 2 BS2FSF2	19: Fines Sinter Feed 3 BS2FSF3	20: Tailings 1 BS2T1	21: Tailings 2 BS2T2	22: Tailings 3 BS2T3
Sample Date & Time	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Paste pH [units]	6.71	6.36	6.53	6.52	6.44	6.41	6.02	6.80	6.81	6.79
Fizz Rate [---]	1	1	1	1	1	1	1	1	1	1
Sample weight [g]	2.04	2.01	2.01	2.02	2.04	2.00	2.01	1.99	2.02	1.98
HCl added [mL]	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to pH=8.3 [mL]	19.74	19.60	19.68	19.70	19.08	17.96	17.45	19.46	19.58	19.62
Final pH [units]	1.02	1.01	1.01	0.98	1.22	1.03	1.05	1.04	1.03	1.00
NP [t CaCO3/1000 t]	0.60	1.0	0.80	0.80	2.2	5.1	6.3	1.4	1.0	0.90
AP [t CaCO3/1000 t]	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Net NP [t CaCO3/1000 t]	0.29	0.69	0.49	0.49	1.89	4.79	5.99	1.09	0.69	0.59
NP/AP [ratio]	1.94	3.23	2.58	2.58	7.10	16.5	20.3	4.52	3.23	2.90
Sulphur (total) [%]	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.007	0.007	0.006
Acid Leachable SO4-S [%]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphide [%]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Carbon (total) [%]	0.016	0.012	0.011	0.013	0.020	0.020	0.022	0.048	0.046	0.046
Carbonate [%]	< 0.005	< 0.005	< 0.005	< 0.005	0.010	0.010	0.010	0.025	0.020	0.030

OnLine LIMS

SGS Canada Inc.
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Modified ABA

LR Report : **CA10284-FEB13**

Brian Graham B.Sc.
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OnLine LIMS

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March-12-13

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
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H3B 4G7, Canada

Phone: 514-228-5034
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Date Rec. : 12 February 2013
LR Report: **CA10285-FEB13**
Reference: ML-ARD Assessment-Joyce Lake PM120008

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: Lump Concentrate 1 BS1LC1	6: Lump Concentrate 2 BS1LC2	7: Lump Concentrate 3 BS1LC3	8: Sinter Feed 1 BS1SF1	9: Sinter Feed 2 BS1SF2	10: Sinter Feed 3 BS1SF3	11: Lump Concentrate 1 BS2LC1	12: Lump Concentrate 2 BS2LC2
Sample Date & Time			Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Silver [µg/g]	08-Mar-13	13:47	0.03	0.01	0.01	0.01	0.01	< 0.01	0.02	< 0.01
Aluminum [µg/g]	11-Mar-13	14:35	980	1200	1200	2600	2600	2100	4000	2400
Arsenic [µg/g]	08-Mar-13	13:47	28	35	35	57	56	53	35	28
Barium [µg/g]	08-Mar-13	13:47	10	12	9.7	24	20	17	51	25
Beryllium [µg/g]	08-Mar-13	13:47	1.1	1.2	1.1	1.4	1.5	1.6	1.5	1.4
Bismuth [µg/g]	08-Mar-13	13:47	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Calcium [µg/g]	11-Mar-13	14:35	110	95	83	240	250	180	130	120
Cadmium [µg/g]	08-Mar-13	13:47	0.02	< 0.02	< 0.02	0.03	0.03	< 0.02	< 0.02	< 0.02
Cobalt [µg/g]	08-Mar-13	13:47	2.1	2.5	2.4	3.2	3.2	3.0	2.6	2.7
Chromium [µg/g]	08-Mar-13	13:47	31	22	21	12	12	13	26	23
Copper [µg/g]	08-Mar-13	13:47	1.3	0.6	3.0	3.7	1.0	0.9	1.0	0.8
Iron [µg/g]	11-Mar-13	14:34	700000	710000	690000	670000	670000	660000	620000	660000
Potassium [µg/g]	11-Mar-13	14:34	84	130	140	530	450	320	1200	380
Lithium [µg/g]	08-Mar-13	13:47	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Magnesium [µg/g]	11-Mar-13	14:34	63	43	34	170	160	100	310	110
Manganese [µg/g]	08-Mar-13	13:47	1200	1400	1300	1900	1700	1700	950	1100
Molybdenum [µg/g]	08-Mar-13	13:47	2.8	2.9	3.0	3.7	3.7	3.5	3.0	3.0
Sodium [µg/g]	11-Mar-13	14:35	48	100	120	230	230	160	440	290
Nickel [µg/g]	08-Mar-13	13:47	1.1	< 0.1	3.2	3.3	1.7	0.6	0.9	1.6
Phosphorus [µg/g]	11-Mar-13	14:35	190	230	210	270	270	250	260	240
Lead [µg/g]	08-Mar-13	13:48	1.5	1.2	1.7	1.9	1.6	1.6	2.1	1.4

OnLine LIMS

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
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LR Report : **CA10285-FEB13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: Lump Concentrate 1 BS1LC1	6: Lump Concentrate 2 BS1LC2	7: Lump Concentrate 3 BS1LC3	8: Sinter Feed 1 BS1SF1	9: Sinter Feed 2 BS1SF2	10: Sinter Feed 3 BS1SF3	11: Lump Concentrate 1 BS2LC1	12: Lump Concentrate 2 BS2LC2
Antimony [µg/g]	08-Mar-13	13:48	1.8	2.1	1.9	3.0	3.0	2.9	2.1	1.6
Selenium [µg/g]	08-Mar-13	13:48	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	08-Mar-13	13:48	1.5	1.0	0.7	0.9	0.7	0.7	0.9	1.4
Strontium [µg/g]	08-Mar-13	13:48	6.3	6.6	5.6	9.7	9.2	8.3	25	16
Titanium [µg/g]	08-Mar-13	13:48	11	16	10	63	58	37	110	66
Thallium [µg/g]	08-Mar-13	13:48	< 0.02	< 0.02	< 0.02	0.03	0.02	< 0.02	0.04	0.03
Uranium [µg/g]	08-Mar-13	13:48	1.9	2.4	2.2	3.4	3.6	3.4	2.5	2.2
Vanadium [µg/g]	08-Mar-13	13:48	43	44	47	55	53	51	79	78
Yttrium [µg/g]	08-Mar-13	13:48	6.1	8.0	6.6	8.0	6.7	5.9	6.4	5.3
Zinc [µg/g]	08-Mar-13	13:48	< 0.7	< 0.7	3.2	4.4	< 0.7	< 0.7	2.4	1.1

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OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

March-12-13

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 12 February 2013
LR Report: **CA10285-FEB13**
Reference: ML-ARD Assessment-Joyce Lake PM120008

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	13: Lump Concentrate 3 BS2LC3	14: Coarse Sinter Feed 1 BS2CSF1	15: Coarse Sinter Feed 2 BS2CSF2	16: Coarse Sinter Feed 3 BS2CSF3	17: Fines Sinter Feed 1 BS2FSF1	18: Fines Sinter Feed 2 BS2FSF2	19: Fines Sinter Feed 3 BS2FSF3	20: Tailings 1 BS2T1	21: Tailings 2 BS2T2	22: Tailings 3 BS2T3
Sample Date & Time	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Silver [µg/g]	0.02	0.01	0.02	0.01	0.08	0.06	0.08	0.23	0.36	0.24
Aluminum [µg/g]	2900	3000	3200	3100	4000	4000	4000	5500	5700	5500
Arsenic [µg/g]	28	54	56	56	67	66	73	60	60	59
Barium [µg/g]	29	34	33	31	57	57	59	180	170	180
Beryllium [µg/g]	1.2	1.6	1.7	1.7	1.5	1.5	1.6	1.4	1.3	1.5
Bismuth [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	0.44	0.22	0.31	1.1	1.0	1.1
Calcium [µg/g]	100	170	140	190	370	380	380	540	550	530
Cadmium [µg/g]	< 0.02	< 0.02	0.02	0.03	0.05	0.04	0.04	0.06	0.07	0.07
Cobalt [µg/g]	2.9	3.0	3.0	2.7	6.2	5.3	6.9	11	9.5	9.7
Chromium [µg/g]	26	17	18	17	23	23	23	33	33	34
Copper [µg/g]	4.2	1.0	1.0	2.8	2.6	3.3	2.7	6.2	8.3	8.6
Iron [µg/g]	660000	650000	670000	620000	620000	630000	660000	560000	540000	540000
Potassium [µg/g]	1100	210	280	210	350	360	340	980	1000	970
Lithium [µg/g]	< 2	< 2	< 2	< 2	< 2	< 2	< 2	3	2	2
Magnesium [µg/g]	200	68	84	77	130	130	130	340	350	340
Manganese [µg/g]	960	1300	1500	1300	1500	1500	1600	1600	1500	1600
Molybdenum [µg/g]	2.8	3.2	3.4	3.3	3.4	3.6	3.5	3.2	3.1	3.3
Sodium [µg/g]	210	150	140	130	170	170	160	320	310	320
Nickel [µg/g]	4.2	1.0	1.8	0.5	2.9	4.1	3.3	9.8	35	24
Phosphorus [µg/g]	180	340	310	320	410	400	400	550	570	560
Lead [µg/g]	1.9	2.4	2.3	2.2	4.8	4.5	12	11	11	11

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LR Report : **CA10285-FEB13**

Analysis	13: Lump Concentrate 3 BS2LC3	14: Coarse Sinter Feed 1 BS2CSF1	15: Coarse Sinter Feed 2 BS2CSF2	16: Coarse Sinter Feed 3 BS2CSF3	17: Fines Sinter Feed 1 BS2FSF1	18: Fines Sinter Feed 2 BS2FSF2	19: Fines Sinter Feed 3 BS2FSF3	20: Tailings 1 BS2T1	21: Tailings 2 BS2T2	22: Tailings 3 BS2T3
Antimony [µg/g]	1.7	2.9	3.1	3.0	3.2	3.2	3.4	3.0	3.0	3.0
Selenium [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	1.6	1.0	1.6
Tin [µg/g]	0.7	< 0.5	0.7	< 0.5	< 0.5	0.6	0.7	1.1	0.8	0.9
Strontium [µg/g]	13	21	18	18	48	47	51	170	170	180
Titanium [µg/g]	88	96	90	87	160	160	170	270	270	270
Thallium [µg/g]	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04
Uranium [µg/g]	2.3	3.9	4.2	3.8	4.1	4.2	4.3	3.6	3.4	3.6
Vanadium [µg/g]	63	88	91	91	120	120	120	130	120	130
Yttrium [µg/g]	6.3	7.2	7.5	6.8	11	11	12	24	24	24
Zinc [µg/g]	8.5	1.7	3.0	1.7	6.7	5.5	5.2	25	69	48

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

March-01-13

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 12 February 2013
LR Report: **CA10286-FEB13**
Reference: ML-ARD Assessment-Joyce Lake PM120008

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: Lump Concentrate 1 BS1LC1	6: Lump Concentrate 2 BS1LC2	7: Lump Concentrate 3 BS1LC3	8: Sinter Feed 1 BS1SF1	9: Sinter Feed 2 BS1SF2	10: Sinter Feed 3 BS1SF3	11: Lump Concentrate 1 BS2LC1	12: Lump Concentrate 2 BS2LC2
Sample Date & Time			Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Sample weight [g]	22-Feb-13	09:19	250	250	250	250	250	250	250	250
Volume D.I. Water [mL]	22-Feb-13	09:19	750	750	750	750	750	750	750	750
Initial pH [units]	22-Feb-13	09:19	8.18	6.71	6.38	6.82	6.79	6.80	6.97	7.05
Final pH [units]	22-Feb-13	09:19	7.70	7.51	6.96	6.99	7.04	6.92	6.95	7.00
Mercury [mg/L]	28-Feb-13	08:19	< 0.00001	< 0.00001	< 0.00001	0.00001	0.00001	0.00001	< 0.00001	< 0.00001
Silver [mg/L]	28-Feb-13	15:06	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Aluminum [mg/L]	01-Mar-13	08:51	0.01	< 0.01	< 0.01	0.27	0.18	0.15	< 0.01	< 0.01
Arsenic [mg/L]	28-Feb-13	15:06	0.0007	< 0.0002	0.0004	0.0037	0.0006	0.0021	< 0.0002	0.0002
Barium [mg/L]	28-Feb-13	15:06	0.00105	0.00126	0.00081	0.00159	0.00142	0.00096	0.00064	0.00060
Boron [mg/L]	28-Feb-13	15:06	0.0163	0.0161	0.0162	0.0567	0.0136	0.0135	0.0151	0.0158
Beryllium [mg/L]	28-Feb-13	15:06	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Bismuth [mg/L]	28-Feb-13	15:06	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	01-Mar-13	08:51	6.48	1.08	0.87	4.52	3.93	4.12	1.17	1.04
Cadmium [mg/L]	28-Feb-13	15:07	0.000010	0.000004	0.000004	< 0.000003	0.000005	< 0.000003	< 0.000003	< 0.000003
Cobalt [mg/L]	28-Feb-13	15:07	0.000143	0.000105	0.000079	0.000183	0.000139	0.000116	0.000071	0.000068
Chromium [mg/L]	28-Feb-13	15:07	< 0.0005	< 0.0005	< 0.0005	0.0017	0.0019	0.0020	< 0.0005	< 0.0005
Copper [mg/L]	28-Feb-13	15:07	0.0005	< 0.0005	< 0.0005	0.0011	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Iron [mg/L]	01-Mar-13	08:51	0.006	< 0.003	< 0.003	0.828	0.619	0.533	0.011	< 0.003
Potassium [mg/L]	01-Mar-13	08:51	0.884	0.904	1.03	0.358	1.33	1.33	0.400	0.360
Lithium [mg/L]	28-Feb-13	15:07	< 0.001	< 0.001	< 0.001	0.001	0.002	0.002	< 0.001	< 0.001
Magnesium [mg/L]	01-Mar-13	08:51	0.936	0.394	0.325	0.868	1.20	1.24	0.437	0.379

OnLine LIMS

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA10286-FEB13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: Lump Concentrate 1 BS1LC1	6: Lump Concentrate 2 BS1LC2	7: Lump Concentrate 3 BS1LC3	8: Sinter Feed 1 BS1SF1	9: Sinter Feed 2 BS1SF2	10: Sinter Feed 3 BS1SF3	11: Lump Concentrate 1 BS2LC1	12: Lump Concentrate 2 BS2LC2
Manganese [mg/L]	28-Feb-13	15:07	0.00612	0.00115	0.00018	0.0110	0.00716	0.00536	0.00014	0.00003
Molybdenum [mg/L]	28-Feb-13	15:07	0.00037	0.00003	< 0.00001	0.00007	0.00012	0.00013	0.00005	0.00001
Sodium [mg/L]	01-Mar-13	08:51	0.47	0.49	0.48	14.3	0.91	0.94	0.72	0.55
Nickel [mg/L]	28-Feb-13	15:07	0.0003	< 0.0001	< 0.0001	0.0004	0.0004	0.0003	< 0.0001	< 0.0001
Lead [mg/L]	28-Feb-13	15:07	< 0.00002	< 0.00002	< 0.00002	0.00008	0.00004	0.00005	< 0.00002	< 0.00002
Antimony [mg/L]	28-Feb-13	15:07	< 0.0002	< 0.0002	< 0.0002	0.0003	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	28-Feb-13	15:07	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Tin [mg/L]	28-Feb-13	15:07	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Strontium [mg/L]	01-Mar-13	08:51	0.0130	0.0035	0.0032	0.0058	0.0068	0.0069	0.0041	0.0045
Titanium [mg/L]	28-Feb-13	15:07	< 0.0001	< 0.0001	< 0.0001	0.0046	0.0033	0.0021	< 0.0001	< 0.0001
Thallium [mg/L]	28-Feb-13	15:07	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	28-Feb-13	15:07	0.000011	< 0.000001	< 0.000001	0.000054	0.000018	0.000015	< 0.000001	< 0.000001
Vanadium [mg/L]	28-Feb-13	15:07	< 0.00003	< 0.00003	< 0.00003	0.00085	0.00061	0.00041	0.00019	< 0.00003
Tungsten [mg/L]	28-Feb-13	15:07	0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	28-Feb-13	15:07	0.000001	0.000001	< 0.000001	0.000079	0.000057	0.000037	0.000021	0.000004
Zinc [mg/L]	28-Feb-13	15:07	0.003	0.001	< 0.001	0.002	0.004	0.002	< 0.001	< 0.001

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Final Report

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Sample Date & Time	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Sample weight [g]	250	250	250	250	250	250	250	250	250	250
Volume D.I. Water [mL]	750	750	750	750	750	750	750	750	750	750
Initial pH [units]	7.32	6.72	6.68	6.65	6.83	6.87	6.91	7.19	7.26	7.27
Final pH [units]	7.03	6.95	6.71	6.78	6.93	6.91	6.75	7.09	7.01	7.18
Mercury [mg/L]	< 0.00001	< 0.00001	< 0.00001	0.00001	0.00002	0.00001	0.00001	0.00001	0.00002	0.00002
Silver [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Aluminum [mg/L]	0.01	< 0.01	< 0.01	< 0.01	0.10	0.08	0.10	0.22	0.26	0.25
Arsenic [mg/L]	0.0005	0.0003	< 0.0002	< 0.0002	0.0010	0.0009	0.0023	0.0011	0.0024	0.0013
Barium [mg/L]	0.00064	0.00049	0.00049	0.00045	0.00249	0.00229	0.00283	0.00366	0.00533	0.00434
Boron [mg/L]	0.0185	0.0107	0.0101	0.0114	0.0065	0.0055	0.0060	0.0054	0.0057	0.0062
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Bismuth [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	1.62	1.00	0.98	1.05	3.72	3.37	3.67	6.34	5.96	5.99
Cadmium [mg/L]	0.000016	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003	< 0.000003
Cobalt [mg/L]	0.000094	0.000077	0.000058	0.000054	0.000100	0.000108	0.000109	0.000129	0.000160	0.000144
Chromium [mg/L]	< 0.0005	0.0007	0.0005	0.0006	0.0032	0.0030	0.0034	0.0036	0.0041	0.0039
Copper [mg/L]	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	0.0007	0.0008	0.0010	0.0006	0.0007
Iron [mg/L]	< 0.003	0.021	0.019	0.022	0.590	0.702	0.722	0.720	0.797	0.811
Potassium [mg/L]	0.466	0.750	0.726	0.597	0.910	0.945	0.795	0.902	0.818	0.855
Lithium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.001	0.001	0.002	0.002	0.002
Magnesium [mg/L]	0.508	0.262	0.263	0.310	0.588	0.528	0.578	0.931	0.874	0.873

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SFE Leach (3:1 ratio filter 0.45µ 24hr)

LR Report : **CA10286-FEB13**

Analysis	13: Lump Concentrate 3 BS2LC3	14: Coarse Sinter Feed 1 BS2CSF1	15: Coarse Sinter Feed 2 BS2CSF2	16: Coarse Sinter Feed 3 BS2CSF3	17: Fines Sinter Feed 1 BS2FSF1	18: Fines Sinter Feed 2 BS2FSF2	19: Fines Sinter Feed 3 BS2FSF3	20: Tailings 1 BS2T1	21: Tailings 2 BS2T2	22: Tailings 3 BS2T3
Manganese [mg/L]	0.00057	0.00022	0.00011	0.00016	0.00323	0.00380	0.00363	0.00338	0.00509	0.00428
Molybdenum [mg/L]	0.00005	< 0.00001	< 0.00001	< 0.00001	0.00002	0.00002	0.00002	0.00017	0.00014	0.00020
Sodium [mg/L]	0.61	1.10	1.10	1.06	1.32	1.34	1.31	1.38	1.45	1.43
Nickel [mg/L]	0.0002	0.0001	< 0.0001	< 0.0001	0.0004	0.0003	0.0003	0.0005	0.0005	0.0004
Lead [mg/L]	0.00004	< 0.00002	< 0.00002	< 0.00002	0.00011	0.00013	0.00023	0.00016	0.00045	0.00021
Antimony [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Tin [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Strontium [mg/L]	0.0068	0.0031	0.0031	0.0034	0.0137	0.0123	0.0137	0.0216	0.0211	0.0217
Titanium [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0012	0.0011	0.0016	0.0023	0.0040	0.0032
Thallium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	0.000004	< 0.000001	< 0.000001	< 0.000001	0.000010	0.000014	0.000013	0.000042	0.000027	0.000039
Vanadium [mg/L]	0.00004	0.00003	< 0.00003	< 0.00003	0.00031	0.00028	0.00033	0.00053	0.00090	0.00067
Tungsten [mg/L]	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	0.000014	0.000013	0.000014	0.000009	0.000369	0.000354	0.000462	0.000582	0.00101	0.000815
Zinc [mg/L]	< 0.001	0.003	< 0.001	< 0.001	0.004	0.001	0.004	0.001	0.002	0.001

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Sunday, March 03, 2013

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Date Rec. : 12 February 2013
LR Report: **CA10287-FEB13**
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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: Lump Concentrate 1 BS1LC1	6: Lump Concentrate 2 BS1LC2	7: Lump Concentrate 3 BS1LC3	8: Sinter Feed 1 BS1SF1	9: Sinter Feed 2 BS1SF2	10: Sinter Feed 3 BS1SF3	11: Lump Concentrate 1 BS2LC1	12: Lump Concentrate 2 BS2LC2
Sample Date & Time			Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Fizz Rate [---]	26-Feb-13	09:20	1	1	1	1	1	1	1	1
Sample weight [g]	26-Feb-13	09:20	2.01	1.99	2.02	1.99	2.05	2.00	2.10	1.98
HCl added [mL]	26-Feb-13	09:20	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	26-Feb-13	09:20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	26-Feb-13	09:20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to [pH=7.0 mL]	26-Feb-13	09:20	13.16	13.39	12.75	12.84	11.86	12.83	12.31	13.02
Final pH [units]	26-Feb-13	09:20	2.05	2.02	2.07	2.02	2.07	2.04	2.12	2.00
NP [t CaCO3/1000t]	26-Feb-13	09:20	17	17	18	18	20	18	18	18

Analysis	13: Lump Concentrate 3 BS2LC3	14: Coarse Sinter Feed 1 BS2CSF1	15: Coarse Sinter Feed 2 BS2CSF2	16: Coarse Sinter Feed 3 BS2CSF3	17: Fines Sinter Feed 1 BS2FSF1	18: Fines Sinter Feed 2 BS2FSF2	19: Fines Sinter Feed 3 BS2FSF3	20: Tailings 1 BS2T1	21: Tailings 2 BS2T2	22: Tailings 3 BS2T3
Sample Date & Time	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Fizz Rate [---]	1	1	1	1	1	1	1	1	1	1
Sample weight [g]	2.09	2.06	2.07	2.02	2.05	2.06	2.06	2.04	1.99	2.02
HCl added [mL]	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to [pH=7.0 mL]	11.51	12.23	11.99	12.38	11.91	13.13	12.51	12.17	12.66	11.60
Final pH [units]	2.13	2.04	2.03	2.05	1.97	2.02	2.03	2.05	2.11	2.08
NP [t CaCO3/1000t]	20	19	19	19	20	17	18	19	18	21

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Standard ABA with Peroxide addition (siderite method)

LR Report : **CA10287-FEB13**

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

Stantec

Memo

To:	Ellen Tracy St. Johns Office	From:	Mark Steinepreis Waterloo Office
File:	121416571	Date:	May 4, 2021

Reference: Joyce Lake Direct Shipping Ore Project ARD/ML Assessment Update

OBJECTIVE

This memorandum summarizes the geochemistry testing that has been carried out since preparation of the Environmental Impact Statement (EIS) for the Joyce Lake Direct Shipping Iron Ore Project (Joyce Lake) in May, 2013.

A Phase 1 acid rock drainage and metal leaching (ARD/ML) assessment was attached as Appendix Q to the EIS[1]. The main conclusion of the assessment was that the mine lithologies (i.e., the Lower Red Chert [LRC], Red Chert [RC], Upper Massive Hematite [UMH], Lower Massive Hematite [LMH], and overburden) have low ARD/ML potential based on static test results. Tailings and concentrates from metallurgical testing were also assessed and classified as non-potentially acid generating (PAG).

Metal concentrations in Shake Flask Extraction leachate were below the *Metal Mining Effluent Regulations* (MMER, now *Metal and Diamond Mines Effluent Regulations* or MDMER) limits for all units and materials tested, indicating low metal leaching potential. Kinetic testing was ongoing at the time of submission and this memorandum provides an update for geochemical testing completed since the Phase I assessment was completed.

METHODS

Geochemical testing for the original EIS submission focused on static methods including Acid Base Accounting (ABA), Shake Flask Extraction and analysis for concentrations of total metals. Since submission, additional static testing included single step NAG tests and kinetic testing including laboratory-based Humidity Cell Tests (HCTs) and Field Leach Bins (FLBs) set up on site. Most of the samples used to prepare the kinetic test samples were also tested for static parameters similar to the Phase I program.

The focus of this memorandum is on the static and kinetic testing that has been completed since preparation of the EIS.

<u>Static Testing - Single Step NAG Tests</u>

A total of 26 single step NAG tests were performed on samples from the borehole database and on separate composite samples of ore, overburden and mine wastes. NAG tests were carried out on samples of the following units/materials:

- LMH Ore
- LMH Ore – composite of PAG samples*
- RC Ore
- UMH Ore*

[1] Stantec Consulting Ltd., 2013. Joyce Lake Direct Shipping iron Ore Project: Phase 1 Assessment for Acid Rock Drainage and Metal Leaching (ARD/ML). May 2013.

- Overburden*
- Lump Concentrate*
- Coarse Sinter Feed*
- Fines Sinter Feed
- Tailings*

The samples used to prepare the composite samples (as indicated with an *) are described in Table 3 to Table 7, attached within Appendix A.

The single step NAG test uses the oxidizing agent hydrogen peroxide (H_2O_2) to oxidize sulphide minerals in the material. The pH of the H_2O_2 solution is 4.5, and the post-digestion solution is tested for pH to determine if the material is capable of neutralizing the acidity produced from sulphide oxidation. According to the guidelines in Price (2009[2]), the following designations are appropriate based on the results of the NAG test:

- NAG pH < 4.5 - PAG
- NAG pH > 4.5 - non-PAG)

Laboratory certificates are provided in Appendix B.

Kinetic Testing – Humidity Cell Testing and Field Bins

A total of eight HCTs were performed by SGS Canada in Lakefield, Ontario, targeting the following material types

- LMH Ore
- LMH Ore – PAG samples*
- RC Ore*
- UMH Ore*
- Overburden*
- Lump Concentrate*
- Coarse Sinter Feed*
- Tailings*

The sample composition used to prepare the composite samples (indicated by an * in the list above) is described in the Table 8 to

, attached in Appendix A, along with the Neutralization Potential Ratio (NPR; a value less than 1 is indicative of a PAG designation, between 1 and 2 is an uncertain designation and above 2 is indicative of a non-PAG designation) as measured in the static testing for the EIS. The HCTs were sampled at Week 0, 1, 2, 4, 7, 10, 15, and 20 and the leachate was tested for pH, acidity, alkalinity, dissolved sulphate and dissolved metals. Laboratory certificates are provided in Appendix C.

In addition, a total of three FLBs were prepared targeting the following material types:

- LMH Waste Rock
- RC Waste Rock

[2] Price, W.A. 2009: Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials Report prepared for MEND. Report 1.20.1, p. 1 - 579.

- UMH Waste Rock

FLBs were prepared from cuttings of the targeted lithology from reverse circulation drilling. Most of the subsamples were characterized by ABA and total metals similar to samples presented in the EIS, as were the final composite samples. The sample compositions are described in Table 13 to Table 15, attached in Appendix A, including the NPR where measured. A cement mixer was used to prepare representative composites of waste rock weighting between 92 and 157 kg (Table 1). These composites were placed in barrels draining to a container that collected the leachate.

Table 1 Field Leach Bin Material Mass

Upper Massive Hematite (kg)	Red Chert (kg)	Lower Massive Hematite (kg)
92	137	157

The tests started on October 4 of 2013 and leachates were sampled by Century staff in October 2013 and August, 2014. Field bin leachate was analyzed for pH, dissolved sulphate, mercury, alkalinity and dissolved metals by Maxxam Analytics in Mississauga, Ontario. Laboratory certificates are provided in Appendix D.

Leachate concentrations form the HCTs and FLBs were compared to MDMER limits and Canadian Council Ministers of the Environment Protection of Freshwater Aquatic Life (CCME FAL) limits. The CCME FAL limits for select species are based on hardness, pH and/or dissolved organic carbon, which were not measured directly in the leachate. The following assumptions were applied to estimate reasonable values for the guideline limit calculation, based on water quality monitoring in Joyce Lake presented in Appendix J of the EIS:

- Hardness (cadmium, copper, nickel, lead and zinc) – 23 mg/L.
- pH (aluminum) – 6.5.
- Dissolved Organic Carbon (DOC; zinc) – 0.5 mg/L.

It is notable that the assumptions used to calculate the CCME FAL limits were based on a single measurement from Joyce Lake from August 7, 2012. The same assumptions may not apply to future assessments.

RESULTS - STATIC TESTS

Table 2 presents the NAG pH result for each single step NAG test, and the corresponding NPR value from the EIS geochemistry work. An average NPR is shown where the NAG test was on a composite sample. A PAG designation is shown in bold.

Table 2 Summary of Single Step NAG Tests

Sample ID	Lithology[1]	NAG pH	NPR (NP/AP) [2]
492078	LMH	7.40	6.45
492094	LMH	6.89	3.87
492218	LMH	7.61	5.16
492220	LMH	6.92	4.52
492222	LMH	7.22	2.88

Reference: Joyce Lake Direct Shipping Ore Project ARD/ML Assessment Update

Table 2 Summary of Single Step NAG Tests

Sample ID	Lithology[1]	NAG pH	NPR (NP/AP) [2]
501065	LMH	6.52	**1.81**
502198	LMH	**3.88**	**0.69**
502197	LMH	**4.30**	6.45
502409	LMH	6.62	5.48
502413	LMH	5.55	3.87
492215	RC	7.30	5.16
492467	RC	6.68	4.84
501015	RC	6.80	5.48
501021/502393 Composite	RC	7.39	6.9 3
A00154738/40/43/47 Composite	UMH	6.86	5.97 3
A00154201/202/331/455/706 Composite	OB	7.18	9.87 3
A00154792	OB	6.66	10
A00154947	OB	7.73	12.7
OV-12	OB	5.42	**-3.87**
OV-13	OB	6.18	**0**
BS1LC1	Lump Concentrate	7.06	2.58
BS1SF1	Sinter Feed	7.35	4.52
BS2LC1/C2/C3 Composite	Lump Concentrate	7.08	2.26 3
BS2CSF1/F2/F3 Composite	Coarse Sinter Feed	7.23	2.80 3
BS2FSF1	Fines Sinter Feed	7.16	7.10
BS2T1/2/3 Composite	Tailings	7.15	3.55 3

Notes:

1. LMH – Lower Massive Hematite, RC – Red Chert, UMH – Upper Massive Hematite, OB - Overburden
2. NPR < 1 is considered to be PAG and NPR <2 is considered to be uncertain, as outlined in Appendix Q of the EIS. The NPR results from the ABA testing was impacted by the low sulfide and/or low carbonate content of the materials
3. The NPR for a composite sample was estimated as the average from the individual samples

In general, the results of the single step NAG tests support the conclusions made in the EIS. The RC and LMH are classified as non-PAG based on the median NAGpH and NPR values. There was only one single step NAG test for the UMH unit and the result indicated a non-PAG designation. The tailings and concentrate samples tested are also indicated to be non-PAG based on the NAG tests, which support the conclusions from the EIS. Single step NAG testing was not done on Ruth Shale samples, which was characterized as PAG from the ABA testing done in the EIS.

The NPR values indicated for the two overburden samples of 0 and -3.87. The sulfide content in both samples was below detection, which resulted in AP being zero in first sample. The acidity in the second sample is

likely related to organic acids (e.g., humic) released from soil. The overburden was classified as non-PAG in the EIS based on the median NPR of all samples, and confirmed by the results of the single step NAG tests.

Figure 1 presents a plot of NPR versus NAGpH, including the entire data set and the data with the low NAGpH results removed. Whilst the correlation coefficient is not particularly strong at $r^2 = 0.2$, a positive relationship is evident. The low NAGpH data points appear to be outliers on the graph; however, it is not clear if this is a result of a small dataset in this range.

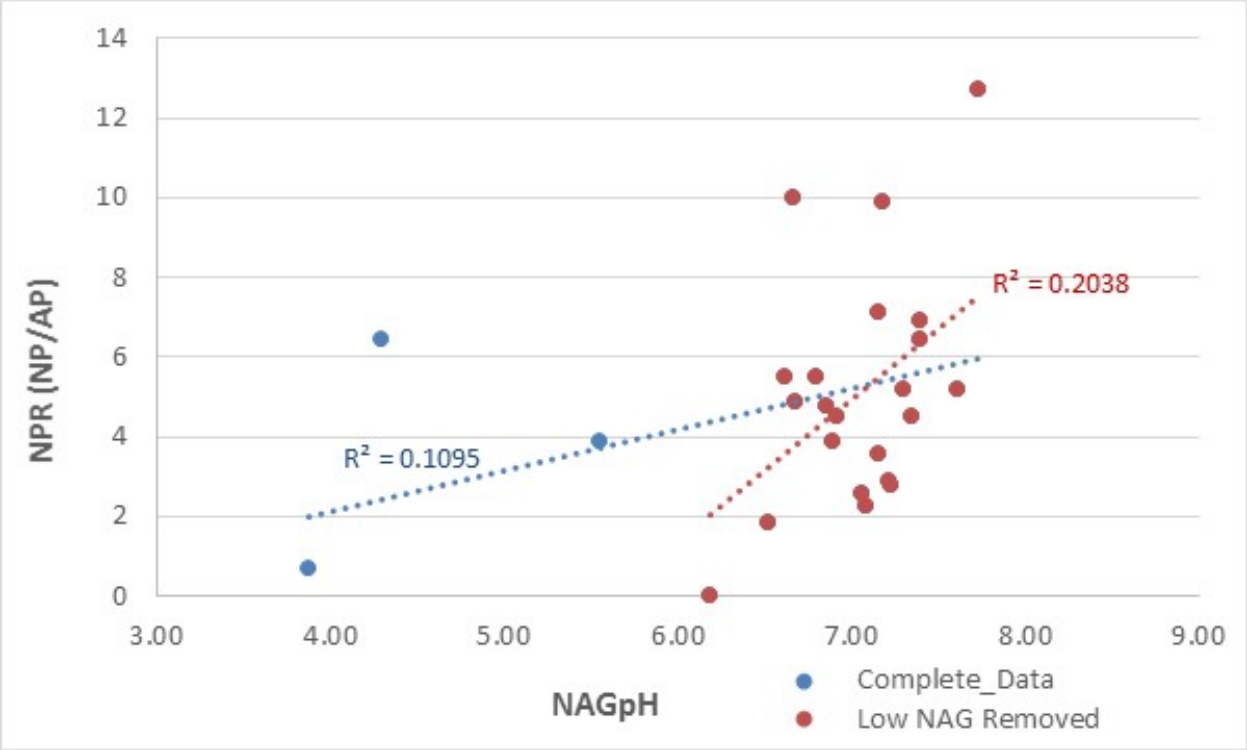

Figure 1 NPR versus NAGpH

RESULTS - KINETIC TESTS

In general, the pH of the leachate from the ore samples HCTs were around 6.0 to 6.1, which is slightly below within the CCME FAL guidelines of 6.5 to 9.0 (Figure 2). The exception was the LMH Ore – PAG HCT, which had a median pH of 4.37 between week 10 and 20. An acidic pH was expected for this HCT as the composite was of PAG samples. Figure 2 presents the trend for leachate pH versus testing week for each sample. It is clear that a reasonable steady state for pH was achieved for all HCTs. The trends in pH was generally steady except for the decreasing trend for LMH Ore – PAG, Composite RC ore and tailings between week 0 and 10.

Reference: Joyce Lake Direct Shipping Ore Project ARD/ML Assessment Update

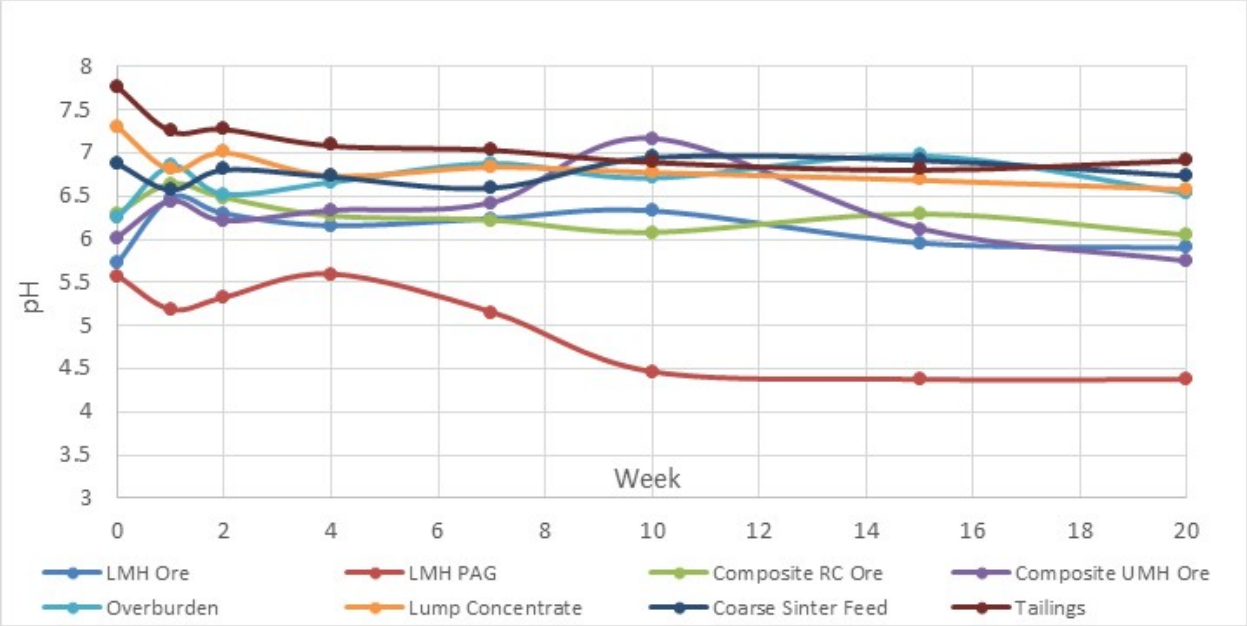

Figure 2 pH versus Testing Week for HCT Leachate

Table 16, attached within Appendix A, presents leachate concentrations for the HCTs and FLBs and the reference guidelines. The comparison of leachate concentrations with guideline limits focused on the median between week 10 to 20, as exceedances during earlier weeks indicate first flush effects, which are typically short lived. There were no MDMER exceedances between week 10 to 20. There were isolated exceedances with respect to CCME FAL for cadmium and zinc and additional exceedances for copper and selenium for the LMH PAG cell.

There were more exceedances in FLB leachate concentrations compared to HCT. The pH of the UMH composite FLB was 1.8, which is not supported by field measurement (pH=7.12). This more likely due to preservation error (i.e., perhaps if nitric acid was added to wrong bottle). In addition, low pH was not expected given the non-PAG characterization of the material. There were exceedances with respect to CCME FAL for at least two of the FLB for aluminum, arsenic, cadmium, copper, nickel and lead; however, there were no exceedances of MDMER limits.

In general, the results of the kinetic testing support of the conclusions outlined in the EIS. The metal leaching potential indicated from the kinetic tests are considered to be low given that there were no exceedances relative to MDMER in the HCT and FLB leachate. CCME FAL exceedances did occur and were relatively consistent for aluminum (up to 500 times above CCME FAL), arsenic (up to 12 times above CCME FAL), cadmium (up to 9 times above CCME FAL) and zinc (up to 40 times above CCME FAL) from the FLBs. CCME FAL is not applicable to mine discharges and was used only to screen potential contaminates of concern, which should be further addressed in water quality predictions.

Reference: Joyce Lake Direct Shipping Ore Project ARD/ML Assessment Update

CONCLUSIONS AND RECOMENDATIONS

In general, the rock units, concentrations and tailings that have gone through kinetic testing are characterized as non-PAG with a low potential for metal leaching. Kinetic testing has not yet been carried out on the Ruth Shale unit as it was not to be excavated under the mine plan in place at the time of the EIS. This unit has been characterized as PAG, and kinetic testing is recommended, including HCTs and FLBs.

The FLBs are still in place on site. It is recommended that the collection system be reconnected and sampling recommenced.

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Attachments:
Attachment A: Static Test Laboratory Certificates: Acid Base Accounting and Single Step NAG Tests
Attachment B: Kinetic Test Laboratory Certificates: Humidity Cell and Field Bin Leachate
Attachment C: Humidity Cell Laboratory Certificates
Attachment D: Field Leach Bin Laboratory Certificates

APPENDIX A
Tables

SINGLE STEP NAG TESTS

Table 3 presents the descriptions of the NAG tests where only a single sample was used in the test

Table 3 Single Step NAG Test Sample Descriptions - Singular Sample Tests

Borehole	Sample ID	Depth From (ft)	Depth To (ft)	Unit
Joy-11-07	492078	36	39	LMH
Joy-11-07	492094	75	78	LMH
Joy-11-10	492218	66	69	LMH
Joy-11-10	492220	72	75	LMH
Joy-11-10	492222	78	81	LMH
Joy-11-25	501065	6	9	LMH
Joy-11-35	502198	33	36	LMH
Joy-11-35	502197	30	33	LMH
Joy-11-41	502409	45	48	LMH
Joy-11-41	502413	54	57	LMH
Joy-11-10	492215	57	60	RC
Joy-11-15	492467	57	60	RC
Joy-11-23	501015	6	9	RC
Joy-12-83	A00154792	0	3	OB
Joy-12-90	A00154947	0	3	OB

Table 4 to Table 7 present the compositions of the NAG tests where a composite of samples was used in the test.

Table 4 Single Step NAG Test Sample Descriptions for 501021/502393 Composite

Borehole	Sample	Depth From (ft)	Depth To (ft)	Unit
Joy-11-23	501021	21	24	Red Chert
Joy-11-41	502393	3	6	

Table 5 Single Step NAG Test Sample Descriptions for A001547(38 40 43 47) Composite

Borehole	Sample	Depth From (ft)	Depth To (ft)	Unit
Joy-12-80	A00154738	3	6	Upper Massive Hematite
Joy-12-80	A00154740	9	12	
Joy-12-80	A00154743	18	21	
Joy-12-80	A00154747	30	33	

Table 6 Single Step NAG Test Sample Descriptions for A00154201 202 331 455 706 Composite

Borehole	Sample	Depth From (ft)	Depth To (ft)	Unit
Joy-12-62	A00154201	0	3	Overburden
Joy-12-62	A00154202	3	6	
Joy-12-68	A00154331	3	6	
Joy-12-70	A00154455	3	6	
Joy-12-79	A00154706	3	6	

Table 7 Single Step NAG Test Sample Descriptions for Overburden and Concentrates

Sample	Material
OV-12	Overburden
OV-13	Overburden
BS1LC1	Lump Concentrate
BS1SF1	Sinter Feed
BS2LC1/C2/C3 Composite	Lump Concentrate
BS2CSF1/F2/F3 Composite	Coarse Sinter Feed
BS2FSF1	Fines Sinter Feed
BS2T1/2/3 Composite	Tailings

HUMIDITY CELLS

Table 8 presents the descriptions of the HCTs where only a single sample was used in the test

Table 8 Humidity Cell Sample Description – Singular Samples

Borehole	Sample	Depth From (ft)	Depth To (ft)	NPR	NAG pH	Unit
Joy-11-25	501065	6	9	1.81	6.5	Lower Massive Hematite
Joy-11-35	502198	33	36	0.69	3.9	

Table 9 to

present the compositions of the HCTs and FLBs where a composite of samples was used in the test

Table 9 Humidity Cell Sample Composition of 501021/502393 Composite

Borehole	Sample	Depth From (ft)	Depth To (ft)	NPR	NAG pH	Unit
Joy-11-23	501021	21	24	2.9	-	Red Chert
Joy-11-41	502393	3	6	10.9	-	

Table 10 Humidity Cell Sample Composition of A001547(38 40 43 47) Composite

Borehole	Sample	Depth From (ft)	Depth To (ft)	NPR	NAG pH	Unit
Joy-12-80	A00154738	3	6	8.1	6.9	Upper Massive Hematite
Joy-12-80	A00154740	9	12	4.8		
Joy-12-80	A00154743	18	21	7.4		
Joy-12-80	A00154747	30	33	3.5		

Table 11 Humidity Cell Sample Composition of A00154201 202 331 455 706

Borehole	Sample	Depth From (ft)	Depth To (ft)	NPR	NAG pH	Unit
Joy-12-62	A00154201	0	3	10.65	7.2	Overburden
Joy-12-62	A00154202	3	6	9.68		
Joy-12-68	A00154331	3	6	4.2		
Joy-12-70	A00154455	3	6	14.2		
Joy-12-79	A00154706	3	6	10.6		

Table 12 Humidity Cell Sample Composition for Concentrates

Sample Name	Concentrate Type
BS2LC1 C2 C3 Composite	Lump Concentrate
BS2CSF1 F2 F3 Composite	Coarse Sinter Feed
BS2T1 2 3 Composite	Tailings

FIELD BINS

Table 13 to Table 15 present the compositions of the HCTs and FLBs where a composite of samples was used.

Table 13 Sample Composition of the UMH FLB

Borehole	Sample	Depth From (ft)	Depth To (ft)	NPR
Joy-12-46	1107542	12	15	3.59
Joy-12-46	1107544	18	21	2.79
Joy-12-46	1107545	21	24	14.5
Joy-12-46	1107546	24	27	13.1
Joy-12-46	1107547	27	30	12.3
Joy-12-54	1100092	15	18	12.9
Joy-12-54	1100094	21	24	-
Joy-12-54	1100095	24	27	-
Joy-12-54	1100101	39	42	8.39
Joy-12-54	1100102	42	45	10
Joy-12-54	1100104	48	51	11.9
Joy-12-54	1100105	51	54	9.7
Joy-12-54	1100106	54	57	9.0
UMH Composite Sample			3.7	

Table 14 Sample Composition of the RC FLB

Borehole	Sample	Depth From (ft)	Depth To (ft)	NPR
Joy-12-46	1107559	60	63	10.3
Joy-12-46	1107560	63	66	10.6
Joy-12-46	1107569	84	87	13.2
Joy-12-46	1107570	87	90	9.35
Joy-12-46	1107571	90	93	10.6
Joy-12-54	1100118	84	87	11.6
Joy-12-54	1100120	90	93	11.6
Joy-12-54	1100121	93	96	11.6
Joy-12-57	1107819	3	6	-
Joy-12-57	1107820	6	9	-
Joy-12-57	1107821	9	12	-
Joy-12-57	1107822	12	15	-
Joy-12-57	1107823	15	18	-
RC Composite Sample			3.4	

Table 15 Sample Composition of the LMH FLB

Borehole	Sample	Depth From (ft)	Depth To (ft)	NPR
Joy-12-46	1107572	93	96	4.19
Joy-12-46	1107573	96	99	5.48
Joy-12-46	1107577	105	108	5.48
Joy-12-46	1107578	108	109.5	4.52
Joy-12-54	1100127	108	111	5.48
Joy-12-54	1100128	111	114	-
Joy-12-54	1100129	114	117	-
Joy-12-54	1100130	117	120	3.23
Joy-12-57	1107826	21	24	-
Joy-12-57	1107830	33	36	-
Joy-12-57	1107831	36	39	-
Joy-12-57	1107864	46.5	48	5.81
Joy-12-57	1107865	48	51	-
Joy-12-57	1107866	51	54	-
Joy-12-57	1107871	63	66	-
LMH Composite Sample			6.8	

Table 16 Humidity Cell and Field Leach Bin Leachate Concentration Comparison to Guideline Limits

	Sample ID		501065 (LMH Ore)	502198 (LMH PAG ore)	501021/502393 Composite (RC Ore)	A001547(38 40 43 47) Composite (UMH Ore)	A00154201 202 331 455 706 (Overburden)	BS2LC1 C2 C3 Composite (Lump concentrate)	BS2CSF1 F2 F3 Composite (Coarse Sinter Feed)	BS2T1 2 3 Composite (tailings)	FLB (LMH Composite)	FLB (RC Composite)	FLB (UMH Composite)
	Guidelines		Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration
	MDMER[2]	CCME FAL[3]	10-20 weeks	10-20 weeks	10-20 weeks	10-20 weeks	10-20 weeks	10-20 weeks	10-20 weeks	10-20 weeks	8/16/2014	6/16/2014	8/17/2014
pH[2]	-	6.5-9.0	**5.96**	**4.37**	**6.08**	**6.12**	6.71	6.69	6.92	6.9	7.24 (6.91)	6.89(6.2)	**1.73 (7.12)**
Acidity[2]	-	-	1	3	1	1	1	1	1	1	5	16	
Alkalinity[2]	-	-	1	1	1	1	4	3	3	4	47	180	5
Conductivity[2]	-	-	28	50	7	8	30	10	8	25	100	440	110
Sulphate	-	-	9.8	13	1.4	0.2	5.6	0.9	0.2	0.6	1	20	1
Mercury	-	0.000026	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Silver	-	0.00025	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.00005	0.00005	0.00005
Aluminum	-	0.005 [4]	**0.010**	**0.110**	**0.010**	**0.005**	**0.020**	**0.005**	**0.010**	**0.030**	**0.084**	**0.35**	**2.3**
Arsenic	0.1	0.005	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0004	0.0017	**0.018**	**0.062**	**0.041**
Barium	-	-	0.00293	0.0136	0.00222	0.00153	0.00091	0.00031	0.00021	0.00041	0.12	0.021	0.07
Beryllium	-	-	0.00001	0.0002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.0005	0.0005	0.0005
Boron	-	1.5	0.0109	0.0042	0.003	0.004	0.0071	0.0026	0.0027	0.0013	0.029	0.053	0.01
Bismuth	-	-	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005			
Calcium	-	-	1.72	2.59	0.4	0.15	1.78	1.07	0.85	2.86	32	9.4	36
Cadmium	-	0.00005 [5]	0.000016	0.000037	0.000002	0.000002	0.000017	0.000002	0.000002	0.000002	**0.000092**	**0.00011**	**0.00045**
Cobalt	-	-	0.00101	0.00365	0.00028	0.00005	0.00020	0.00002	0.00002	0.00018	0.057	0.003	0.012
Chromium	-	0.001	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0005	**0.0013**	**0.01**
Copper	0.1	0.002 [5]	0.0005	**0.004**	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00048	**0.006**	**0.042**
Iron	-	0.3	0.0015	0.0015	0.0015	0.0015	0.024	0.0015	0.011	0.046	0.15	**1.1**	**9.7**
Potassium	-	-	0.08	0.20	0.04	0.19	0.71	0.10	0.15	0.08	8.7	0.33	2.3
Lithium		-	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00025	0.01	0.00022
Magnesium	-	-	0.86	1.21	0.26	0.10	1.10	0.27	0.23	0.37	28	5.2	19
Manganese	-	-	1.53	0.1610	0.1310	0.0423	0.461	0.0081	0.0008	0.0085	72	9.1	8.6
Molybdenum	-	0.073	0.000005	0.000005	0.00002	0.000005	0.00018	0.00028	0.00016	0.00019	0.0001	0.0001	0.0001
Sodium	-	-	0.05	0.03	0.02	0.55	0.32	0.05	0.14	0.2	2.3	0.87	7.3
Nickel	0.25	0.025 [5]	0.0024	0.0118	0.0030	0.0004	0.0004	0.0001	0.0001	0.0002	**0.094**	0.0072	**0.027**
Phosphorus		0.004-0.1 [6]	0.005	0.005	0.005	0.016	0.005	0.010	0.005	0.011	0.05	0.05	0.05
Lead	0.08	0.001 [5]	0.00001	0.00003	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00069	**0.0037**	**0.022**
Antimony	-	-	0.0005	0.0004	0.0004	0.0005	0.0004	0.0004	0.0004	0.0004	0.0003	0.0003	0.0003
Selenium	-	0.001	0.0005	**0.0090**	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00025	0.0001	0.00022
Silicon	-	-	0.75	1.37	0.90	0.82	0.90	0.62	1.21	0.45	49	54	80
Tin	-	-	0.00040	0.00033	0.00014	0.00025	0.00020	0.00032	0.00010	0.00012	0.001	0.0075	0.001
Strontium	-	-	0.0107	0.015	0.0044	0.0042	0.0067	0.0023	0.0023	0.0076	0.14	0.052	0.14

Table 16 Humidity Cell and Field Leach Bin Leachate Concentration Comparison to Guideline Limits

	Sample ID		501065 (LMH Ore)	502198 (LMH PAG ore)	501021/502393 Composite (RC Ore)	A001547(38 40 43 47) Composite (UMH Ore)	A00154201 202 331 455 706 (Overburden)	BS2LC1 C2 C3 Composite (Lump concentrate)	BS2CSF1 F2 F3 Composite (Coarse Sinter Feed)	BS2T1 2 3 Composite (tailings)	FLB (LMH Composite)	FLB (RC Composite)	FLB (UMH Composite)
	Guidelines		Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration	Median Concentration
	MDMER[2]	CCME FAL[3]	10-20 weeks	10-20 weeks	10-20 weeks	10-20 weeks	10-20 weeks	10-20 weeks	10-20 weeks	10-20 weeks	8/16/2014	6/16/2014	8/17/2014
Titanium	-	-	0.00005	0.00005	0.00005	0.00005	0.0002	0.00005	0.00005	0.00005	0.0005	0.0087	0.044
Thallium	-	0.0008	0.00001	0.00004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	-	-	-
Uranium	-	0.015	0.000002	0.000016	0.000002	0.000003	0.000007	0.000003	0.000005	0.000011	0.0005	0.00016	0.0017
Vanadium	-	-	0.00002	0.00002	0.00002	0.00002	0.00005	0.00002	0.00002	0.00004	0.0005	0.0005	0.0069
Tungsten	-	-	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	-	-	-
Yttrium	-	-	0.000004	0.000506	0.000007	0.000001	0.000007	0.000002	0.000005	0.000019	-	-	-
Zinc	0.5	0.0075	0.004	**0.01**	0.003	0.005	0.004	0.006	0.001	0.001	**0.3**	**0.037**	**0.17**

Notes:

1 -See table 1-1 for Lithology Code Description;

2 - pH concentration is presented in pH Units; acidity and alkalinity concentrations are presented as mg/L of $CaCO_3$ and loadings as mg/kg/week of $CaCO_3$; and conductivity concentration is presented in µS/cm;

3 - MDMER MAMMC - Maximum Authorized Monthly Mean Concentrations (MAMMC) of deleterious substances from Table 1 in Schedule 4 of the *Metal and Diamong Mining Effluent Regulations* (MDMER, 2021);

4 - CCME FAL - Canadian Environmental Quality Guidelines by Canadian Council of Ministers of the Environment (CCME) for Protection of Freshwater Aquatic Life (FAL), long term exposure (CCME, 1999)

5 - CCME FAL guidelines for aluminum were based on an assumed pH of less than 6.5

6 - CCME FAL guidelines for cadmium, copper, nickel, and lead were calculated using the hardness value of 23 mg/L from monitoring in Joyce Lake

7 - CCME FAL guidelines for phosphorus are established in the form of the trigger ranges, including ultra-oligotrophic <4, oligotrophic 4-10, mesotrophic .10-20, meso-eutrophic 20-35, eutrophic 35-100, hyper-eutrophic >100; Detection limits for the FLB analysis were above the lower CCME FAL guideline

Exceedances of MMER and CCME FAL guidelines are shaded and bolded, respectively.

Field pH values are shown in brackets.

References:

1. Canadian Council of Ministers of the Environment (CCME). 1999. Canadian water quality guidelines for the protection of aquatic life: Summary Table. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

APPENDIX B

Single Step NAG Tests Laboratory Certificates

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

12-July-2013

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 19 April 2013
LR Report: **CA14161-MAY13**
Reference: Century Iron Mines

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample weight g	Vol H2O2 mL	Final pH units	NaOH Normality	Vol NaOH to PH 4.5 mL	Vol NaOH to PH 7.0 mL	NAG (pH 4.5) kg H2SO4/tonne	NAG (pH 7.0) kg H2SO4/tonne
3: Analysis Approval Date	07-Jun-13	07-Jun-13	07-Jun-13	07-Jun-13	07-Jun-13	07-Jun-13	07-Jun-13	07-Jun-13
4: Analysis Approval Time	10:09	10:09	10:09	10:09	10:09	10:09	10:09	10:09
5: 492078	1.52	150	7.40	0.10	0.00	0.00	0.0	0.0
6: 492094	1.53	150	6.89	0.10	0.00	0.20	0.0	0.6
7: 492218	1.51	150	7.61	0.10	0.00	0.00	0.0	0.0
8: 492220	1.53	150	6.92	0.10	0.00	0.11	0.0	0.4
9: 492222	1.51	150	7.22	0.10	0.00	0.00	0.0	0.0
10: 501065	1.53	150	6.52	0.10	0.00	0.32	0.0	1.0
11: 502198	1.52	150	3.88	0.10	0.61	0.95	2.0	3.1
12: 502197	1.50	150	4.30	0.10	0.30	1.20	1.0	3.9
13: 502409	1.50	150	6.62	0.10	0.00	0.21	0.0	0.7
14: 502413	1.49	150	5.55	0.10	0.00	0.41	0.0	1.3
15: 492215	1.50	150	7.30	0.10	0.00	0.00	0.0	0.0
16: 492467	1.48	150	6.68	0.10	0.00	0.44	0.0	1.5
17: 501015	1.53	150	6.80	0.10	0.00	0.12	0.0	0.4
18: 501021/502393 Composite	1.50	150	7.39	0.10	0.00	0.00	0.0	0.0
19: A00154738/40/43/47 Composite	1.51	150	6.86	0.10	0.00	0.19	0.0	0.6
20: A00154201/202/331/455/706 Composite	1.49	150	7.18	0.10	0.00	0.00	0.0	0.0
21: A00154792	1.53	150	6.66	0.10	0.00	0.20	0.0	0.6

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

NAG Test

LR Report : **CA14161-MAY13**

Sample ID	Sample weight g	Vol H2O2 mL	Final pH units	NaOH Normality	Vol NaOH to PH 4.5 mL	Vol NaOH to PH 7.0 mL	NAG (pH 4.5) kg H2SO4/tonne	NAG (pH 7.0) kg H2SO4/tonne
22: A00154947	1.48	150	7.73	0.10	0.00	0.00	0.0	0.0
23: OV-12	1.54	150	5.42	0.10	0.00	1.38	0.0	4.4
24: OV-13	1.58	150	6.18	0.10	0.00	0.30	0.0	0.9
25: BS1LC1	1.53	150	7.06	0.10	0.00	0.00	0.0	0.0
26: BS1SF1	1.55	150	7.35	0.10	0.00	0.00	0.0	0.0
27: BS2LC1/C2/C3 Composite	1.48	150	7.08	0.10	0.00	0.00	0.0	0.0
28: BS2CSF1/F2/F3 Composite	1.47	150	7.23	0.10	0.00	0.00	0.0	0.0
29: BS2FSF1	1.51	150	7.16	0.10	0.00	0.00	0.0	0.0
30: BS2T1/2/3 Composite	1.54	150	7.15	0.10	0.00	0.00	0.0	0.0

NAG = (49 x Vol. of base x N of base)/sample weight
kg H2SO4/tonne

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Canada Inc.
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17-June-2013

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 19 April 2013
LR Report: **CA14160-MAY13**
Reference: Century Iron Mines

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=7.0 mL	Final pH units	NP t CaCO3/1000 t	Carbonate %	Total Inorganic Carbon %
3: Analysis Approval Date	30-May-13	30-May-13	30-May-13	30-May-13	30-May-13	30-May-13	30-May-13	30-May-13	30-May-13	30-May-13	30-May-13
4: Analysis Approval Time	15:52	15:52	15:52	15:52	15:52	15:52	15:52	15:52	15:52	16:11	16:11
5: 492078	6.89	1	2.03	20.00	0.10	0.10	11.80	2.07	20	0.070	0.010
6: 492094	6.70	1	2.09	20.00	0.10	0.10	13.26	2.03	16	0.090	0.020
7: 492218	5.79	1	1.98	20.00	0.10	0.10	12.54	2.05	19	0.115	0.020
8: 492220	5.31	1	2.04	20.00	0.10	0.10	12.91	2.02	17	0.095	0.020
9: 492222	5.94	1	2.03	20.00	0.10	0.10	11.97	2.08	20	0.245	0.050
10: 501065	6.04	1	2.04	20.00	0.10	0.10	11.64	2.09	20	0.190	0.040
11: 502198	5.36	1	2.03	20.00	0.10	0.10	12.24	2.10	19	0.280	0.060
12: 502197	5.13	1	2.04	20.00	0.10	0.10	11.79	2.07	20	0.295	0.060
13: 502409	6.12	1	2.08	20.00	0.10	0.10	12.68	2.09	18	0.075	0.020
14: 502413	6.15	1	2.12	20.00	0.10	0.10	12.68	2.03	17	0.070	0.010
15: 492215	5.54	1	2.03	20.00	0.10	0.10	12.49	2.05	18	0.120	0.020
16: 492467	6.02	1	2.05	20.00	0.10	0.10	11.38	2.13	21	0.150	0.030
17: 501015	6.28	1	2.07	20.00	0.10	0.10	11.52	2.16	20	0.090	0.020
18: 501021/502393 Composite	5.98	1	2.03	20.00	0.10	0.10	9.71	2.16	25	0.215	0.040
19: A00154738/40/43/47 Composite	6.11	1	2.08	20.00	0.10	0.10	13.51	2.05	16	0.140	0.030
20: A00154201/202/331/455/706 Composite	5.89	1	2.02	20.00	0.10	0.10	12.78	2.10	18	0.774	0.160
21: A00154792	6.52	1	2.02	20.00	0.10	0.10	12.03	2.08	20	0.160	0.030
22: A00154947	6.18	1	2.03	20.00	0.10	0.10	11.05	2.19	22	1.64	0.330
23: OV-12	4.86	1	2.03	20.00	0.10	0.10	12.29	2.43	19	4.40	0.880
24: OV-13	5.33	1	2.07	20.00	0.10	0.10	12.11	2.53	19	2.59	0.520
25: BS1LC1	---	---	---	---	---	---	---	---	---	0.150	0.030

SGS Canada Inc.
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Standard ABA with Peroxide addition (siderite NP)

LR Report : **CA14160-MAY13**

Sample ID	Paste pH units	Fizz Rate ---	Sample weight g	HCl added mL	HCl Normality	NaOH Normality	NaOH to pH=7.0 mL	Final pH units	NP t CaCO3/1000 t	Carbonate %	Total Inorganic Carbon %
26: BS1SF1	---	---	---	---	---	---	---	---	---	0.150	0.030
27: BS2LC1/C2/C3 Composite	7.05	1	2.03	20.00	0.10	0.10	17.30	2.27	6.7	0.090	0.020
28: BS2CSF1/F2/F3 Composite	6.94	1	2.01	20.00	0.10	0.10	15.54	2.30	11	0.185	0.040
29: BS2FSF1	---	---	---	---	---	---	---	---	---	0.140	0.030
30: BS2T1/2/3 Composite	---	---	---	---	---	---	---	---	---	0.135	0.030

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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APPENDIX C

Humidity Cell Laboratory Certificates

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

21-February-2014

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 14 May 2013
LR Report: **CA10155-MAY13**
Reference: Wk#0

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#0	6: 502198 Wk#0	7: 501021/502393 Composite Wk#0	8: A00154738/40/43 /47 Composite Wk#0	9: A00154201/202/33 1/455/706 Composite Wk#0	10: BS2LC1/C2/C3 Composite Wk#0	11: BS2CSF1/F2/F3 Composite Wk#0	12: BS2T1/2/3 Composite Wk#0
Sample Date & Time			14-May-13	14-May-13	14-May-13	14-May-13	14-May-13	14-May-13	14-May-13	14-May-13
Hum Cell Leachate Volume [mL]	---	---	314	498	435	310	351	614	526	224
pH [units]	16-May-13	14:51	5.73	5.57	6.30	6.02	6.25	7.31	6.88	7.77
Acidity [mg/L as CaCO3]	16-May-13	14:51	3	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Alkalinity [mg/L as CaCO3]	16-May-13	14:51	< 2	< 2	< 2	< 2	3	12	6	14
Conductivity [µS/cm]	16-May-13	14:51	15	18	9	11	24	76	59	66
Sulphate [mg/L]	16-May-13	08:56	2.9	4.5	< 0.2	0.4	0.9	11	5.0	3.8
Mercury [mg/L]	17-May-13	11:19	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00002	0.00002	< 0.00001
Silver [mg/L]	17-May-13	11:31	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Aluminum [mg/L]	16-May-13	12:11	0.02	< 0.01	0.03	0.02	0.02	0.03	0.02	0.03
Arsenic [mg/L]	17-May-13	11:31	< 0.0002	0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0003	0.0008
Barium [mg/L]	17-May-13	11:31	0.00134	0.00346	0.00169	0.00117	0.00276	0.00342	0.00253	0.00102
Beryllium [mg/L]	17-May-13	11:31	< 0.00002	0.00003	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	17-May-13	11:31	0.0104	0.0058	0.0015	0.0026	0.0049	0.0125	0.0040	0.0023
Bismuth [mg/L]	17-May-13	11:31	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	16-May-13	12:11	1.01	0.89	0.89	0.35	1.57	7.82	3.81	5.96
Cadmium [mg/L]	17-May-13	11:31	0.000004	0.000006	< 0.000003	< 0.000003	0.000053	< 0.000003	< 0.000003	< 0.000003
Cobalt [mg/L]	17-May-13	11:31	0.000273	0.000465	0.000236	0.000129	0.000807	0.000112	0.000106	0.000092
Chromium [mg/L]	17-May-13	11:31	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0015	0.0015

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA10155-MAY13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#0	6: 502198 Wk#0	7: 501021/502393 Composite Wk#0	8: A00154738/40/43 /47 Composite Wk#0	9: A00154201/202/33 1/455/706 Composite Wk#0	10: BS2LC1/C2/C3 Composite Wk#0	11: BS2CSF1/F2/F3 Composite Wk#0	12: BS2T1/2/3 Composite Wk#0
Copper [mg/L]	17-May-13	11:31	< 0.0005	0.0013	0.0007	< 0.0005	0.0006	< 0.0005	0.0013	< 0.0005
Iron [mg/L]	16-May-13	12:11	< 0.003	< 0.003	< 0.003	0.023	0.003	0.004	0.041	0.070
Potassium [mg/L]	16-May-13	12:11	0.172	0.436	0.143	0.270	1.30	1.45	2.05	0.437
Lithium [mg/L]	17-May-13	11:31	< 0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	0.001
Magnesium [mg/L]	16-May-13	12:11	0.483	0.252	0.191	0.095	0.734	1.80	0.910	0.802
Manganese [mg/L]	17-May-13	11:31	0.0810	0.0147	0.0311	0.0230	0.994	0.0402	0.00225	0.00046
Molybdenum [mg/L]	17-May-13	11:31	0.00005	< 0.00001	0.00003	0.00001	0.00008	0.00048	0.00005	0.00010
Sodium [mg/L]	16-May-13	12:11	0.10	0.23	0.10	0.91	0.31	1.59	3.88	1.49
Nickel [mg/L]	17-May-13	11:32	0.0007	0.0010	0.0011	0.0002	0.0010	< 0.0001	< 0.0001	0.0002
Phosphorus [mg/L]	16-May-13	12:11	< 0.009	< 0.009	< 0.009	< 0.009	0.010	< 0.009	< 0.009	0.015
Lead [mg/L]	17-May-13	11:32	< 0.00002	< 0.00002	0.00004	< 0.00002	< 0.00002	< 0.00002	0.00013	< 0.00002
Antimony [mg/L]	17-May-13	11:32	0.0005	0.0005	0.0007	0.0006	0.0004	0.0005	0.0005	0.0006
Selenium [mg/L]	17-May-13	11:32	< 0.001	0.027	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silicon [mg/L]	16-May-13	12:11	0.38	1.20	0.27	0.39	0.56	0.74	1.99	0.83
Tin [mg/L]	17-May-13	11:32	0.00257	0.00208	0.0295	0.00222	0.00237	0.00796	0.00654	0.00396
Strontium [mg/L]	16-May-13	12:11	0.0079	0.0038	0.0043	0.0048	0.0094	0.0240	0.0112	0.0177
Titanium [mg/L]	17-May-13	11:32	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Thallium [mg/L]	17-May-13	11:32	< 0.00002	0.00010	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	17-May-13	11:32	0.000012	0.000010	0.000006	0.000003	0.000009	0.000016	0.000009	0.000008
Vanadium [mg/L]	17-May-13	11:32	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	0.00004
Tungsten [mg/L]	17-May-13	11:32	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	17-May-13	11:32	0.000007	0.000020	0.000005	0.000002	0.000008	0.000006	0.000017	0.000020
Zinc [mg/L]	16-May-13	12:11	< 0.002	0.006	< 0.002	0.002	0.003	< 0.002	0.003	< 0.002

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21-February-2014

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900, Montreal
Canada, H3B 4G7
Phone: 514-228-5034, Fax:514-228-5643

Date Rec. : 21 May 2013
LR Report: **CA10157-MAY13**
Reference: Wk#1

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#1	6: 502198 Wk#1	7: 501021/502393 Composite Wk#1	8: A00154738/40/43 /47 Composite Wk#1	9: A00154201/202/33 1/455/706 Composite Wk#1	10: BS2LC1/C2/C3 Composite Wk#1	11: BS2CSF1/F2/F3 Composite Wk#1	12: BS2T1/2/3 Composite Wk#1
Sample Date & Time			21-May-13	21-May-13	21-May-13	21-May-13	21-May-13	21-May-13	21-May-13	21-May-13
Hum Cell Leachate Volume [mL]	---	---	315	496	492	284	351	488	441	397
pH [units]	28-May-13	14:22	6.48	5.18	6.64	6.44	6.85	6.81	6.58	7.26
Acidity [mg/L as CaCO3]	28-May-13	14:22	2	3	< 2	2	< 2	< 2	< 2	< 2
Alkalinity [mg/L as CaCO3]	28-May-13	14:22	2	< 2	2	< 2	10	6	2	11
Conductivity [µS/cm]	28-May-13	14:22	23	21	20	22	60	41	21	45
Sulphate [mg/L]	27-May-13	15:01	4.8	5.0	0.9	1.4	6.6	8.0	3.8	3.4
Mercury [mg/L]	23-May-13	07:57	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Silver [mg/L]	23-May-13	09:22	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Aluminum [mg/L]	23-May-13	08:36	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Arsenic [mg/L]	23-May-13	09:22	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002	0.0004	0.0010
Barium [mg/L]	23-May-13	09:22	0.00197	0.00430	0.00578	0.00142	0.00263	0.00130	0.00054	0.00084
Beryllium [mg/L]	23-May-13	09:22	< 0.00002	0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	23-May-13	09:22	0.0125	0.0062	0.0067	0.0102	0.0111	0.0088	0.0044	0.0025
Bismuth [mg/L]	23-May-13	09:22	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	23-May-13	08:36	1.78	0.80	1.22	0.34	3.91	4.21	0.98	5.49
Cadmium [mg/L]	23-May-13	09:22	0.000004	0.000011	0.000006	< 0.000003	0.000045	0.000003	< 0.000003	0.000007
Cobalt [mg/L]	23-May-13	09:22	0.000124	0.000747	0.000370	0.000096	0.000600	0.000037	0.000027	0.000152
Chromium [mg/L]	23-May-13	09:22	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0030	< 0.0005

OnLine LIMS

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LR Report : **CA10157-MAY13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#1	6: 502198 Wk#1	7: 501021/502393 Composite Wk#1	8: A00154738/40/43 /47 Composite Wk#1	9: A00154201/202/33 1/455/706 Composite Wk#1	10: BS2LC1/C2/C3 Composite Wk#1	11: BS2CSF1/F2/F3 Composite Wk#1	12: BS2T1/2/3 Composite Wk#1
Copper [mg/L]	23-May-13	09:22	0.0009	0.0011	0.0005	0.0006	0.0011	< 0.0005	0.0015	0.0008
Iron [mg/L]	23-May-13	08:36	< 0.003	< 0.003	< 0.003	< 0.003	0.006	< 0.003	0.020	0.039
Potassium [mg/L]	23-May-13	08:36	0.107	0.362	0.198	0.400	1.66	0.371	0.423	0.282
Lithium [mg/L]	23-May-13	09:22	< 0.001	< 0.001	0.005	< 0.001	0.001	< 0.001	< 0.001	0.001
Magnesium [mg/L]	23-May-13	08:36	0.712	0.371	0.574	0.124	2.24	1.06	0.266	0.744
Manganese [mg/L]	23-May-13	09:22	0.0487	0.0342	0.0824	0.0397	1.46	0.0148	0.00128	0.0159
Molybdenum [mg/L]	23-May-13	09:22	0.00008	0.00001	0.00006	0.00008	0.00015	0.00037	0.00013	0.00017
Sodium [mg/L]	23-May-13	08:37	0.12	0.29	0.22	2.16	1.19	0.71	1.59	1.26
Nickel [mg/L]	23-May-13	09:22	< 0.0001	0.0014	0.0029	0.0003	0.0001	0.0001	0.0001	0.0003
Phosphorus [mg/L]	23-May-13	08:37	< 0.009	< 0.009	< 0.009	0.010	< 0.009	< 0.009	0.011	< 0.009
Lead [mg/L]	23-May-13	09:22	0.00010	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Antimony [mg/L]	23-May-13	09:22	0.0005	0.0003	0.0006	0.0007	0.0005	0.0005	0.0005	0.0005
Selenium [mg/L]	23-May-13	09:22	< 0.001	0.029	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silicon [mg/L]	23-May-13	08:37	0.51	1.66	1.78	1.55	1.02	0.82	1.71	0.78
Tin [mg/L]	23-May-13	09:22	0.0110	0.00125	0.00454	0.00214	0.00177	0.00284	0.00089	0.00122
Strontium [mg/L]	23-May-13	08:37	0.0080	0.0041	0.0097	0.0049	0.0169	0.0083	0.0027	0.0154
Titanium [mg/L]	23-May-13	09:23	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Thallium [mg/L]	23-May-13	09:23	< 0.00002	0.00005	< 0.00002	< 0.00002	< 0.00002	< 0.00002	0.00004	< 0.00002
Uranium [mg/L]	23-May-13	09:23	0.000007	0.000007	0.000006	0.000004	0.000004	0.000007	0.000006	0.000012
Vanadium [mg/L]	23-May-13	09:23	0.00004	0.00005	0.00004	0.00003	0.00010	0.00007	0.00004	0.00009
Tungsten [mg/L]	23-May-13	09:23	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	23-May-13	09:23	0.000005	0.000024	0.000008	0.000001	0.000006	0.000002	0.000016	0.000016
Zinc [mg/L]	23-May-13	08:37	0.004	0.008	0.002	0.006	< 0.002	< 0.002	< 0.002	< 0.002

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21-February-2014

Labec Century Iron Ore Inc
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Date Rec. : 28 May 2013
LR Report: **CA10176-MAY13**
Reference: Wk#2

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#2	6: 502198 Wk#2	7: 501021/502393 Composite Wk#2	8: A00154738/40/43 /47 Composite Wk#2	9: A00154201/202/33 1/455/706 Composite Wk#2	10: BS2LC1/C2/C3 Composite Wk#2	11: BS2CSF1/F2/F3 Composite Wk#2	12: BS2T1/2/3 Composite Wk#2
Sample Date & Time			28-May-13	28-May-13	28-May-13	28-May-13	28-May-13	28-May-13	28-May-13	28-May-13
Hum Cell Leachate Volume [mL]	---	---	318	499	517	289	368	498	467	378
pH [units]	30-May-13	11:37	6.30	5.32	6.48	6.21	6.52	7.01	6.81	7.28
Acidity [mg/L as CaCO3]	30-May-13	11:37	< 2	2	< 2	< 2	< 2	< 2	< 2	< 2
Alkalinity [mg/L as CaCO3]	30-May-13	11:37	2	< 2	< 2	< 2	9	5	2	10
Conductivity [µS/cm]	30-May-13	11:37	46	18	9	15	58	26	11	29
Sulphate [mg/L]	30-May-13	10:50	16	5.6	0.8	1.1	8.4	5.0	1.4	2.1
Mercury [mg/L]	31-May-13	14:45	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Silver [mg/L]	30-May-13	11:42	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Aluminum [mg/L]	30-May-13	13:30	< 0.01	0.03	0.02	0.02	0.02	< 0.01	0.01	0.02
Arsenic [mg/L]	30-May-13	11:42	< 0.0002	0.0005	< 0.0002	< 0.0002	0.0002	< 0.0002	0.0005	0.0013
Barium [mg/L]	30-May-13	11:42	0.00132	0.00512	0.00356	0.00111	0.00274	0.00077	0.00043	0.00059
Beryllium [mg/L]	30-May-13	11:42	< 0.00002	0.00003	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	30-May-13	11:42	0.0287	0.0050	0.0038	0.0069	0.0116	0.0060	0.0033	0.0013
Bismuth [mg/L]	30-May-13	11:42	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	30-May-13	13:29	3.42	0.93	0.63	0.22	4.07	2.75	0.61	3.64
Cadmium [mg/L]	30-May-13	11:42	0.000006	0.000064	0.000005	0.000003	0.000196	< 0.000003	0.000003	0.000004
Cobalt [mg/L]	30-May-13	11:42	0.000229	0.000877	0.000330	0.000051	0.000821	0.000013	0.000014	0.000124
Chromium [mg/L]	30-May-13	11:42	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0028	< 0.0005

OnLine LIMS

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LR Report : **CA10176-MAY13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#2	6: 502198 Wk#2	7: 501021/502393 Composite Wk#2	8: A00154738/40/43 /47 Composite Wk#2	9: A00154201/202/33 1/455/706 Composite Wk#2	10: BS2LC1/C2/C3 Composite Wk#2	11: BS2CSF1/F2/F3 Composite Wk#2	12: BS2T1/2/3 Composite Wk#2
Copper [mg/L]	30-May-13	11:42	< 0.0005	0.0020	< 0.0005	< 0.0005	0.0018	< 0.0005	< 0.0005	< 0.0005
Iron [mg/L]	30-May-13	13:29	< 0.003	< 0.003	< 0.003	< 0.003	0.014	0.005	0.016	0.037
Potassium [mg/L]	30-May-13	13:29	0.111	0.305	0.086	0.258	1.47	0.259	0.268	0.166
Lithium [mg/L]	30-May-13	11:42	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium [mg/L]	30-May-13	13:29	1.93	0.451	0.345	0.076	2.53	0.715	0.167	0.501
Manganese [mg/L]	30-May-13	11:42	0.105	0.0496	0.0928	0.0318	1.62	0.00746	0.00096	0.00636
Molybdenum [mg/L]	30-May-13	11:42	< 0.00001	< 0.00001	0.00011	0.00005	0.00013	0.00037	0.00015	0.00016
Sodium [mg/L]	30-May-13	13:30	0.13	0.22	0.10	1.33	1.12	0.36	0.88	0.64
Nickel [mg/L]	30-May-13	11:42	< 0.0001	0.0022	0.0033	0.0003	0.0004	< 0.0001	< 0.0001	0.0004
Phosphorus [mg/L]	30-May-13	13:30	< 0.009	< 0.009	< 0.009	< 0.009	0.012	< 0.009	0.012	0.011
Lead [mg/L]	30-May-13	13:30	< 0.00002	0.00002	< 0.00002	0.00003	< 0.00002	< 0.00002	0.00003	< 0.00002
Antimony [mg/L]	30-May-13	11:42	0.0003	0.0003	0.0004	0.0005	0.0004	0.0005	0.0004	0.0004
Selenium [mg/L]	30-May-13	11:42	< 0.001	0.026	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001
Silicon [mg/L]	30-May-13	13:30	1.42	1.58	1.17	1.20	1.23	0.77	1.52	0.53
Tin [mg/L]	30-May-13	11:43	0.00176	0.00064	0.00057	0.00119	0.00087	0.00089	0.00040	0.00045
Strontium [mg/L]	30-May-13	13:30	0.0136	0.0052	0.0060	0.0031	0.0175	0.0054	0.0018	0.0098
Titanium [mg/L]	30-May-13	11:43	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001
Thallium [mg/L]	30-May-13	11:43	< 0.00002	0.00004	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	30-May-13	11:43	0.000001	0.000002	0.000002	0.000003	0.000008	0.000006	0.000008	0.000015
Vanadium [mg/L]	30-May-13	11:43	< 0.00003	0.00004	0.00122	< 0.00003	0.00007	< 0.00003	< 0.00003	0.00008
Tungsten [mg/L]	30-May-13	11:43	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	30-May-13	11:43	0.000004	0.000025	0.000004	0.000002	0.000010	0.000004	0.000013	0.000015
Zinc [mg/L]	30-May-13	13:30	0.006	0.010	0.003	0.004	0.005	< 0.002	< 0.002	< 0.002

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21-February-2014

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Date Rec. : 04 June 2013
LR Report: **CA10018-JUN13**
Reference: Wk# 3

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk# 3	04-Jun-13	324
6: 502198 Wk# 3	04-Jun-13	498
7: 501021/502393 Composite Wk# 3	04-Jun-13	496
8: A00154738/40/43/47 Composite Wk# 3	04-Jun-13	302
9: A00154201/202/331/455/706 Composite Wk# 3	04-Jun-13	351
10: BS2LC1/C2/C3 Composite Wk# 3	04-Jun-13	489
11: BS2CSF1/F2/F3 Composite Wk# 3	04-Jun-13	438
12: BS2T1/2/3 Composite Wk# 3	04-Jun-13	358

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21-February-2014

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Date Rec. : 11 June 2013
LR Report: **CA10062-JUN13**
Reference: Wk#4

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#4	6: 502198 Wk#4	7: 501021/502393 Composite Wk#4	8: A00154738/40/43/47 Composite Wk#4	9: A00154201/202/331/455/706 Composite Wk#4	10: BS2LC1/C2/C3 Composite Wk#4	11: BS2CSF1/F2/F3 Composite Wk#4	12: BS2T1/2/3 Composite Wk#4
Sample Date & Time			11-Jun-13	11-Jun-13	11-Jun-13	11-Jun-13	11-Jun-13	11-Jun-13	11-Jun-13	11-Jun-13
Hum Cell Leachate Volume [mL]	---	---	330	515	505	290	387	517	519	392
pH [units]	13-Jun-13	13:41	6.16	5.59	6.27	6.33	6.66	6.74	6.73	7.09
Acidity [mg/L as CaCO3]	13-Jun-13	13:41	2	4	< 2	< 2	< 2	< 2	< 2	< 2
Alkalinity [mg/L as CaCO3]	13-Jun-13	13:41	< 2	< 2	< 2	< 2	8	4	4	8
Conductivity [µS/cm]	13-Jun-13	13:41	31	44	12	10	56	16	11	29
Sulphate [mg/L]	17-Jun-13	15:09	9.0	12	1.1	1.1	8.3	2.3	0.6	1.9
Mercury [mg/L]	14-Jun-13	07:59	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Silver [mg/L]	17-Jun-13	08:35	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Aluminum [mg/L]	13-Jun-13	08:50	< 0.01	0.07	< 0.01	0.02	0.03	< 0.01	< 0.01	< 0.01
Arsenic [mg/L]	17-Jun-13	08:35	< 0.0002	0.0003	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0004	0.0016
Barium [mg/L]	17-Jun-13	08:35	0.00275	0.0110	0.00299	0.00087	0.00191	0.00051	0.00052	0.00054
Beryllium [mg/L]	17-Jun-13	08:35	< 0.00002	0.00008	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	17-Jun-13	08:35	0.0120	0.0042	0.0026	0.0048	0.0102	0.0039	0.0026	0.0008
Bismuth [mg/L]	17-Jun-13	08:35	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	13-Jun-13	08:50	2.12	2.23	0.56	0.17	3.61	1.97	0.83	3.59
Cadmium [mg/L]	17-Jun-13	08:35	< 0.000003	0.000019	0.000003	< 0.000003	0.000036	< 0.000003	< 0.000003	< 0.000003
Cobalt [mg/L]	17-Jun-13	08:35	0.000151	0.00209	0.000281	0.000041	0.000477	0.000012	0.000018	0.000130
Chromium [mg/L]	17-Jun-13	08:36	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0014	< 0.0005

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LR Report : **CA10062-JUN13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#4	6: 502198 Wk#4	7: 501021/502393 Composite Wk#4	8: A00154738/40/43/47 Composite Wk#4	9: A00154201/202/331/455/706 Composite Wk#4	10: BS2LC1/C2/C3 Composite Wk#4	11: BS2CSF1/F2/F3 Composite Wk#4	12: BS2T1/2/3 Composite Wk#4
Copper [mg/L]	17-Jun-13	08:36	< 0.0005	0.0019	< 0.0005	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005
Iron [mg/L]	13-Jun-13	08:50	< 0.003	< 0.003	< 0.003	< 0.003	0.032	0.006	0.036	0.124
Potassium [mg/L]	13-Jun-13	08:50	0.063	0.406	0.068	0.229	1.29	0.187	0.264	0.131
Lithium [mg/L]	17-Jun-13	08:36	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium [mg/L]	13-Jun-13	08:50	1.16	1.10	0.345	0.071	2.23	0.495	0.229	0.474
Manganese [mg/L]	17-Jun-13	08:36	0.102	0.101	0.114	0.0259	1.25	0.00983	0.00209	0.00441
Molybdenum [mg/L]	17-Jun-13	08:36	0.00001	< 0.00001	0.00002	0.00004	0.00015	0.00038	0.00014	0.00018
Sodium [mg/L]	13-Jun-13	08:50	0.07	0.22	0.07	1.00	0.96	0.20	0.68	0.54
Nickel [mg/L]	17-Jun-13	08:36	0.0004	0.0067	0.0034	0.0002	0.0007	< 0.0001	< 0.0001	0.0002
Phosphorus [mg/L]	13-Jun-13	08:50	< 0.009	< 0.009	< 0.009	0.022	< 0.009	0.009	0.016	< 0.009
Lead [mg/L]	17-Jun-13	08:36	< 0.00002	0.00002	< 0.00002	< 0.00002	0.00002	< 0.00002	< 0.00002	< 0.00002
Antimony [mg/L]	17-Jun-13	08:36	0.0004	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004
Selenium [mg/L]	17-Jun-13	08:36	< 0.001	0.022	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silicon [mg/L]	13-Jun-13	08:50	0.71	1.67	1.10	1.01	1.21	0.74	1.47	0.53
Tin [mg/L]	17-Jun-13	08:36	0.00157	0.00052	0.00023	0.00051	0.00034	0.00050	0.00033	0.00019
Strontium [mg/L]	13-Jun-13	08:50	0.0084	0.0122	0.0057	0.0023	0.0145	0.0038	0.0024	0.0097
Titanium [mg/L]	17-Jun-13	08:36	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0003	< 0.0001	< 0.0001	0.0001
Thallium [mg/L]	17-Jun-13	08:36	< 0.00002	0.00006	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	17-Jun-13	08:36	0.000002	0.000009	0.000003	0.000003	0.000024	0.000005	0.000007	0.000027
Vanadium [mg/L]	17-Jun-13	08:36	< 0.00003	0.00004	< 0.00003	< 0.00003	0.00010	< 0.00003	0.00004	0.00009
Tungsten [mg/L]	17-Jun-13	08:36	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	17-Jun-13	08:36	0.000002	0.000177	0.000003	0.000003	0.000012	0.000004	0.000011	0.000037
Zinc [mg/L]	13-Jun-13	08:51	0.004	0.015	0.013	0.007	0.003	0.004	< 0.002	< 0.002

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21-February-2014

Labec Century Iron Ore Inc
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Montreal, QC
H3B 4G7, Canada

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Date Rec. : 18 June 2013
LR Report: **CA10106-JUN13**
Reference: Wk# 5

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk# 5	18-Jun-13	338
6: 502198 Wk# 5	18-Jun-13	523
7: 501021/502393 Composite Wk# 5	18-Jun-13	513
8: A00154738/40/43/47 Composite Wk# 5	18-Jun-13	290
9: A00154201/202/331/455/706 Composite Wk# 5	18-Jun-13	368
10: BS2LC1/C2/C3 Composite Wk# 5	18-Jun-13	517
11: BS2CSF1/F2/F3 Composite Wk# 5	18-Jun-13	450
12: BS2T1/2/3 Composite Wk# 5	18-Jun-13	388

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Date Rec. : 25 June 2013
LR Report: **CA10156-JUN13**
Reference: Wk#6

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk#6	25-Jun-13	321
6: 502198 Wk#6	25-Jun-13	511
7: 501021/502393 Composite Wk#6	25-Jun-13	497
8: A00154738/40/43/47 Composite Wk#6	25-Jun-13	288
9: A00154201/202/331/455/706 Composite Wk#6	25-Jun-13	368
10: BS2LC1/C2/C3 Composite Wk#6	25-Jun-13	507
11: BS2CSF1/F2/F3 Composite Wk#6	25-Jun-13	470
12: BS2T1/2/3 Composite Wk#6	25-Jun-13	385

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21-February-2014

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Date Rec. : 02 July 2013
LR Report: **CA10016-JUL13**
Reference: Wk# 7

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk# 7	6: 502198 Wk# 7	7: 501021/502393 Composite Wk# 7	8: A00154738/40/43/47 Composite Wk# 7	9: A00154201/202/331/455/706 Composite Wk# 7	10: BS2LC1/C2/C3 Composite Wk# 7	11: BS2CSF1/F2/F3 Composite Wk# 7	12: BS2T1/2/3 Composite Wk# 7
Sample Date & Time			02-Jul-13	02-Jul-13	02-Jul-13	02-Jul-13	02-Jul-13	02-Jul-13	02-Jul-13	02-Jul-13
Hum Cell Leachate Volume [mL]	---	---	321	515	502	288	376	510	465	378
pH [units]	08-Jul-13	09:15	6.24	5.15	6.22	6.42	6.88	6.84	6.60	7.04
Acidity [mg/L as CaCO3]	08-Jul-13	09:15	< 2	5	< 2	< 2	< 2	< 2	< 2	< 2
Alkalinity [mg/L as CaCO3]	08-Jul-13	09:15	< 2	< 2	< 2	< 2	8	3	2	5
Conductivity [µS/cm]	08-Jul-13	09:15	35	58	10	11	38	11	12	22
Sulphate [mg/L]	04-Jul-13	08:49	11	16	1.3	0.7	7.0	1.2	0.4	1.4
Mercury [mg/L]	08-Jul-13	07:40	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Silver [mg/L]	04-Jul-13	15:45	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Aluminum [mg/L]	10-Jul-13	14:50	< 0.01	0.10	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Arsenic [mg/L]	04-Jul-13	15:45	< 0.0002	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0004	0.0016
Barium [mg/L]	04-Jul-13	15:45	0.00261	0.0171	0.00230	0.00106	0.00126	0.00036	0.00027	0.00036
Beryllium [mg/L]	04-Jul-13	15:45	< 0.00002	0.00017	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	04-Jul-13	15:45	0.0167	0.0056	0.0035	0.0061	0.0101	0.0042	0.0033	0.0015
Bismuth [mg/L]	04-Jul-13	15:45	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	10-Jul-13	14:50	2.36	3.36	0.41	0.14	2.45	1.28	0.66	2.33
Cadmium [mg/L]	04-Jul-13	15:45	0.000007	0.000035	< 0.000003	< 0.000003	0.000021	< 0.000003	< 0.000003	< 0.000003
Cobalt [mg/L]	04-Jul-13	15:45	0.000233	0.00378	0.000306	0.000068	0.000299	0.000022	0.000026	0.000139
Chromium [mg/L]	04-Jul-13	15:45	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0008	< 0.0005

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LR Report : **CA10016-JUL13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk# 7	6: 502198 Wk# 7	7: 501021/502393 Composite Wk# 7	8: A00154738/40/43/47 Composite Wk# 7	9: A00154201/202/331/455/706 Composite Wk# 7	10: BS2LC1/C2/C3 Composite Wk# 7	11: BS2CSF1/F2/F3 Composite Wk# 7	12: BS2T1/2/3 Composite Wk# 7
Copper [mg/L]	04-Jul-13	15:45	< 0.0005	0.0033	< 0.0005	< 0.0005	0.0006	< 0.0005	< 0.0005	0.0010
Iron [mg/L]	10-Jul-13	14:51	< 0.003	< 0.003	< 0.003	< 0.003	0.014	0.003	0.016	0.104
Potassium [mg/L]	10-Jul-13	14:51	0.091	0.414	0.055	0.227	1.01	0.138	0.213	0.090
Lithium [mg/L]	04-Jul-13	15:47	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium [mg/L]	10-Jul-13	14:51	1.36	1.66	0.277	0.076	1.55	0.333	0.188	0.311
Manganese [mg/L]	04-Jul-13	15:47	0.331	0.177	0.110	0.0401	0.749	0.00590	0.00143	0.00377
Molybdenum [mg/L]	04-Jul-13	15:47	0.00001	< 0.00001	0.00004	0.00004	0.00016	0.00039	0.00015	0.00021
Sodium [mg/L]	10-Jul-13	14:51	0.08	0.14	0.05	1.03	0.66	0.10	0.39	0.33
Nickel [mg/L]	04-Jul-13	15:47	0.0009	0.0117	0.0028	0.0003	0.0005	0.0001	0.0001	0.0003
Phosphorus [mg/L]	10-Jul-13	14:51	< 0.009	< 0.009	< 0.009	< 0.009	0.012	< 0.009	0.009	< 0.009
Lead [mg/L]	04-Jul-13	15:47	< 0.00002	0.00004	< 0.00002	0.00006	< 0.00002	< 0.00002	< 0.00002	0.00003
Antimony [mg/L]	04-Jul-13	15:47	0.0004	0.0003	0.0003	0.0005	0.0004	0.0004	0.0004	0.0004
Selenium [mg/L]	04-Jul-13	15:47	< 0.001	0.018	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silicon [mg/L]	10-Jul-13	14:51	1.09	1.79	0.98	1.10	1.12	0.66	1.34	0.42
Tin [mg/L]	04-Jul-13	15:47	0.00071	0.00036	0.00015	0.00031	0.00026	0.00028	0.00011	0.00017
Strontium [mg/L]	10-Jul-13	14:51	0.0109	0.0185	0.0044	0.0029	0.0096	0.0025	0.0018	0.0061
Titanium [mg/L]	04-Jul-13	15:48	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001
Thallium [mg/L]	04-Jul-13	15:48	< 0.00002	0.00006	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	04-Jul-13	15:48	0.000006	0.000033	0.000004	0.000003	0.000011	0.000004	0.000006	0.000018
Vanadium [mg/L]	04-Jul-13	15:48	< 0.00003	< 0.00003	< 0.00003	0.00003	0.00008	0.00003	< 0.00003	0.00009
Tungsten [mg/L]	04-Jul-13	15:48	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	04-Jul-13	15:48	0.000002	0.000499	0.000005	0.000002	0.000005	0.000001	0.000008	0.000031
Zinc [mg/L]	10-Jul-13	14:51	0.004	0.016	0.005	0.006	< 0.002	0.005	< 0.002	< 0.002

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21-February-2014

Labec Century Iron Ore Inc
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Date Rec. : 09 July 2013
LR Report: **CA10057-JUL13**
Reference: Wk#8

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk#8	09-Jul-13	326
6: 502198 Wk#8	09-Jul-13	505
7: 501021/502393 Composite Wk#8	09-Jul-13	507
8: 8A00154738/40/43/47 Composite Wk#	09-Jul-13	314
9: A00154201/202/331/455/706 Composite Wk#8	09-Jul-13	381
10: BS2LC1/C2/C3 Composite Wk#8	09-Jul-13	530
11: BS2CSF1/F2/F3 Composite Wk#8	09-Jul-13	460
12: BS2T1/2/3 Composite Wk#8	09-Jul-13	386

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21-February-2014

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Date Rec. : 16 July 2013
LR Report: **CA10098-JUL13**
Reference: Wk#9

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk# 9	16-Jul-13	326
6: 502198 Wk# 9	16-Jul-13	506
7: 501021/502393 Composite Wk# 9	16-Jul-13	502
8: A00154738/40/43/47 Composite Wk# 9	16-Jul-13	277
9: A00154201/202/331/455/706 Composite Wk# 9	16-Jul-13	365
10: BS2LC1/C2/C3 Composite Wk# 9	16-Jul-13	514
11: BS2CSF1/F2/F3 Composite Wk# 9	16-Jul-13	458
12: BS2T1/2/3 Composite Wk# 9	16-Jul-13	374

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21-February-2014

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Date Rec. : 23 July 2013
LR Report: **CA10137-JUL13**
Reference: Wk#10

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#10	6: 502198 Wk#10	7: 501021/502393 Composite Wk#10	8: A00154738/40/43/47 Composite Wk#10	9: A00154201/202/331/455/706 Composite Wk#10	10: BS2LC1/C2/C3 Composite Wk#10	11: BS2CSF1/F2/F3 Composite Wk#10	12: BS2T1/2/3 Composite Wk#10
Sample Date & Time			23-Jul-13	23-Jul-13	23-Jul-13	23-Jul-13	23-Jul-13	23-Jul-13	23-Jul-13	23-Jul-13
Hum Cell Leachate Volume [mL]	---	---	321	498	505	277	362	497	476	371
pH [units]	30-Jul-13	08:03	6.33	4.46	6.08	7.17	6.71	6.78	6.95	6.90
Acidity [mg/L as CaCO3]	30-Jul-13	08:03	< 2	3	< 2	< 2	< 2	< 2	< 2	< 2
Alkalinity [mg/L as CaCO3]	30-Jul-13	08:03	< 2	< 2	< 2	< 2	4	3	3	8
Conductivity [µS/cm]	30-Jul-13	08:03	20	50	10	7	30	10	8	25
Sulphate [mg/L]	25-Jul-13	16:50	9.8	15	1.3	0.4	5.3	1.0	0.3	0.9
Mercury [mg/L]	25-Jul-13	14:17	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Silver [mg/L]	26-Jul-13	10:38	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Aluminum [mg/L]	30-Jul-13	08:38	0.02	0.11	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Arsenic [mg/L]	26-Jul-13	10:38	< 0.0002	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0004	0.0016
Barium [mg/L]	26-Jul-13	10:38	0.00262	0.0155	0.00221	0.00103	0.00091	0.00031	0.00027	0.00034
Beryllium [mg/L]	26-Jul-13	10:38	< 0.00002	0.00019	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	26-Jul-13	10:38	0.0109	0.0045	0.0030	0.0040	0.0074	0.0031	0.0028	0.0012
Bismuth [mg/L]	26-Jul-13	10:38	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	30-Jul-13	08:39	1.72	2.90	0.42	0.15	1.71	1.21	0.90	2.78
Cadmium [mg/L]	26-Jul-13	10:38	0.000004	0.000045	< 0.000003	< 0.000003	0.000014	< 0.000003	< 0.000003	< 0.000003
Cobalt [mg/L]	26-Jul-13	10:38	0.000304	0.00375	0.000253	0.000066	0.000197	0.000028	0.000038	0.000165
Chromium [mg/L]	26-Jul-13	10:38	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

OnLine LIMS

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LR Report : **CA10137-JUL13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#10	6: 502198 Wk#10	7: 501021/502393 Composite Wk#10	8: A00154738/40/ 43/47 Composite Wk#10	9: A00154201/202 /331/455/706 Composite Wk#10	10: BS2LC1/C2/C3 Composite Wk#10	11: BS2CSF1/F2/F 3 Composite Wk#10	12: BS2T1/2/3 Composite Wk#10
Copper [mg/L]	26-Jul-13	10:38	0.0005	0.0037	< 0.0005	< 0.0005	0.0005	< 0.0005	< 0.0005	< 0.0005
Iron [mg/L]	30-Jul-13	08:39	0.003	< 0.003	< 0.003	< 0.003	0.006	< 0.003	0.021	0.030
Potassium [mg/L]	30-Jul-13	08:39	0.070	0.276	0.041	0.173	0.761	0.112	0.192	0.082
Lithium [mg/L]	26-Jul-13	10:38	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium [mg/L]	30-Jul-13	08:39	0.861	1.36	0.256	0.076	1.03	0.297	0.237	0.358
Manganese [mg/L]	26-Jul-13	10:38	0.481	0.166	0.125	0.0383	0.487	0.00297	0.00080	0.00550
Molybdenum [mg/L]	26-Jul-13	10:38	< 0.00001	< 0.00001	0.00004	0.00007	0.00018	0.00035	0.00014	0.00020
Sodium [mg/L]	30-Jul-13	08:39	0.05	0.07	0.04	0.71	0.42	0.07	0.26	0.29
Nickel [mg/L]	26-Jul-13	10:39	0.0021	0.0121	0.0030	0.0006	0.0006	0.0002	0.0005	0.0002
Phosphorus [mg/L]	30-Jul-13	08:39	< 0.009	< 0.009	< 0.009	0.018	< 0.009	< 0.009	< 0.009	0.011
Lead [mg/L]	26-Jul-13	10:39	< 0.00002	0.00003	< 0.00002	< 0.00002	< 0.00002	0.00002	0.00003	< 0.00002
Antimony [mg/L]	26-Jul-13	10:39	0.0005	0.0005	0.0005	0.0006	0.0006	0.0004	0.0004	0.0005
Selenium [mg/L]	26-Jul-13	10:39	< 0.001	0.013	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silicon [mg/L]	30-Jul-13	08:39	0.75	1.37	0.86	0.82	0.82	0.62	1.21	0.39
Tin [mg/L]	26-Jul-13	10:39	0.00075	0.00033	0.00014	0.00025	0.00020	0.00036	0.00012	0.00016
Strontium [mg/L]	30-Jul-13	08:39	0.0097	0.0168	0.0044	0.0030	0.0067	0.0027	0.0025	0.0073
Titanium [mg/L]	26-Jul-13	10:39	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Thallium [mg/L]	26-Jul-13	10:39	< 0.00002	0.00005	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	26-Jul-13	10:39	0.000002	0.000010	0.000001	0.000001	0.000003	0.000003	0.000004	0.000026
Vanadium [mg/L]	26-Jul-13	10:39	< 0.00003	< 0.00003	< 0.00003	< 0.00003	0.00003	< 0.00003	< 0.00003	0.00004
Tungsten [mg/L]	26-Jul-13	10:39	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	26-Jul-13	10:39	0.000003	0.000506	0.000007	0.000003	0.000006	0.000003	0.000011	0.000011
Zinc [mg/L]	30-Jul-13	08:39	0.004	0.012	0.005	0.008	0.006	0.009	< 0.002	< 0.002

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21-February-2014

Labec Century Iron Ore Inc
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Phone: 514-228-5034, Fax:514-228-5643

Date Rec. : 30 July 2013
LR Report: **CA10177-JUL13**
Reference: Wk#11

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk#11	30-Jul-13	373
6: 502198 Wk#11	30-Jul-13	528
7: 501021/502393 Composite Wk#11	30-Jul-13	519
8: A00154738/40/43/47 Composite Wk#11	30-Jul-13	304
9: A00154201/202/331/455/706 Composite Wk#11	30-Jul-13	399
10: BS2LC1/C2/C3 Composite Wk#11	30-Jul-13	514
11: BS2CSF1/F2/F3 Composite Wk#11	30-Jul-13	525
12: BS2T1/2/3 Composite Wk#11	30-Jul-13	394

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Date Rec. : 06 August 2013
LR Report: **CA10014-AUG13**
Reference: Wk# 12

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk# 12	06-Aug-13	351
6: 502198 Wk# 12	06-Aug-13	503
7: 501021/502393 Composite Wk# 12	06-Aug-13	496
8: A00154738/40/43/47 Composite Wk# 12	06-Aug-13	290
9: A00154201/202/331/455/706 Composite Wk# 12	06-Aug-13	387
10: BS2LC1/C2/C3 Composite Wk# 12	06-Aug-13	505
11: BS2CSF1/F2/F3 Composite Wk# 12	06-Aug-13	480
12: BS2T1/2/3 Composite Wk# 12	06-Aug-13	383

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Project : PO#PO PM120008

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Date Rec. : 13 August 2013
LR Report: **CA10055-AUG13**
Reference: Wk# 13

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk# 13	13-Aug-13	331
6: 502198 Wk# 13	13-Aug-13	506
7: 501021/502393 Composite Wk# 13	13-Aug-13	502
8: A00154738/40/43/47 Composite Wk# 13	13-Aug-13	284
9: A00154201/202/331/455/706 Composite Wk# 13	13-Aug-13	373
10: BS2LC1/C2/C3 Composite Wk# 13	13-Aug-13	505
11: BS2CSF1/F2/F3 Composite Wk# 13	13-Aug-13	476
12: BS2T1/2/3 Composite Wk# 13	13-Aug-13	372

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Date Rec. : 20 August 2013
LR Report: **CA10100-AUG13**
Reference: Wk#14

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk#14	20-Aug-13	342
6: 502198 Wk#14	20-Aug-13	513
7: 501021/502393 Composite Wk#14	20-Aug-13	518
8: A00154738/40/43/47 Composite Wk#14	20-Aug-13	304
9: A00154201/202/331/455/706 Composite Wk#14	20-Aug-13	384
10: BS2LC1/C2/C3 Composite Wk#14	20-Aug-13	516
11: BS2CSF1/F2/F3 Composite Wk#14	20-Aug-13	449
12: BS2T1/2/3 Composite Wk#14	20-Aug-13	413

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Date Rec. : 27 August 2013
LR Report: **CA10140-AUG13**
Reference: Wk#15

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#15	6: 502198 Wk#15	7: 501021/502393 Composite Wk#15	8: A00154738/40/4 3/47 Composite Wk#15	9: A00154201/202/ 331/455/706 Composite Wk#15	10: BS2LC1/C2/C3 Composite Wk#15	11: BS2CSF1/F2/F3 Composite Wk#15	12: BS2T1/2/3 Composite Wk#15
Sample Date & Time			27-Aug-13	27-Aug-13	27-Aug-13	27-Aug-13	27-Aug-13	27-Aug-13	27-Aug-13	27-Aug-13
Hum Cell Leachate Volume [mL]	---	---	327	518	504	297	368	509	449	379
pH [units]	04-Sep-13	12:20	5.96	4.37	6.29	6.12	6.97	6.69	6.92	6.81
Acidity [mg/L as CaCO3]	04-Sep-13	12:20	< 2	3	< 2	< 2	< 2	< 2	< 2	< 2
Alkalinity [mg/L as CaCO3]	04-Sep-13	12:20	< 2	< 2	< 2	< 2	4	4	4	4
Conductivity [µS/cm]	04-Sep-13	12:21	37	32	7	8	20	10	8	16
Sulphate [mg/L]	30-Aug-13	15:04	18	13	1.4	0.2	5.6	0.9	0.2	0.6
Mercury [mg/L]	29-Aug-13	12:10	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Silver [mg/L]	30-Aug-13	13:15	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Aluminum [mg/L]	04-Sep-13	11:58	< 0.01	0.12	0.01	< 0.01	0.03	< 0.01	0.01	0.03
Arsenic [mg/L]	30-Aug-13	13:15	< 0.0002	0.0003	< 0.0002	< 0.0002	< 0.0002	0.0002	0.0004	0.0017
Barium [mg/L]	30-Aug-13	13:15	0.00293	0.0136	0.00222	0.00153	0.00092	0.00031	0.00021	0.00041
Beryllium [mg/L]	30-Aug-13	13:15	< 0.00002	0.00020	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	30-Aug-13	13:15	0.0170	0.0042	0.0028	0.0035	0.0066	0.0026	0.0027	0.0013
Bismuth [mg/L]	30-Aug-13	13:15	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	04-Sep-13	11:59	3.59	2.59	0.36	0.14	1.78	1.07	0.85	2.86
Cadmium [mg/L]	30-Aug-13	13:15	0.000022	0.000037	< 0.000003	< 0.000003	0.000019	< 0.000003	< 0.000003	< 0.000003
Cobalt [mg/L]	30-Aug-13	13:15	0.00168	0.00365	0.000279	0.000050	0.000226	0.000022	0.000017	0.000222
Chromium [mg/L]	30-Aug-13	13:15	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

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LR Report : **CA10140-AUG13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#15	6: 502198 Wk#15	7: 501021/502393 Composite Wk#15	8: A00154738/40/43/47 Composite Wk#15	9: A00154201/202/331/455/706 Composite Wk#15	10: BS2LC1/C2/C3 Composite Wk#15	11: BS2CSF1/F2/F3 Composite Wk#15	12: BS2T1/2/3 Composite Wk#15
Copper [mg/L]	30-Aug-13	13:15	< 0.0005	0.0040	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Iron [mg/L]	04-Sep-13	11:59	< 0.003	< 0.003	< 0.003	< 0.003	0.043	< 0.003	0.011	0.046
Potassium [mg/L]	04-Sep-13	11:59	0.130	0.200	0.031	0.185	0.702	0.103	0.152	0.084
Lithium [mg/L]	30-Aug-13	13:15	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium [mg/L]	04-Sep-13	11:59	1.97	1.21	0.259	0.103	1.11	0.269	0.232	0.375
Manganese [mg/L]	30-Aug-13	13:16	1.76	0.161	0.131	0.0423	0.461	0.00893	0.00133	0.00850
Molybdenum [mg/L]	30-Aug-13	13:16	0.00001	< 0.00001	0.00002	< 0.00001	0.00018	0.00028	0.00016	0.00017
Sodium [mg/L]	04-Sep-13	11:59	0.08	0.03	0.02	0.55	0.32	0.05	0.14	0.20
Nickel [mg/L]	30-Aug-13	13:16	0.0034	0.0118	0.0027	0.0003	0.0004	< 0.0001	< 0.0001	0.0002
Phosphorus [mg/L]	04-Sep-13	11:59	< 0.009	0.011	< 0.009	< 0.009	< 0.009	0.010	0.014	0.012
Lead [mg/L]	30-Aug-13	13:16	< 0.00002	0.00003	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Antimony [mg/L]	30-Aug-13	13:16	0.0003	0.0003	0.0002	0.0004	0.0003	0.0003	0.0002	0.0003
Selenium [mg/L]	30-Aug-13	13:16	< 0.001	0.009	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silicon [mg/L]	04-Sep-13	11:59	1.09	1.39	0.90	0.83	0.96	0.67	1.21	0.45
Tin [mg/L]	30-Aug-13	13:16	0.00021	0.00029	0.00015	0.00019	0.00020	0.00026	0.00010	0.00012
Strontium [mg/L]	04-Sep-13	11:59	0.0225	0.0150	0.0041	0.0042	0.0069	0.0023	0.0023	0.0076
Titanium [mg/L]	30-Aug-13	13:16	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0004	< 0.0001	< 0.0001	< 0.0001
Thallium [mg/L]	30-Aug-13	13:16	< 0.00002	0.00004	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	30-Aug-13	13:16	0.000002	0.000016	0.000002	0.000003	0.000007	0.000004	0.000005	0.000011
Vanadium [mg/L]	30-Aug-13	13:16	< 0.00003	< 0.00003	< 0.00003	< 0.00003	0.00012	< 0.00003	0.00003	0.00007
Tungsten [mg/L]	30-Aug-13	13:16	0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	30-Aug-13	13:16	0.000017	0.000511	0.000004	0.000001	0.000008	0.000002	0.000005	0.000019
Zinc [mg/L]	04-Sep-13	11:59	0.003	0.010	< 0.002	0.005	0.002	0.004	< 0.002	< 0.002

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21-February-2014

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Date Rec. : 03 September 2013
LR Report: **CA10015-SEP13**
Reference: Wk#16

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk#16	03-Sep-13	306
6: 502198 Wk#16	03-Sep-13	503
7: 501021/502393 Composite Wk#16	03-Sep-13	503
8: A00154738/40/43/47 Composite Wk#16	03-Sep-13	298
9: A00154201/202/331/455/706 Composite Wk#16	03-Sep-13	373
10: BS2LC1/C2/C3 Composite Wk#16	03-Sep-13	489
11: BS2CSF1/F2/F3 Composite Wk#16	03-Sep-13	423
12: BS2T1/2/3 Composite Wk#16	03-Sep-13	370

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21-February-2014

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Date Rec. : 09 September 2013
LR Report: **CA10053-SEP13**
Reference: Wk#17

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk#17	09-Sep-13	348
6: 502198 Wk#17	09-Sep-13	522
7: 501021/502393 Composite Wk#17	09-Sep-13	520
8: A00154738/40/43/47 Composite Wk#17	09-Sep-13	284
9: A00154201/202/331/455/706 Composite Wk#17	09-Sep-13	382
10: BS2LC1/C2/C3 Composite Wk#17	09-Sep-13	518
11: BS2CSF1/F2/F3 Composite Wk#17	09-Sep-13	478
12: BS2T1/2/3 Composite Wk#17	09-Sep-13	399

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21-February-2014

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Date Rec. : 17 September 2013
LR Report: **CA10095-SEP13**
Reference: Wk#18

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk#18	17-Sep-13	342
6: 502198 Wk#18	17-Sep-13	499
7: 501021/502393 Composite Wk#18	17-Sep-13	502
8: A00154738/40/43/47 Composite Wk#18	17-Sep-13	291
9: A00154201/202/331/455/706 Composite Wk#18	17-Sep-13	370
10: BS2LC1/C2/C3 Composite Wk#18	17-Sep-13	501
11: BS2CSF1/F2/F3 Composite Wk#18	17-Sep-13	429
12: BS2T1/2/3 Composite Wk#18	17-Sep-13	376

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21-February-2014

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Date Rec. : 24 September 2013
LR Report: **CA10138-SEP13**
Reference: Wk#19

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk#19	24-Sep-13	320
6: 502198 Wk#19	24-Sep-13	516
7: 501021/502393 Composite Wk#19	24-Sep-13	497
8: A00154738/40/43/47 Composite Wk#19	24-Sep-13	290
9: A00154201/202/331/455/706 Composite Wk#19	24-Sep-13	377
10: BS2LC1/C2/C3 Composite Wk#19	24-Sep-13	509
11: BS2CSF1/F2/F3 Composite Wk#19	24-Sep-13	443
12: BS2T1/2/3 Composite Wk#19	24-Sep-13	379

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21-February-2014

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Date Rec. : 01 October 2013
LR Report: **CA10017-OCT13**
Reference: Wk#20

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#20	6: 502198 Wk#20	7: 501021/502393 Composite Wk#20	8: A00154738/40/43/47 Composite Wk#20	9: A00154201/202/331/455/706 Composite Wk#20	10: BS2LC1/C2/C3 Composite Wk#20	11: BS2CSF1/F2/F3 Composite Wk#20	12: BS2T1/2/3 Composite Wk#20
Sample Date & Time			01-Oct-13	01-Oct-13	01-Oct-13	01-Oct-13	01-Oct-13	01-Oct-13	01-Oct-13	01-Oct-13
Hum Cell Leachate Volume [mL]	---	---	314	507	497	294	369	522	447	367
pH [units]	03-Oct-13	10:13	5.90	4.37	6.05	5.74	6.53	6.58	6.74	6.92
Acidity [mg/L as CaCO3]	03-Oct-13	10:13	< 2	5	< 2	3	< 2	< 2	< 2	< 2
Alkalinity [mg/L as CaCO3]	03-Oct-13	10:13	< 2	< 2	< 2	< 2	3	< 2	3	4
Conductivity [µS/cm]	03-Oct-13	10:13	28	51	7	11	30	10	8	26
Sulphate [mg/L]	02-Oct-13	14:50	9.4	12	1.4	< 0.2	5.7	0.8	< 0.2	0.5
Mercury [mg/L]	07-Oct-13	10:16	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Silver [mg/L]	07-Oct-13	10:45	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Aluminum [mg/L]	08-Oct-13	11:38	0.01	0.10	0.02	0.02	0.02	0.02	0.03	0.03
Arsenic [mg/L]	07-Oct-13	10:45	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0004	0.0018
Barium [mg/L]	07-Oct-13	10:45	0.00320	0.0113	0.00247	0.00168	0.00088	0.00024	0.00017	0.00043
Beryllium [mg/L]	07-Oct-13	10:45	< 0.00002	0.00020	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	07-Oct-13	10:45	0.0087	0.0037	0.0031	0.0041	0.0071	0.0024	0.0026	0.0016
Bismuth [mg/L]	07-Oct-13	10:45	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	08-Oct-13	11:38	1.37	1.70	0.40	0.15	1.79	0.80	0.82	2.99
Cadmium [mg/L]	07-Oct-13	10:45	0.000016	0.000036	< 0.000003	< 0.000003	0.000017	< 0.000003	< 0.000003	< 0.000003
Cobalt [mg/L]	07-Oct-13	10:45	0.00101	0.00304	0.000292	0.000033	0.000191	0.000013	0.000011	0.000184
Chromium [mg/L]	07-Oct-13	10:45	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

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0000112532

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
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LR Report : **CA10017-OCT13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 501065 Wk#20	6: 502198 Wk#20	7: 501021/502393 Composite Wk#20	8: A00154738/40/ 43/47 Composite Wk#20	9: A00154201/202 /331/455/706 Composite Wk#20	10: BS2LC1/C2/C3 Composite Wk#20	11: BS2CSF1/F2/F 3 Composite Wk#20	12: BS2T1/2/3 Composite Wk#20
Copper [mg/L]	07-Oct-13	10:45	0.0008	0.0042	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Iron [mg/L]	08-Oct-13	11:38	< 0.003	< 0.003	< 0.003	< 0.003	0.024	< 0.003	0.006	0.056
Potassium [mg/L]	08-Oct-13	11:38	0.075	0.133	0.041	0.196	0.706	0.078	0.131	0.097
Lithium [mg/L]	07-Oct-13	10:46	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium [mg/L]	08-Oct-13	11:38	0.743	0.766	0.276	0.097	1.10	0.184	0.201	0.372
Manganese [mg/L]	07-Oct-13	10:46	1.53	0.138	0.169	0.0503	0.446	0.00810	0.00082	0.00879
Molybdenum [mg/L]	07-Oct-13	10:46	< 0.00001	< 0.00001	0.00002	< 0.00001	0.00021	0.00023	0.00017	0.00019
Sodium [mg/L]	08-Oct-13	11:38	0.04	0.01	0.02	0.49	0.28	0.03	0.09	0.20
Nickel [mg/L]	07-Oct-13	10:46	0.0024	0.0094	0.0031	0.0004	0.0004	0.0001	0.0001	0.0003
Phosphorus [mg/L]	08-Oct-13	11:38	0.010	< 0.009	< 0.009	0.016	< 0.009	0.012	< 0.009	0.011
Lead [mg/L]	07-Oct-13	10:46	0.00003	0.00003	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Antimony [mg/L]	07-Oct-13	10:46	0.0005	0.0004	0.0004	0.0005	0.0004	0.0004	0.0004	0.0004
Selenium [mg/L]	07-Oct-13	10:46	< 0.001	0.007	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silicon [mg/L]	08-Oct-13	11:38	0.52	0.93	0.90	0.77	0.90	0.51	1.01	0.46
Tin [mg/L]	07-Oct-13	10:46	0.00040	0.00036	0.00014	0.00030	0.00010	0.00032	0.00010	0.00011
Strontium [mg/L]	08-Oct-13	11:38	0.0107	0.0102	0.0047	0.0049	0.0065	0.0018	0.0021	0.0081
Titanium [mg/L]	07-Oct-13	10:46	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001
Thallium [mg/L]	07-Oct-13	10:46	< 0.00002	0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Uranium [mg/L]	07-Oct-13	10:46	0.000004	0.000020	0.000003	0.000005	0.000008	0.000003	0.000006	0.000006
Vanadium [mg/L]	07-Oct-13	10:46	< 0.00003	< 0.00003	< 0.00003	< 0.00003	0.00005	< 0.00003	< 0.00003	< 0.00003
Tungsten [mg/L]	07-Oct-13	10:46	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Yttrium [mg/L]	07-Oct-13	10:46	0.000004	0.000389	0.000010	0.000001	0.000007	0.000001	0.000004	0.000019
Zinc [mg/L]	08-Oct-13	11:38	0.006	0.008	0.003	0.005	0.004	0.006	< 0.002	< 0.002

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

0000112532

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21-February-2014

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900, Montreal
Canada, H3B 4G7
Phone: 514-228-5034, Fax:514-228-5643

Date Rec. : 08 October 2013
LR Report: **CA10064-OCT13**
Reference: Wk#21

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CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Hum Cell Leachate Volume mL
3: Analysis Approval Date		---
4: Analysis Approval Time		---
5: 501065 Wk#21	08-Oct-13	305
6: 502198 Wk#21	08-Oct-13	510
7: 501021/502393 Composite Wk#21	08-Oct-13	506
8: A00154738/40/43/47 Composite Wk#21	08-Oct-13	288
9: A00154201/202/331/455/706 Composite Wk#21	08-Oct-13	379
10: BS2LC1/C2/C3 Composite Wk#21	08-Oct-13	513
11: BS2CSF1/F2/F3 Composite Wk#21	08-Oct-13	421
12: BS2T1/2/3 Composite Wk#21	08-Oct-13	382

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APPENDIX D

Field Leach Bin Laboratory Certificates

SGS Canada Inc.
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Phone: 705-652-2000 FAX: 705-652-6365

23-December-2013

Stantec
Attn : Nikolay Sidenko

603-386 Broadway Ave., Winnipeg
, R3C 3R6
Phone: 204-928-8862, Fax:204-942-2548

Date Rec. : 05 December 2013
LR Report: **CA14098-DEC13**
Reference: 121511139 task 500.008.ML-ARD Assessment-Joyce Lake

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 1107542	6: 1107544	7: 1107545	8: 1107546	9: 1107547	10: 1100092	11: 1100101	12: 1100102	13: 1100104	14: 1100105	15: 1100106	16: UMH Com	17: UMH Com Dup
Sample Date & Time			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH	20-Dec-13	09:52	7.93	7.62	7.41	7.32	7.05	6.96	7.82	8.12	7.67	6.70	6.68	7.35	7.55
Fizz Rate [---]	20-Dec-13	09:52	1	1	1	1	1	1	1	1	1	1	1	1	1
Sample weight [g]	20-Dec-13	09:52	1.97	1.97	2.00	2.03	2.00	2.02	2.02	1.97	1.97	2.00	1.98	2.02	1.98
HCl added [mL]	20-Dec-13	09:52	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	20-Dec-13	09:52	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	20-Dec-13	09:52	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to [pH=8.3 mL]	20-Dec-13	09:52	16.00	17.60	18.19	18.34	18.49	18.37	18.96	18.79	18.52	18.79	18.88	18.37	18.43
Final pH	20-Dec-13	09:52	1.23	1.11	1.08	1.05	0.99	0.97	1.03	1.04	1.05	1.00	0.98	1.03	1.04
NP [t CaCO3/1000 t]	20-Dec-13	09:52	10	6.1	4.5	4.1	3.8	4.0	2.6	3.1	3.7	3.0	2.8	4.0	4.0
AP [t CaCO3/1000 t]	---	---	2.81	2.19	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Net NP [t CaCO3/1000 t]	---	---	7.29	3.91	4.19	3.79	3.49	3.69	2.29	2.79	3.39	2.69	2.49	3.69	3.69
NP/AP [ratio]	---	---	3.59	2.79	14.5	13.1	12.3	12.9	8.39	10.0	11.9	9.68	9.03	12.8	12.9
Sulphur (total) [%]	16-Dec-13	10:07	0.098	0.094	0.025	0.021	0.005	0.005	0.009	0.010	0.017	< 0.005	< 0.005	0.023	0.015
Acid Leachable SO4-S [%]	---	---	< 0.01	0.02	0.02	0.01	< 0.01	< 0.01	< 0.01	0.01	0.02	< 0.01	< 0.01	0.01	0.02
Sulphide [%]	16-Dec-13	09:52	0.09	0.07	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Carbon (total) [%]	13-Dec-13	10:41	0.870	0.419	0.139	0.162	0.023	0.033	0.023	0.031	0.062	0.039	0.022	0.097	0.078
Carbonate [%]	16-Dec-13	09:57	0.300	0.085	0.030	0.035	0.020	0.010	0.015	0.010	0.015	0.010	0.015	0.020	0.025

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*NP (Neutralization Potential)

$$= \frac{50 \times (\text{N of HCL} \times \text{Total HCL added} - \text{N NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.01 will be calculated using a 0.01 value.

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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20-December-2013

Stantec
Attn : Nikolay Sidenko

603-386 Broadway Ave.
Winnipeg, MB
R3C 3R6,

Phone: 204-928-8862
Fax:204-942-2548

Date Rec. : 05 December 2013
LR Report: **CA14099-DEC13**
Reference: 121511139 task 500.008.ML-ARD Assessment-Joyce Lake

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: UMH Com	6: UMH Com Dup
Sample Date & Time			N/A	N/A
Sample weight [g]	16-Dec-13	10:02	250	250
Volume D.I. Water [mL]	16-Dec-13	10:02	750	750
Initial pH	16-Dec-13	10:02	7.8	7.8
Final pH	16-Dec-13	10:02	8.97	8.68
Mercury [mg/L]	20-Dec-13	08:17	< 0.00001	< 0.00001
Silver [mg/L]	18-Dec-13	14:30	< 0.00001	< 0.00001
Aluminum [mg/L]	18-Dec-13	13:41	0.58	0.62
Arsenic [mg/L]	18-Dec-13	14:30	0.0008	0.0007
Barium [mg/L]	18-Dec-13	14:30	0.0224	0.0196
Boron [mg/L]	18-Dec-13	14:30	0.113	0.115
Beryllium [mg/L]	18-Dec-13	14:30	< 0.00002	< 0.00002
Bismuth [mg/L]	18-Dec-13	14:30	< 0.00001	< 0.00001
Calcium [mg/L]	18-Dec-13	13:41	2.02	2.13
Cadmium [mg/L]	18-Dec-13	14:30	0.000007	0.000006
Cobalt [mg/L]	18-Dec-13	14:30	0.000434	0.000460
Chromium [mg/L]	18-Dec-13	14:30	0.0014	0.0012
Copper [mg/L]	18-Dec-13	14:30	0.0015	0.0017
Iron [mg/L]	18-Dec-13	13:40	3.05	3.03
Potassium [mg/L]	18-Dec-13	13:40	1.07	1.15
Lithium [mg/L]	18-Dec-13	14:30	0.004	0.004
Magnesium [mg/L]	18-Dec-13	13:40	1.02	1.10
Manganese [mg/L]	18-Dec-13	14:30	0.0294	0.0339
Molybdenum [mg/L]	18-Dec-13	14:30	0.00138	0.00098
Sodium [mg/L]	18-Dec-13	13:40	10.2	8.78
Nickel [mg/L]	18-Dec-13	14:30	0.0013	0.0013
Lead [mg/L]	18-Dec-13	14:30	0.00048	0.00037
Antimony [mg/L]	18-Dec-13	14:30	0.0004	0.0004
Selenium [mg/L]	18-Dec-13	14:30	< 0.001	< 0.001

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LR Report : **CA14099-DEC13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: UMH Com	6: UMH Com Dup
Tin [mg/L]	18-Dec-13	14:30	0.00005	0.00005
Strontium [mg/L]	18-Dec-13	13:40	0.0099	0.0108
Titanium [mg/L]	18-Dec-13	14:30	0.0047	0.0050
Thallium [mg/L]	18-Dec-13	14:30	< 0.00002	< 0.00002
Uranium [mg/L]	18-Dec-13	14:30	0.000080	0.000089
Vanadium [mg/L]	18-Dec-13	14:30	0.00071	0.00075
Tungsten [mg/L]	18-Dec-13	14:30	0.00009	< 0.00003
Yttrium [mg/L]	18-Dec-13	14:30	0.000167	0.000187
Zinc [mg/L]	18-Dec-13	14:30	0.005	0.004

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23-December-2013

Stantec
Attn : Nikolay Sidenko

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Date Rec. : 05 December 2013
LR Report: **CA14100-DEC13**
Reference: 121511139 task 500.008.ML-ARD Assessment-Joyce Lake

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 1107559	6: 1107560	7: 1107569	8: 1107570	9: 1107571	10: 1100118	11: 1100120	12: 1100121	13: RC Com	14: RC Com Dup
Sample Date & Time			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH	20-Dec-13	09:52	6.37	6.47	6.68	6.62	6.94	6.17	5.80	5.93	5.90	6.16
Fizz Rate [---]	20-Dec-13	09:52	1	1	1	1	1	1	1	1	1	1
Sample weight [g]	20-Dec-13	09:52	1.97	1.97	2.02	1.99	1.99	1.96	1.95	2.04	2.04	2.01
HCl added [mL]	20-Dec-13	09:52	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	20-Dec-13	09:52	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	20-Dec-13	09:52	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to [pH=8.3 mL]	20-Dec-13	09:52	18.74	18.68	18.36	18.85	18.69	18.59	18.61	18.54	18.50	18.40
Final pH	20-Dec-13	09:52	1.02	1.02	0.94	0.99	1.01	1.02	1.01	0.96	0.94	0.95
NP [t CaCO3/1000 t]	20-Dec-13	09:52	3.2	3.3	4.1	2.9	3.3	3.6	3.6	3.6	3.7	4.0
AP [t CaCO3/1000 t]	---	---	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Net NP [t CaCO3/1000 t]	---	---	2.89	2.99	3.79	2.59	2.99	3.29	3.29	3.29	3.39	3.69
NP/AP [ratio]	---	---	10.3	10.6	13.2	9.35	10.6	11.6	11.6	11.6	11.9	12.9
Sulphur (total) [%]	16-Dec-13	09:52	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.007	0.011	0.010	0.005	0.005
Acid Leachable SO4-S [%]	---	---	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01
Sulphide [%]	16-Dec-13	09:52	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbon (total) [%]	13-Dec-13	10:41	0.024	0.013	0.016	0.016	0.013	0.010	0.011	0.008	0.024	0.023
Carbonate [%]	16-Dec-13	09:57	0.010	< 0.005	< 0.005	< 0.005	0.010	< 0.005	0.010	< 0.005	0.010	0.010

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*NP (Neutralization Potential)

$$= \frac{50 \times (\text{N of HCL} \times \text{Total HCL added} - \text{N NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.01 will be calculated using a 0.01 value.

Brian Graham B.Sc.
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20-December-2013

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Date Rec. : 05 December 2013
LR Report: **CA14101-DEC13**
Reference: 121511139 task
500.008.ML-ARD
Assessment-Joyce Lake

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: RC Com	6: RC Com Dup
Sample Date & Time			N/A	N/A
Sample weight [g]	16-Dec-13	10:02	250	250
Volume D.I. Water [mL]	16-Dec-13	10:02	750	750
Initial pH	16-Dec-13	10:02	6.5	6.7
Final pH	16-Dec-13	10:02	7.79	7.38
Mercury [mg/L]	20-Dec-13	08:17	< 0.00001	< 0.00001
Silver [mg/L]	18-Dec-13	14:31	< 0.00001	< 0.00001
Aluminum [mg/L]	18-Dec-13	13:42	< 0.01	< 0.01
Arsenic [mg/L]	18-Dec-13	14:31	0.0002	< 0.0002
Barium [mg/L]	18-Dec-13	14:31	0.0121	0.0139
Boron [mg/L]	18-Dec-13	14:31	0.0690	0.0652
Beryllium [mg/L]	18-Dec-13	14:31	< 0.00002	< 0.00002
Bismuth [mg/L]	18-Dec-13	14:31	< 0.00001	< 0.00001
Calcium [mg/L]	18-Dec-13	13:42	0.46	0.52
Cadmium [mg/L]	18-Dec-13	14:31	< 0.000003	< 0.000003
Cobalt [mg/L]	18-Dec-13	14:31	0.000269	0.000330
Chromium [mg/L]	18-Dec-13	14:31	< 0.0005	< 0.0005
Copper [mg/L]	18-Dec-13	14:31	< 0.0005	< 0.0005
Iron [mg/L]	18-Dec-13	14:31	0.031	0.022
Potassium [mg/L]	18-Dec-13	13:41	0.205	1.24
Lithium [mg/L]	18-Dec-13	14:31	0.002	0.002
Magnesium [mg/L]	18-Dec-13	13:41	0.206	0.215
Manganese [mg/L]	18-Dec-13	14:31	0.146	0.167
Molybdenum [mg/L]	18-Dec-13	14:31	0.00005	0.00002
Sodium [mg/L]	18-Dec-13	13:41	4.87	4.46

SGS Canada Inc.
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LR Report : **CA14101-DEC13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: RC Com	6: RC Com Dup
Nickel [mg/L]	18-Dec-13	14:31	0.0015	0.0015
Lead [mg/L]	18-Dec-13	14:31	< 0.00002	< 0.00002
Antimony [mg/L]	18-Dec-13	14:31	0.0002	0.0002
Selenium [mg/L]	18-Dec-13	14:31	< 0.001	< 0.001
Tin [mg/L]	18-Dec-13	14:31	0.00001	0.00001
Strontium [mg/L]	18-Dec-13	13:41	0.0050	0.0058
Titanium [mg/L]	18-Dec-13	14:31	< 0.0001	< 0.0001
Thallium [mg/L]	18-Dec-13	14:31	< 0.00002	< 0.00002
Uranium [mg/L]	18-Dec-13	14:31	0.000205	0.000049
Vanadium [mg/L]	18-Dec-13	14:31	0.00003	0.00004
Tungsten [mg/L]	18-Dec-13	14:31	< 0.00003	< 0.00003
Yttrium [mg/L]	18-Dec-13	14:31	0.000005	0.000002
Zinc [mg/L]	18-Dec-13	14:31	< 0.001	< 0.001

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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ABA - Modified Sobek

23-December-2013

Stantec
Attn : Nikolay Sidenko

603-386 Broadway Ave., Winnipeg
, R3C 3R6
Phone: 204-928-8862, Fax:204-942-2548

Date Rec. : 05 December 2013
LR Report: **CA14102-DEC13**
Reference: 121511139 task 500.008.ML-ARD Assessment-Joyce Lake

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: 1107572	6: 1107573	7: 1107577	8: 1107578	9: 1100127	10: 1100130	11: 1107864	12: LMH Com	13: LMH Com Dup
Sample Date & Time				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paste pH	20-Dec-13	16:06	7.97	6.89	6.19	6.35	6.18	6.01	5.26	5.61	5.83
Fizz Rate [---]	20-Dec-13	16:06	1	1	1	1	1	1	1	1	1
Sample weight [g]	20-Dec-13	16:06	2.03	2.01	2.01	2.00	2.03	2.01	2.02	2.01	2.03
HCl added [mL]	20-Dec-13	16:06	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	20-Dec-13	16:06	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	20-Dec-13	16:06	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to [pH=8.3 mL]	20-Dec-13	16:06	19.48	19.31	19.34	19.46	19.31	19.59	19.29	19.16	18.91
Final pH	20-Dec-13	16:06	0.97	0.95	0.94	0.91	0.94	0.97	0.95	0.96	0.94
NP [t CaCO3/1000 t]	20-Dec-13	16:06	1.3	1.7	1.7	1.4	1.7	1.0	1.8	2.1	2.7
AP [t CaCO3/1000 t]	---	---	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Net NP [t CaCO3/1000 t]	---	---	0.99	1.39	1.39	1.09	1.39	0.69	1.49	1.79	2.39
NP/AP [ratio]	---	---	4.19	5.48	5.48	4.52	5.48	3.23	5.81	6.77	8.71
Sulphur (total) [%]	16-Dec-13	09:52	< 0.005	< 0.005	< 0.005	< 0.005	0.012	0.009	0.009	0.009	0.008
Acid Leachable SO4-S [%]	---	---	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sulphide [%]	16-Dec-13	09:52	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbon (total) [%]	13-Dec-13	10:42	0.011	0.018	0.010	0.011	0.013	0.009	0.116	0.093	0.097
Carbonate [%]	16-Dec-13	09:57	0.010	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.015	0.020	0.020

SGS Canada Inc.
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*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N \text{ NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.01 will be calculated using a 0.01 value.

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

00000282826

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

20-December-2013

Stantec
Attn : Nikolay Sidenko

603-386 Broadway Ave., Winnipeg
, R3C 3R6
Phone: 204-928-8862, Fax:204-942-2548

Date Rec. : 05 December 2013
LR Report: **CA14103-DEC13**
Reference: 121511139 task
500.008.ML-ARD
Assessment-Joyce Lake

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: LMH Com	6: LMH Com Dup
Sample Date & Time			N/A	N/A
Sample weight [g]	16-Dec-13	10:02	250	250
Volume D.I. Water [mL]	16-Dec-13	10:02	750	750
Initial pH	16-Dec-13	10:02	5.7	5.8
Final pH	16-Dec-13	10:02	7.88	7.15
Mercury [mg/L]	20-Dec-13	08:17	< 0.00001	< 0.00001
Silver [mg/L]	18-Dec-13	14:31	< 0.00001	< 0.00001
Aluminum [mg/L]	18-Dec-13	13:44	< 0.01	< 0.01
Arsenic [mg/L]	18-Dec-13	14:31	< 0.0002	< 0.0002
Barium [mg/L]	18-Dec-13	14:31	0.0266	0.0219
Boron [mg/L]	18-Dec-13	14:31	0.0905	0.0860
Beryllium [mg/L]	18-Dec-13	14:31	< 0.00002	< 0.00002
Bismuth [mg/L]	18-Dec-13	14:31	< 0.00001	< 0.00001
Calcium [mg/L]	18-Dec-13	13:44	1.53	1.54
Cadmium [mg/L]	18-Dec-13	14:31	< 0.000003	0.000013
Cobalt [mg/L]	18-Dec-13	14:31	0.00135	0.00140
Chromium [mg/L]	18-Dec-13	14:31	0.0007	< 0.0005
Copper [mg/L]	18-Dec-13	14:31	< 0.0005	< 0.0005
Iron [mg/L]	18-Dec-13	13:44	0.010	0.028
Potassium [mg/L]	18-Dec-13	13:44	0.344	0.386
Lithium [mg/L]	18-Dec-13	14:31	0.002	0.002
Magnesium [mg/L]	18-Dec-13	13:44	1.13	1.11
Manganese [mg/L]	18-Dec-13	14:31	1.83	1.98
Molybdenum [mg/L]	18-Dec-13	14:31	0.00006	0.00002
Sodium [mg/L]	18-Dec-13	13:44	7.20	4.80
Nickel [mg/L]	18-Dec-13	14:31	0.0042	0.0038
Lead [mg/L]	18-Dec-13	14:31	< 0.00002	< 0.00002
Antimony [mg/L]	18-Dec-13	14:31	< 0.0002	< 0.0002
Selenium [mg/L]	18-Dec-13	14:31	< 0.001	< 0.001

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14103-DEC13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: LMH Com	6: LMH Com Dup
Tin [mg/L]	18-Dec-13	14:31	0.00001	0.00003
Strontium [mg/L]	18-Dec-13	13:44	0.0133	0.0140
Titanium [mg/L]	18-Dec-13	14:32	< 0.0001	< 0.0001
Thallium [mg/L]	18-Dec-13	14:32	< 0.00002	< 0.00002
Uranium [mg/L]	18-Dec-13	14:32	0.000009	0.000003
Vanadium [mg/L]	18-Dec-13	14:32	0.00006	0.00006
Tungsten [mg/L]	18-Dec-13	14:32	< 0.00003	< 0.00003
Yttrium [mg/L]	18-Dec-13	14:32	0.000004	0.000003
Zinc [mg/L]	18-Dec-13	14:32	0.002	0.005

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

Your P.O. #: 16300R-20
Your Project #: 121511139
Site Location: JOYCE LAKE
Your C.O.C. #: ET340913

Attention:Nikolay Sidenko

Stantec Consulting Ltd
905 Waverley Street
Winnipeg, MB
CANADA R3T 5P4

Report Date: 2014/09/16
Report #: R3157853
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B4G1250
Received: 2014/09/03, 14:50

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Acidity as CaC03 in liquid (1, 2)	3	2014/09/09	2014/09/16	SLA SOP-00100	APHA SM2310B (Mod)
Alkalinity	1	N/A	2014/09/09	CAM SOP-00448	SM 22 2320 B m
Alkalinity	3	N/A	2014/09/10	CAM SOP-00448	SM 22 2320 B m
Mercury (low level)	4	2014/09/08	2014/09/09	CAM SOP-00453	EPA 7470 m
pH	1	N/A	2014/09/09	CAM SOP-00413	SM 4500H+ B
pH	3	N/A	2014/09/10	CAM SOP-00413	SM 4500H+ B
Sulphate by Automated Colourimetry	4	N/A	2014/09/09	CAM SOP-00464	EPA 375.4 m

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Sladeview Petrochemical
(2) Sample(s) analyzed using methodologies that have not been subjected to Maxxam's standard validation process for the submitted matrix and is not an Accredited method. Analysis performed with client consent, however results should be viewed with discretion

Your P.O. #: 16300R-20
Your Project #: 121511139
Site Location: JOYCE LAKE
Your C.O.C. #: ET340913

Attention:Nikolay Sidenko

Stantec Consulting Ltd
905 Waverley Street
Winnipeg, MB
CANADA R3T 5P4

Report Date: 2014/09/16
Report #: R3157853
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B4G1250
Received: 2014/09/03, 14:50

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Renata Spena, Senior Project Manager
Email: RSpena@maxxam.ca
Phone# (905)817-5818 Ext:5818

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B4G1250
Report Date: 2014/09/16

Stantec Consulting Ltd
Client Project #: 121511139
Site Location: JOYCE LAKE
Your P.O. #: 16300R-20

RESULTS OF ANALYSES OF WATER

Maxxam ID		XK3488	XK3489		XK3491		XK3493		
Sampling Date		2014/06/16	2014/08/16		2014/08/17		2013/10/06		
COC Number		ET340913	ET340913		ET340913		ET340913		
	Units	RC	LMH/2014/08/16	QC Batch	UMH	QC Batch	LMH/2013/10/06	RDL	QC Batch
Inorganics									
Acidity as CaC03	mg/L	16	ND	3741605		3741605	20	10	3741605
pH	pH	6.89	7.24	3738944	1.73	3740292	6.19	N/A	3738944
Dissolved Sulphate (SO4)	mg/L	20	1	3739008	1	3739813	8	1	3739008
Alkalinity (Total as CaCO3)	mg/L	180	47	3738943	ND	3740289	150	1.0	3738943

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable

Maxxam ID		XK3493		
Sampling Date		2013/10/06		
COC Number		ET340913		
	Units	LMH/2013/10/06 Lab-Dup	RDL	QC Batch
Inorganics				
Acidity as CaC03	mg/L	20	10	3741605

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B4G1250
Report Date: 2014/09/16

Stantec Consulting Ltd
Client Project #: 121511139
Site Location: JOYCE LAKE
Your P.O. #: 16300R-20

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		XK3488	XK3489		XK3491	XK3493		
Sampling Date		2014/06/16	2014/08/16		2014/08/17	2013/10/06		
COC Number		ET340913	ET340913		ET340913	ET340913		
	Units	RC	LMH/2014/08/16	RDL	UMH	LMH/2013/10/06	RDL	QC Batch
Metals								
Mercury (Hg)	ug/L	ND (1)	ND (1)	0.1	ND	ND	0.01	3739875

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
(1) Test Group: Due to colour interferences, sample required dilution. Detection limits were adjusted accordingly.

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Maxxam Job #: B4G1250
Report Date: 2014/09/16

Stantec Consulting Ltd
Client Project #: 121511139
Site Location: JOYCE LAKE
Your P.O. #: 16300R-20

TEST SUMMARY

Maxxam ID: XK3488
Sample ID: RC
Matrix: Water

Collected: 2014/06/16
Shipped:
Received: 2014/09/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Acidity as CaC03 in liquid		3741605	2014/09/09	2014/09/16	Grace Sison
Alkalinity	PH	3738943	N/A	2014/09/10	Surinder Rai
Mercury (low level)	CVAA	3739875	2014/09/08	2014/09/09	Ron Morrison
pH	PH	3738944	N/A	2014/09/10	Surinder Rai
Sulphate by Automated Colourimetry	AC	3739008	N/A	2014/09/09	Deonarine Ramnarine

Maxxam ID: XK3489
Sample ID: LMH/2014/08/16
Matrix: Water

Collected: 2014/08/16
Shipped:
Received: 2014/09/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Acidity as CaC03 in liquid		3741605	2014/09/09	2014/09/16	Grace Sison
Alkalinity	PH	3738943	N/A	2014/09/10	Surinder Rai
Mercury (low level)	CVAA	3739875	2014/09/08	2014/09/09	Ron Morrison
pH	PH	3738944	N/A	2014/09/10	Surinder Rai
Sulphate by Automated Colourimetry	AC	3739008	N/A	2014/09/09	Deonarine Ramnarine

Maxxam ID: XK3491
Sample ID: UMH
Matrix: Water

Collected: 2014/08/17
Shipped:
Received: 2014/09/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	PH	3740289	N/A	2014/09/09	Surinder Rai
Mercury (low level)	CVAA	3739875	2014/09/08	2014/09/09	Ron Morrison
pH	PH	3740292	N/A	2014/09/09	Surinder Rai
Sulphate by Automated Colourimetry	AC	3739813	N/A	2014/09/09	Deonarine Ramnarine

Maxxam ID: XK3493
Sample ID: LMH/2013/10/06
Matrix: Water

Collected: 2013/10/06
Shipped:
Received: 2014/09/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Acidity as CaC03 in liquid		3741605	2014/09/09	2014/09/16	Grace Sison
Alkalinity	PH	3738943	N/A	2014/09/10	Surinder Rai
Mercury (low level)	CVAA	3739875	2014/09/08	2014/09/09	Ron Morrison
pH	PH	3738944	N/A	2014/09/10	Surinder Rai
Sulphate by Automated Colourimetry	AC	3739008	N/A	2014/09/09	Deonarine Ramnarine

Maxxam ID: XK3493 Dup
Sample ID: LMH/2013/10/06
Matrix: Water

Collected: 2013/10/06
Shipped:
Received: 2014/09/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Acidity as CaC03 in liquid		3741605	2014/09/09	2014/09/16	Grace Sison

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B4G1250
Report Date: 2014/09/16

Stantec Consulting Ltd
Client Project #: 121511139
Site Location: JOYCE LAKE
Your P.O. #: 16300R-20

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	26.0°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B4G1250
Report Date: 2014/09/16

Stantec Consulting Ltd
Client Project #: 121511139
Site Location: JOYCE LAKE
Your P.O. #: 16300R-20

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
3738943	SAU	Spiked Blank	Alkalinity (Total as CaCO3)	2014/09/10		96	%	85 - 115
3738943	SAU	Method Blank	Alkalinity (Total as CaCO3)	2014/09/10	1.3 , RDL=1.0		mg/L	
3738943	SAU	RPD	Alkalinity (Total as CaCO3)	2014/09/10	5.3		%	25
3738944	SAU	Spiked Blank	pH	2014/09/10		101	%	98 - 103
3738944	SAU	RPD	pH	2014/09/10	1.4		%	N/A
3739008	DRM	Matrix Spike	Dissolved Sulphate (SO4)	2014/09/09		NC	%	75 - 125
3739008	DRM	Spiked Blank	Dissolved Sulphate (SO4)	2014/09/09		102	%	80 - 120
3739008	DRM	Method Blank	Dissolved Sulphate (SO4)	2014/09/09	ND , RDL=1		mg/L	
3739008	DRM	RPD	Dissolved Sulphate (SO4)	2014/09/09	0.36		%	20
3739813	DRM	Matrix Spike	Dissolved Sulphate (SO4)	2014/09/09		NC	%	75 - 125
3739813	DRM	Spiked Blank	Dissolved Sulphate (SO4)	2014/09/09		102	%	80 - 120
3739813	DRM	Method Blank	Dissolved Sulphate (SO4)	2014/09/09	ND , RDL=1		mg/L	
3739813	DRM	RPD	Dissolved Sulphate (SO4)	2014/09/09	1.7		%	20
3739875	RON	Matrix Spike	Mercury (Hg)	2014/09/09		95	%	75 - 125
3739875	RON	Spiked Blank	Mercury (Hg)	2014/09/09		91	%	80 - 120
3739875	RON	Method Blank	Mercury (Hg)	2014/09/09	ND , RDL=0.01		ug/L	
3739875	RON	RPD	Mercury (Hg)	2014/09/09	NC		%	20
3740289	SAU	Spiked Blank	Alkalinity (Total as CaCO3)	2014/09/09		95	%	85 - 115
3740289	SAU	Method Blank	Alkalinity (Total as CaCO3)	2014/09/09	ND , RDL=1.0		mg/L	
3740289	SAU	RPD	Alkalinity (Total as CaCO3)	2014/09/09	0.17		%	25
3740292	SAU	Spiked Blank	pH	2014/09/09		102	%	98 - 103
3740292	SAU	RPD	pH	2014/09/09	0.057		%	N/A
3741605	TCH	Method Blank	Acidity as CaC03	2014/09/16	ND , RDL=10		mg/L	
3741605	TCH	RPD [XK3493-02]	Acidity as CaC03	2014/09/16	NC		%	25

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B4G1250
Report Date: 2014/09/16

Stantec Consulting Ltd
Client Project #: 121511139
Site Location: JOYCE LAKE
Your P.O. #: 16300R-20

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere, Scientific Services

Grace Sison, B.Sc., C.Chem, Senior Project Manager - Petroleum Division

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Your Project #: MB4G1250
Site Location: 121511139
Your C.O.C. #: MB4G1250

Attention: SUB CONTRACTOR
MAXXAM ANALYTICS
CAMPOBELLO
6740 CAMPOBELLO ROAD
MISSISSAUGA, ON
CANADA L5N 2L8

Report Date: 2014/09/10
Report #: R1639495
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B479304
Received: 2014/09/09, 08:40

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Cadmium - low level CCME - Dissolved	8	N/A	2014/09/10	AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICP - Dissolved	7	N/A	2014/09/10	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP-Dissolved-Lab Filtered	1	N/A	2014/09/10	AB SOP-00042	EPA 200.7
Elements by ICPMS - Dissolved	7	N/A	2014/09/10	AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICPMS-Dissolved-Lab Filtered	1	N/A	2014/09/10	AB SOP-00043	EPA 200.8 R5.4 m

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Cynny Hagen, Project Manager Assistant
Email: CHagen@maxxam.ca
Phone# (403) 735-2273

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B479304
Report Date: 2014/09/10

MAXXAM ANALYTICS
Client Project #: MB4G1250
Site Location: 121511139

REGULATED METALS (CCME/AT1) - DISSOLVED

Maxxam ID		KN8717		KN8718	KN8719		KN8720		
Sampling Date		2014/06/16		2014/08/16	2014/08/16		2014/08/17		
COC Number		MB4G1250		MB4G1250	MB4G1250		MB4G1250		
	UNITS	**RC (XK3488-01)**	**RDL**	**LMH/2014/08/16 (XK3489-01)**	**LMH DUP/2014/08/16 (XK3490-01)**	**RDL**	**UMH (XK3491-01)**	**RDL**	**QC Batch**
Low Level Elements									
Dissolved Cadmium (Cd)	ug/L	0.11	0.020	0.092	0.085	0.020	0.45	0.020	7630766
Elements									
Dissolved Aluminum (Al)	mg/L	0.35	0.0030	0.084	0.051	0.0030	2.3	0.0030	7631275
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	<0.00060	<0.00060	0.00060	<0.00060	0.00060	7631275
Dissolved Arsenic (As)	mg/L	0.062	0.00020	0.018	0.018	0.00020	0.041	0.00020	7631275
Dissolved Barium (Ba)	mg/L	0.021	0.010	0.12	0.13	0.010	0.070	0.010	7632167
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	<0.0010	<0.0010	0.0010	<0.0010	0.0010	7631275
Dissolved Boron (B)	mg/L	0.053	0.020	0.029	0.025	0.020	<0.020	0.020	7632167
Dissolved Calcium (Ca)	mg/L	9.4	0.30	32	32	0.30	36	0.30	7632167
Dissolved Chromium (Cr)	mg/L	0.0013	0.0010	<0.0010	<0.0010	0.0010	0.010	0.0010	7631275
Dissolved Cobalt (Co)	mg/L	0.0030	0.00030	0.057	0.057	0.00030	0.012	0.00030	7631275
Dissolved Copper (Cu)	mg/L	0.0060	0.00020	0.0063	0.0048	0.00020	0.042	0.00020	7631275
Dissolved Iron (Fe)	mg/L	1.1	0.060	0.15	0.13	0.060	9.7	0.060	7632167
Dissolved Lead (Pb)	mg/L	0.0037	0.00020	0.00069	0.00053	0.00020	0.022	0.00020	7631275
Dissolved Lithium (Li)	mg/L	<0.020	0.020	<0.020	<0.020	0.020	<0.020	0.020	7632167
Dissolved Magnesium (Mg)	mg/L	5.2	0.20	28	29	0.20	19	0.20	7632167
Dissolved Manganese (Mn)	mg/L	9.1	0.0040	72 (1)	72 (1)	0.020	8.6	0.0040	7632167
Dissolved Molybdenum (Mo)	mg/L	<0.00020	0.00020	<0.00020	<0.00020	0.00020	<0.00020	0.00020	7631275
Dissolved Nickel (Ni)	mg/L	0.0072	0.00050	0.093	0.094	0.00050	0.027	0.00050	7631275
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	<0.10	<0.10	0.10	<0.10	0.10	7632167
Dissolved Potassium (K)	mg/L	0.33	0.30	8.7	9.0	0.30	2.3	0.30	7632167
Dissolved Selenium (Se)	mg/L	<0.00020	0.00020	0.00025	0.00024	0.00020	0.00022	0.00020	7631275
Dissolved Silicon (Si)	mg/L	54	0.10	49	49	0.10	80	0.10	7632167
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00010	7631275
Dissolved Sodium (Na)	mg/L	0.87	0.50	2.3	2.3	0.50	7.3	0.50	7632167
Dissolved Strontium (Sr)	mg/L	0.052	0.020	0.14	0.14	0.020	0.14	0.020	7632167
Dissolved Sulphur (S)	mg/L	0.51	0.20	8.0	8.1	0.20	0.69	0.20	7632167
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	<0.00020	<0.00020	0.00020	<0.00020	0.00020	7631275
Dissolved Tin (Sn)	mg/L	0.0075	0.0010	<0.0010	<0.0010	0.0010	0.017	0.0010	7631275
Dissolved Titanium (Ti)	mg/L	0.0087	0.0010	<0.0010	<0.0010	0.0010	0.044	0.0010	7631275
Dissolved Uranium (U)	mg/L	0.00016	0.00010	<0.00010	<0.00010	0.00010	0.0017	0.00010	7631275

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B479304
Report Date: 2014/09/10

MAXXAM ANALYTICS
Client Project #: MB4G1250
Site Location: 121511139

REGULATED METALS (CCME/AT1) - DISSOLVED

Maxxam ID		KN8717		KN8718	KN8719		KN8720		
Sampling Date		2014/06/16		2014/08/16	2014/08/16		2014/08/17		
COC Number		MB4G1250		MB4G1250	MB4G1250		MB4G1250		
	UNITS	**RC (XK3488-01)**	**RDL**	**LMH/2014/08/16 (XK3489-01)**	**LMH DUP/2014/08/16 (XK3490-01)**	**RDL**	**UMH (XK3491-01)**	**RDL**	**QC Batch**
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	<0.0010	<0.0010	0.0010	0.0069	0.0010	7631275
Dissolved Zinc (Zn)	mg/L	0.037	0.0030	0.30	0.29	0.0030	0.17	0.0030	7631275

RDL = Reportable Detection Limit

Maxxam Job #: B479304
Report Date: 2014/09/10

MAXXAM ANALYTICS
Client Project #: MB4G1250
Site Location: 121511139

REGULATED METALS (CCME/AT1) - DISSOLVED

Maxxam ID		KN8721	KN8723	KN8724		
Sampling Date		2014/08/17	2013/10/06	2014/08/16		
COC Number		MB4G1250	MB4G1250	MB4G1250		
	UNITS	**UMH DUP (XK3492-01)**	**LMH DUP/2013/10/06 (XK3494-01)**	**RC DUP (XK3495-01)**	**RDL**	**QC Batch**
Low Level Elements						
Dissolved Cadmium (Cd)	ug/L	<0.020	0.034	0.12	0.020	7630766
Elements						
Dissolved Aluminum (Al)	mg/L	0.0059	0.045	0.52	0.0030	7631275
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	<0.00060	0.00060	7631275
Dissolved Arsenic (As)	mg/L	0.0046	0.018	0.061	0.00020	7631275
Dissolved Barium (Ba)	mg/L	0.016	0.024	0.024	0.010	7632167
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	7631275
Dissolved Boron (B)	mg/L	<0.020	<0.020	0.041	0.020	7632167
Dissolved Calcium (Ca)	mg/L	23	8.1	9.1	0.30	7632167
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0022	0.0010	7631275
Dissolved Cobalt (Co)	mg/L	0.0035	0.017	0.0034	0.00030	7631275
Dissolved Copper (Cu)	mg/L	0.00036	0.0027	0.0069	0.00020	7631275
Dissolved Iron (Fe)	mg/L	1.4	<0.060	1.7	0.060	7632167
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	0.0044	0.00020	7631275
Dissolved Lithium (Li)	mg/L	<0.020	<0.020	<0.020	0.020	7632167
Dissolved Magnesium (Mg)	mg/L	13	7.3	5.1	0.20	7632167
Dissolved Manganese (Mn)	mg/L	5.2	14	8.9	0.0040	7632167
Dissolved Molybdenum (Mo)	mg/L	0.0044	<0.00020	<0.00020	0.00020	7631275
Dissolved Nickel (Ni)	mg/L	0.0069	0.033	0.0076	0.00050	7631275
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	<0.10	0.10	7632167
Dissolved Potassium (K)	mg/L	1.5	<0.30	0.36	0.30	7632167
Dissolved Selenium (Se)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	7631275
Dissolved Silicon (Si)	mg/L	9.7	1.3	52	0.10	7632167
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	7631275
Dissolved Sodium (Na)	mg/L	5.4	0.57	0.91	0.50	7632167
Dissolved Strontium (Sr)	mg/L	0.13	0.032	0.051	0.020	7632167
Dissolved Sulphur (S)	mg/L	0.72	0.89	0.50	0.20	7632167
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	7631275
Dissolved Tin (Sn)	mg/L	0.0083	<0.0010	0.0084	0.0010	7631275
Dissolved Titanium (Ti)	mg/L	<0.0010	<0.0010	0.011	0.0010	7631275
Dissolved Uranium (U)	mg/L	0.00021	<0.00010	0.00019	0.00010	7631275
Dissolved Vanadium (V)	mg/L	<0.0010	<0.0010	0.0011	0.0010	7631275

RDL = Reportable Detection Limit

Maxxam Job #: B479304
Report Date: 2014/09/10

MAXXAM ANALYTICS
Client Project #: MB4G1250
Site Location: 121511139

REGULATED METALS (CCME/AT1) - DISSOLVED

Maxxam ID		KN8721	KN8723	KN8724		
Sampling Date		2014/08/17	2013/10/06	2014/08/16		
COC Number		MB4G1250	MB4G1250	MB4G1250		
	UNITS	**UMH DUP (XK3492-01)**	**LMH DUP/2013/10/06 (XK3494-01)**	**RC DUP (XK3495-01)**	**RDL**	**QC Batch**
Dissolved Zinc (Zn)	mg/L	0.0036	0.092	0.040	0.0030	7631275

RDL = Reportable Detection Limit

Maxxam Job #: B479304
Report Date: 2014/09/10

MAXXAM ANALYTICS
Client Project #: MB4G1250
Site Location: 121511139

REGULATED METALS (CCME/AT1) - DISSOLVED

Maxxam ID		KN8722		
Sampling Date		2013/10/06		
COC Number		MB4G1250		
	UNITS	**LMH/2013/10/06 (XK3493-01)**	**RDL**	**QC Batch**
Low Level Elements				
Dissolved Cadmium (Cd)	ug/L	0.10	0.020	7630766
Lab Filtered Elements				
Dissolved Aluminum (Al)	mg/L	0.0057	0.0030	7624009
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	7624009
Dissolved Arsenic (As)	mg/L	0.047	0.00020	7624009
Dissolved Barium (Ba)	mg/L	0.12	0.010	7632323
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	7624009
Dissolved Boron (B)	mg/L	0.028	0.020	7632323
Dissolved Calcium (Ca)	mg/L	41	0.30	7632323
Dissolved Chromium (Cr)	mg/L	0.0011	0.0010	7624009
Dissolved Cobalt (Co)	mg/L	0.093	0.00030	7624009
Dissolved Copper (Cu)	mg/L	0.012	0.00020	7624009
Dissolved Iron (Fe)	mg/L	<0.060	0.060	7632323
Dissolved Lead (Pb)	mg/L	0.00046	0.00020	7624009
Dissolved Lithium (Li)	mg/L	<0.020	0.020	7632323
Dissolved Magnesium (Mg)	mg/L	37	0.20	7632323
Dissolved Manganese (Mn)	mg/L	70 (1)	0.020	7632323
Dissolved Molybdenum (Mo)	mg/L	<0.00020	0.00020	7624009
Dissolved Nickel (Ni)	mg/L	0.17	0.00050	7624009
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	7632323
Dissolved Potassium (K)	mg/L	1.6	0.30	7632323
Dissolved Selenium (Se)	mg/L	<0.00020	0.00020	7624009
Dissolved Silicon (Si)	mg/L	9.1	0.10	7632323
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	7624009
Dissolved Sodium (Na)	mg/L	2.8	0.50	7632323
Dissolved Strontium (Sr)	mg/L	0.16	0.020	7632323
Dissolved Sulphur (S)	mg/L	4.1	0.20	7632323
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	7624009
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	7624009
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	7624009
Dissolved Uranium (U)	mg/L	<0.00010	0.00010	7624009

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B479304
Report Date: 2014/09/10

MAXXAM ANALYTICS
Client Project #: MB4G1250
Site Location: 121511139

REGULATED METALS (CCME/AT1) - DISSOLVED

Maxxam ID		KN8722		
Sampling Date		2013/10/06		
COC Number		MB4G1250		
	UNITS	**LMH/2013/10/06 (XK3493-01)**	**RDL**	**QC Batch**
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	7624009
Dissolved Zinc (Zn)	mg/L	0.42	0.0030	7624009
RDL = Reportable Detection Limit				

Maxxam Job #: B479304
Report Date: 2014/09/10

MAXXAM ANALYTICS
Client Project #: MB4G1250
Site Location: 121511139

Package 1	8.0°C

Each temperature is the average of up to three cooler temperatures taken at receipt

REGULATED METALS (CCME/AT1) - DISSOLVED Comments

Sample KN8717-01 Elements by ICPMS - Dissolved: Client supplied DM bottle contained particulate.

Sample KN8718-01 Elements by ICPMS - Dissolved: Client supplied DM bottle contained particulate.

Sample KN8719-01 Elements by ICPMS - Dissolved: Client supplied DM bottle contained particulate.

Sample KN8720-01 Elements by ICPMS - Dissolved: Client supplied DM bottle contained particulate.

Sample KN8721-01 Elements by ICPMS - Dissolved: Client supplied DM bottle contained particulate.

Sample KN8723-01 Elements by ICPMS - Dissolved: Client supplied DM bottle contained particulate.

Sample KN8724-01 Elements by ICPMS - Dissolved: Client supplied DM bottle contained particulate.

Results relate only to the items tested.

MAXXAM ANALYTICS
Attention: SUB CONTRACTOR
Client Project #: MB4G1250
P.O. #:
Site Location: 121511139

Quality Assurance Report

Maxxam Job Number: CB479304

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7624009	HC7	Matrix Spike	Dissolved Aluminum (Al)	2014/09/04		123 (1)	%	80 - 120
			Dissolved Antimony (Sb)	2014/09/04		103	%	80 - 120
			Dissolved Arsenic (As)	2014/09/04		NC	%	80 - 120
			Dissolved Beryllium (Be)	2014/09/04		104	%	80 - 120
			Dissolved Chromium (Cr)	2014/09/04		NC	%	80 - 120
			Dissolved Cobalt (Co)	2014/09/04		86	%	80 - 120
			Dissolved Copper (Cu)	2014/09/04		86	%	80 - 120
			Dissolved Lead (Pb)	2014/09/04		93	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/09/04		100	%	80 - 120
			Dissolved Nickel (Ni)	2014/09/04		86	%	80 - 120
			Dissolved Selenium (Se)	2014/09/04		94	%	80 - 120
			Dissolved Silver (Ag)	2014/09/04		96	%	80 - 120
			Dissolved Thallium (Tl)	2014/09/04		93	%	80 - 120
			Dissolved Tin (Sn)	2014/09/04		87	%	80 - 120
			Dissolved Titanium (Ti)	2014/09/04		94	%	80 - 120
			Dissolved Uranium (U)	2014/09/04		94	%	80 - 120
			Dissolved Vanadium (V)	2014/09/04		97	%	80 - 120
			Dissolved Zinc (Zn)	2014/09/04		108	%	80 - 120
		Spiked Blank	Dissolved Aluminum (Al)	2014/09/04		118	%	80 - 120
			Dissolved Antimony (Sb)	2014/09/04		100	%	80 - 120
			Dissolved Arsenic (As)	2014/09/04		102	%	80 - 120
			Dissolved Beryllium (Be)	2014/09/04		107	%	80 - 120
			Dissolved Chromium (Cr)	2014/09/04		97	%	80 - 120
			Dissolved Cobalt (Co)	2014/09/04		98	%	80 - 120
			Dissolved Copper (Cu)	2014/09/04		97	%	80 - 120
			Dissolved Lead (Pb)	2014/09/04		102	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/09/04		100	%	80 - 120
			Dissolved Nickel (Ni)	2014/09/04		95	%	80 - 120
			Dissolved Selenium (Se)	2014/09/04		100	%	80 - 120
			Dissolved Silver (Ag)	2014/09/04		104	%	80 - 120
			Dissolved Thallium (Tl)	2014/09/04		101	%	80 - 120
			Dissolved Tin (Sn)	2014/09/04		89	%	80 - 120
			Dissolved Titanium (Ti)	2014/09/04		98	%	80 - 120
			Dissolved Uranium (U)	2014/09/04		96	%	80 - 120
			Dissolved Vanadium (V)	2014/09/04		104	%	80 - 120
			Dissolved Zinc (Zn)	2014/09/04		113	%	80 - 120
		Method Blank	Dissolved Aluminum (Al)	2014/09/04	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2014/09/04	<0.00060		mg/L	
			Dissolved Arsenic (As)	2014/09/04	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2014/09/04	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2014/09/04	0.0010, RDL=0.0010		mg/L	
			Dissolved Cobalt (Co)	2014/09/04	<0.00030		mg/L	
			Dissolved Copper (Cu)	2014/09/04	<0.00020		mg/L	
			Dissolved Lead (Pb)	2014/09/04	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2014/09/04	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2014/09/04	<0.00050		mg/L	
			Dissolved Selenium (Se)	2014/09/04	<0.00020		mg/L	
			Dissolved Silver (Ag)	2014/09/04	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2014/09/04	<0.00020		mg/L	
			Dissolved Tin (Sn)	2014/09/04	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2014/09/04	<0.0010		mg/L	
			Dissolved Uranium (U)	2014/09/04	<0.00010		mg/L	
			Dissolved Vanadium (V)	2014/09/04	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2014/09/04	<0.0030		mg/L	
		RPD	Dissolved Aluminum (Al)	2014/09/04	NC		%	20

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QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7624009	HC7	RPD	Dissolved Antimony (Sb)	2014/09/04	NC		%	20
			Dissolved Arsenic (As)	2014/09/04	0.2		%	20
			Dissolved Beryllium (Be)	2014/09/04	NC		%	20
			Dissolved Chromium (Cr)	2014/09/04	1.4		%	20
			Dissolved Cobalt (Co)	2014/09/04	NC		%	20
			Dissolved Copper (Cu)	2014/09/04	0.3		%	20
			Dissolved Lead (Pb)	2014/09/04	NC		%	20
			Dissolved Molybdenum (Mo)	2014/09/04	1.1		%	20
			Dissolved Nickel (Ni)	2014/09/04	NC		%	20
			Dissolved Selenium (Se)	2014/09/04	3.0		%	20
			Dissolved Silver (Ag)	2014/09/04	NC		%	20
			Dissolved Thallium (Tl)	2014/09/04	NC		%	20
			Dissolved Tin (Sn)	2014/09/04	NC		%	20
			Dissolved Titanium (Ti)	2014/09/04	NC		%	20
			Dissolved Uranium (U)	2014/09/04	2.5		%	20
			Dissolved Vanadium (V)	2014/09/04	NC		%	20
			Dissolved Zinc (Zn)	2014/09/04	NC		%	20
7631275	TDB	Matrix Spike	Dissolved Aluminum (Al)	2014/09/10		86	%	80 - 120
			Dissolved Antimony (Sb)	2014/09/10		63 (1)	%	80 - 120
			Dissolved Arsenic (As)	2014/09/10		104	%	80 - 120
			Dissolved Beryllium (Be)	2014/09/10		102	%	80 - 120
			Dissolved Chromium (Cr)	2014/09/10		98	%	80 - 120
			Dissolved Cobalt (Co)	2014/09/10		91	%	80 - 120
			Dissolved Copper (Cu)	2014/09/10		90	%	80 - 120
			Dissolved Lead (Pb)	2014/09/10		90	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/09/10		107	%	80 - 120
			Dissolved Nickel (Ni)	2014/09/10		93	%	80 - 120
			Dissolved Selenium (Se)	2014/09/10		101	%	80 - 120
			Dissolved Silver (Ag)	2014/09/10		81	%	80 - 120
			Dissolved Thallium (Tl)	2014/09/10		92	%	80 - 120
			Dissolved Tin (Sn)	2014/09/10		90	%	80 - 120
			Dissolved Titanium (Ti)	2014/09/10		106	%	80 - 120
			Dissolved Uranium (U)	2014/09/10		97	%	80 - 120
			Dissolved Vanadium (V)	2014/09/10		106	%	80 - 120
			Dissolved Zinc (Zn)	2014/09/10		92	%	80 - 120
		Spiked Blank	Dissolved Aluminum (Al)	2014/09/10		102	%	80 - 120
			Dissolved Antimony (Sb)	2014/09/10		98	%	80 - 120
			Dissolved Arsenic (As)	2014/09/10		97	%	80 - 120
			Dissolved Beryllium (Be)	2014/09/10		98	%	80 - 120
			Dissolved Chromium (Cr)	2014/09/10		94	%	80 - 120
			Dissolved Cobalt (Co)	2014/09/10		91	%	80 - 120
			Dissolved Copper (Cu)	2014/09/10		97	%	80 - 120
			Dissolved Lead (Pb)	2014/09/10		95	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/09/10		99	%	80 - 120
			Dissolved Nickel (Ni)	2014/09/10		97	%	80 - 120
			Dissolved Selenium (Se)	2014/09/10		96	%	80 - 120
			Dissolved Silver (Ag)	2014/09/10		98	%	80 - 120
			Dissolved Thallium (Tl)	2014/09/10		97	%	80 - 120
			Dissolved Tin (Sn)	2014/09/10		98	%	80 - 120
			Dissolved Titanium (Ti)	2014/09/10		97	%	80 - 120
			Dissolved Uranium (U)	2014/09/10		95	%	80 - 120
			Dissolved Vanadium (V)	2014/09/10		98	%	80 - 120
			Dissolved Zinc (Zn)	2014/09/10		102	%	80 - 120
		Method Blank	Dissolved Aluminum (Al)	2014/09/10	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2014/09/10	<0.00060		mg/L	

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QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7631275	TDB	Method Blank	Dissolved Arsenic (As)	2014/09/10	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2014/09/10	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2014/09/10	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2014/09/10	<0.00030		mg/L	
			Dissolved Copper (Cu)	2014/09/10	<0.00020		mg/L	
			Dissolved Lead (Pb)	2014/09/10	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2014/09/10	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2014/09/10	<0.00050		mg/L	
			Dissolved Selenium (Se)	2014/09/10	<0.00020		mg/L	
			Dissolved Silver (Ag)	2014/09/10	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2014/09/10	<0.00020		mg/L	
			Dissolved Tin (Sn)	2014/09/10	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2014/09/10	<0.0010		mg/L	
			Dissolved Uranium (U)	2014/09/10	<0.00010		mg/L	
			Dissolved Vanadium (V)	2014/09/10	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2014/09/10	<0.0030		mg/L	
		RPD	Dissolved Aluminum (Al)	2014/09/10	NC		%	20
			Dissolved Antimony (Sb)	2014/09/10	NC		%	20
			Dissolved Arsenic (As)	2014/09/10	NC		%	20
			Dissolved Beryllium (Be)	2014/09/10	NC		%	20
			Dissolved Chromium (Cr)	2014/09/10	NC		%	20
			Dissolved Cobalt (Co)	2014/09/10	NC		%	20
			Dissolved Copper (Cu)	2014/09/10	3.8		%	20
			Dissolved Lead (Pb)	2014/09/10	NC		%	20
			Dissolved Molybdenum (Mo)	2014/09/10	2.8		%	20
			Dissolved Nickel (Ni)	2014/09/10	NC		%	20
			Dissolved Selenium (Se)	2014/09/10	NC		%	20
			Dissolved Silver (Ag)	2014/09/10	NC		%	20
			Dissolved Thallium (Tl)	2014/09/10	NC		%	20
			Dissolved Tin (Sn)	2014/09/10	NC		%	20
			Dissolved Titanium (Ti)	2014/09/10	NC		%	20
			Dissolved Uranium (U)	2014/09/10	3.1		%	20
			Dissolved Vanadium (V)	2014/09/10	NC		%	20
			Dissolved Zinc (Zn)	2014/09/10	NC		%	20
7632167	KSF	Matrix Spike	Dissolved Barium (Ba)	2014/09/10		87	%	80 - 120
			Dissolved Boron (B)	2014/09/10		92	%	80 - 120
			Dissolved Calcium (Ca)	2014/09/10		NC	%	80 - 120
			Dissolved Iron (Fe)	2014/09/10		90	%	80 - 120
			Dissolved Lithium (Li)	2014/09/10		93	%	80 - 120
			Dissolved Magnesium (Mg)	2014/09/10		NC	%	80 - 120
			Dissolved Manganese (Mn)	2014/09/10		93	%	80 - 120
			Dissolved Phosphorus (P)	2014/09/10		101	%	80 - 120
			Dissolved Potassium (K)	2014/09/10		96	%	80 - 120
			Dissolved Silicon (Si)	2014/09/10		90	%	80 - 120
			Dissolved Sodium (Na)	2014/09/10		NC	%	80 - 120
			Dissolved Strontium (Sr)	2014/09/10		86	%	80 - 120
		Spiked Blank	Dissolved Barium (Ba)	2014/09/10		90	%	80 - 120
			Dissolved Boron (B)	2014/09/10		93	%	80 - 120
			Dissolved Calcium (Ca)	2014/09/10		96	%	80 - 120
			Dissolved Iron (Fe)	2014/09/10		91	%	80 - 120
			Dissolved Lithium (Li)	2014/09/10		96	%	80 - 120
			Dissolved Magnesium (Mg)	2014/09/10		101	%	80 - 120
			Dissolved Manganese (Mn)	2014/09/10		97	%	80 - 120
			Dissolved Phosphorus (P)	2014/09/10		94	%	80 - 120
			Dissolved Potassium (K)	2014/09/10		98	%	80 - 120

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Maxxam Job Number: CB479304

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7632167 KSF	Spiked Blank	Dissolved Silicon (Si)	2014/09/10		92	%	80 - 120
		Dissolved Sodium (Na)	2014/09/10		96	%	80 - 120
		Dissolved Strontium (Sr)	2014/09/10		90	%	80 - 120
	Method Blank	Dissolved Barium (Ba)	2014/09/10	<0.010		mg/L	
		Dissolved Boron (B)	2014/09/10	<0.020		mg/L	
		Dissolved Calcium (Ca)	2014/09/10	<0.30		mg/L	
		Dissolved Iron (Fe)	2014/09/10	<0.060		mg/L	
		Dissolved Lithium (Li)	2014/09/10	<0.020		mg/L	
		Dissolved Magnesium (Mg)	2014/09/10	<0.20		mg/L	
		Dissolved Manganese (Mn)	2014/09/10	<0.0040		mg/L	
		Dissolved Phosphorus (P)	2014/09/10	<0.10		mg/L	
		Dissolved Potassium (K)	2014/09/10	<0.30		mg/L	
		Dissolved Silicon (Si)	2014/09/10	<0.10		mg/L	
		Dissolved Sodium (Na)	2014/09/10	<0.50		mg/L	
		Dissolved Strontium (Sr)	2014/09/10	<0.020		mg/L	
		Dissolved Sulphur (S)	2014/09/10	<0.20		mg/L	
	RPD	Dissolved Barium (Ba)	2014/09/10	NC		%	20
		Dissolved Boron (B)	2014/09/10	NC		%	20
		Dissolved Calcium (Ca)	2014/09/10	4.3		%	20
		Dissolved Iron (Fe)	2014/09/10	NC		%	20
		Dissolved Lithium (Li)	2014/09/10	NC		%	20
		Dissolved Magnesium (Mg)	2014/09/10	7.0		%	20
		Dissolved Manganese (Mn)	2014/09/10	5.8		%	20
		Dissolved Phosphorus (P)	2014/09/10	NC		%	20
		Dissolved Potassium (K)	2014/09/10	9.7		%	20
		Dissolved Silicon (Si)	2014/09/10	8.0		%	20
		Dissolved Sodium (Na)	2014/09/10	0.6		%	20
		Dissolved Strontium (Sr)	2014/09/10	7.3		%	20
		Dissolved Sulphur (S)	2014/09/10	0.4		%	20
7632323 KSF	Matrix Spike	Dissolved Barium (Ba)	2014/09/10		92	%	80 - 120
		Dissolved Boron (B)	2014/09/10		95	%	80 - 120
		Dissolved Calcium (Ca)	2014/09/10		NC	%	80 - 120
		Dissolved Iron (Fe)	2014/09/10		95	%	80 - 120
		Dissolved Lithium (Li)	2014/09/10		97	%	80 - 120
		Dissolved Magnesium (Mg)	2014/09/10		99	%	80 - 120
		Dissolved Manganese (Mn)	2014/09/10		99	%	80 - 120
		Dissolved Phosphorus (P)	2014/09/10		98	%	80 - 120
		Dissolved Potassium (K)	2014/09/10		99	%	80 - 120
		Dissolved Silicon (Si)	2014/09/10		92	%	80 - 120
		Dissolved Sodium (Na)	2014/09/10		96	%	80 - 120
		Dissolved Strontium (Sr)	2014/09/10		92	%	80 - 120
	Spiked Blank	Dissolved Barium (Ba)	2014/09/10		92	%	80 - 120
		Dissolved Boron (B)	2014/09/10		94	%	80 - 120
		Dissolved Calcium (Ca)	2014/09/10		99	%	80 - 120
		Dissolved Iron (Fe)	2014/09/10		95	%	80 - 120
		Dissolved Lithium (Li)	2014/09/10		96	%	80 - 120
		Dissolved Magnesium (Mg)	2014/09/10		103	%	80 - 120
		Dissolved Manganese (Mn)	2014/09/10		98	%	80 - 120
		Dissolved Phosphorus (P)	2014/09/10		95	%	80 - 120
		Dissolved Potassium (K)	2014/09/10		98	%	80 - 120
		Dissolved Silicon (Si)	2014/09/10		96	%	80 - 120
		Dissolved Sodium (Na)	2014/09/10		96	%	80 - 120
		Dissolved Strontium (Sr)	2014/09/10		92	%	80 - 120
	Method Blank	Dissolved Barium (Ba)	2014/09/10	<0.010		mg/L	
		Dissolved Boron (B)	2014/09/10	<0.020		mg/L	

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Maxxam Job Number: CB479304

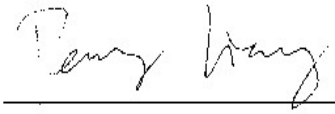
QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7632323	KSF	Method Blank	Dissolved Calcium (Ca)	2014/09/10	<0.30		mg/L	
			Dissolved Iron (Fe)	2014/09/10	<0.060		mg/L	
			Dissolved Lithium (Li)	2014/09/10	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2014/09/10	<0.20		mg/L	
			Dissolved Manganese (Mn)	2014/09/10	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2014/09/10	<0.10		mg/L	
			Dissolved Potassium (K)	2014/09/10	<0.30		mg/L	
			Dissolved Silicon (Si)	2014/09/10	<0.10		mg/L	
			Dissolved Sodium (Na)	2014/09/10	<0.50		mg/L	
			Dissolved Strontium (Sr)	2014/09/10	<0.020		mg/L	
			Dissolved Sulphur (S)	2014/09/10	<0.20		mg/L	
		RPD	Dissolved Calcium (Ca)	2014/09/10	0.06		%	20
			Dissolved Iron (Fe)	2014/09/10	NC		%	20
			Dissolved Magnesium (Mg)	2014/09/10	0.08		%	20
			Dissolved Manganese (Mn)	2014/09/10	NC		%	20
			Dissolved Potassium (K)	2014/09/10	2.0		%	20
			Dissolved Sodium (Na)	2014/09/10	0.6		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).
NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Validation Signature Page

Maxxam Job #: B479304

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Peng Liang, Analyst II

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

APPENDIX R

Characterization and Preliminary Treatability Testing of Tailings Effluent

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Joyce Lake Direct Shipping Iron Ore Project: Characterization and Preliminary Treatability Testing of Tailings Effluent

Report Prepared for

Labec Century Iron Ore Corp.

File No. 121810649

Date: May 1, 2013

Executive Summary

Stantec was retained by Labec Century Iron Ore Corporation to characterize the tailings effluent of the proposed Joyce Lake Iron Ore Mine. This report discusses the results of analyses and preliminary treatability testing of process water generated during metallurgical work. The process water is currently considered to be the best surrogate of future effluent from the tailings.

Water quality assessment of initial process water indicated it was in compliance with *Metal Mining Effluent Regulation* (MMER) parameters except for Total Suspended Solids (TSS), which ranged from 321 to 123 mg/L. In addition, the raw process water was characterized by an intensive red colour, referred to as Red Water, which originated from very fine grained suspended particles of ferric iron oxides produced during crushing. Therefore, major effluent quality concerns could be addressed through the removal of Total Suspended Solids (TSS) including very fine grain sizes.

Conventional gravitational settling may provide adequate time to reduce TSS and colour criteria to below regulatory guidance however, results were conflicting and a distinct red discolouration persisted. The addition of coagulants Ferric Sulfate or Aluminum Sulfate to concentrations of 10 ppm followed by 24 hours settling time resulted in significant water clarity improvement, colour of 4 – 6 TCU and TSS concentrations of <2 – 4 mg/L well below the MMER Guideline (15 mg/L). The addition of flocculant is not required for the treatment.

At the TMA drainage discharge point with receiving waters, there is expected to be limited assimilation or dilution potential due to lower flows, limited mixing depth and high background colour thresholds. Addressing red colouration concomitantly addresses elevated TSS concentrations. The recommended effluent criterion for colour is 7.5 TCU.

Further settling testing in the laboratory is recommended to confirm that treatment is required and cannot be replaced by larger settling ponds. It is currently recommended that Red Water treatment be included in the cost estimates of the project feasibility study.

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 METHODOLOGY 2

3.0 RESULTS AND DISCUSSION 5

3.1 Initial Samples 5

3.2 Treatability Testing 5

3.3 Effluent Assimilation 6

4.0 CONCLUSIONS 11

5.0 RECOMMENDATIONS 12

6.0 REFERENCES 13

7.0 CLOSURE 14

LIST OF FIGURES

Figure 2-1: Process Water from Wet Screening only (top row) and Scrubbing Process (bottom row) after Thawing and Agitation (left column) and One Hour Later (right column) 4
Figure 3-1: Control Samples after 72 hours of Testing 9
Figure 3-2: Samples After 24 hours Testing (see Table 3-2 for test details) 10

LIST OF TABLES

Table 2-1 Process Water Samples Associated with Metallurgical Testing 2
Table 3-1: Initial and Treated Water Samples Collected During Metallurgical Testing 7
Table 3-2: Results of Treatability Tests for Total Suspended Solids (TSS) 8

LIST OF ATTACHMENTS

Attachment 1: SGS Memo on Process Water Generation
Attachment 2: CNS Treatability Testing Report
Attachment 3: Certificates of Analysis for Process Water
Attachment 4: Examples of Mobile Equipment used by CNS for Tailings Effluent Treatment

1.0 INTRODUCTION

Labec Century Iron Ore (Labec Century), a subsidiary of Century Iron Mines Corporation, is proposing to initiate open-pit mining operations at the Joyce Lake in Labrador, approximately 20 km northeast of Schefferville, QC. The later stage of the operations may require construction of a beneficiation plant and tailings facility. Tailing effluents at existing iron-ore mining operations in the region (e.g., Labrador City and Wabush, NL, and Fermont, QC) have a red colour which is often referred as “Red Water.” Red Water is coloured by colloidal particles of ferric-iron oxides produced during crushing, milling and beneficiation of iron-ore minerals. The Red Water condition is not usually associated with waste rock or mine water from open-pit dewatering.

According to the Canada Gazette (2009), Red Water environmental issues are minimal and mostly aesthetic in nature. However, red water is associated with discolouration of fish flesh. Red-particle suspension may also affect light penetration in the water column and the ability of fish to forage by sight, affecting the trophic productivity of the water body.

Currently, there is no regulatory requirement related to the colour of water discharged from iron mining operations into the receiving environment. However, social and community concerns necessitate addressing the Red Water issue. It is expected that regulators will likely require Red Water from the tailings effluent to be treated and that specific Red Water effluent criteria will be determined through consultation with regulators and applied in the project Certificate of Approval. Given the lack of such criteria, colour criteria specified in Health Canada Guidelines for Canadian Drinking Water Quality (Health Canada 1999) were preliminarily applied in this study, imposing a colour limit of 15 TCU in addition to other parameters set in the *Metal Mining Effluent Regulation (2002)*.

Stantec was retained by Labec Century to characterize tailings effluent including the Red Water issue. This report discusses the results of analyses and preliminary treatability testing of process water generated during metallurgical work. The process water is currently considered to be the best surrogate of future effluent from project tailings.

2.0 METHODOLOGY

Process water was obtained from three metallurgical tests (Table 2-1). The first test included crushing and wet screening of high-grade ore. In the second test, the ore was scrubbed after crushing and then wet screened. The third test included crushing, screening and separating on a Wifely Table. A more detailed description of the metallurgical process conducted by SGS is presented in Attachment 1.

Table 2-1 Process Water Samples Associated with Metallurgical Testing

Process	Samples
Crushing → wet screening	PW1 and PW2
Crushing → scrubbing → wet screening	PWS, S1 and S2 – series
Crushing → wet screening → separating via Wilfley Table	W – series

Samples of process water were analyzed prior the treatability testing. Samples from the first set of metallurgical testing (PW1 and PW2) were lost after the initial analyses and were not subjected to further treatability testing. Water from the scrubbing process (PWS) was frozen, which changed the characteristics of fine particles. Therefore, frozen samples were thawed and reanalyzed prior to treatability testing in duplicate (S1 and S2 series). Photographs of these samples are shown in Figure 2-1. Water from the Wifely Table process was not frozen and was stored inside for several days between metallurgical and treatability testing.

Preliminary treatability testing was targeted to control TSS because the red colour is the result of suspended particles. The testing was requested by Stantec and completed by personnel from CNS company, with support from SGS laboratory. CNS company provides such services, along with a supply of chemicals for treatment of mining effluents, and particularly Red Water. Therefore, this document heavily relied upon the treatability testing report provided by CNS to Stantec (Attachment 2).

Three samples were selected and were analyzed for TSS prior the treatability testing:

1. Scrubber#1 (S1-0): 60 ppm

2. Scrubber#2 (S2-0): 80 ppm

3. Wilfley tails (W0): 120 ppm

For TSS analyses, 50 mL of each sample was filtered through 0.45 um filter paper of known weight, then dried in an oven and the dry weight was determined. The TSS was calculated using the weight of dry solids on the filter paper divided by the volume of the sample.

CNS started testing using coagulants by adding Ferric Sulfate (Ferrichem) at a concentration of 80 ppm, Aluminum Sulfate (Aluchem) at a concentration of 60 ppm, and Flomin 920MC flocculant at a concentration of 1 ppm. The concentrations of the reactants were reduced, and the settling time was increased. Samples were taken at 4, 24, 48 and 72 hours and analyzed for TSS. At the end of each test (48 or 72 hours), samples were collected except for the S1 series, which were disposed of in error. The samples were analyzed for colour, TSS, conductivity, turbidity, pH, hardness, alkalinity and total and dissolved metals. Measurements of TSS in the final samples involved a larger volume, ~500 mL, providing higher precision, but resulting in a different value if compared with TSS measured during the treatability testing. The certificates of analyses are presented in Attachment 3.

Results of this testing were compared to the *Metal Mining Effluent Regulation* for compliance (MMER 2002). The results were also checked against *Health Canada Guidelines for Canadian Drinking Water Quality* (CDWQ) for colour (15 TCU) and *Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Fresh Water Aquatic Life* (CCME 1999) for reference purposes.

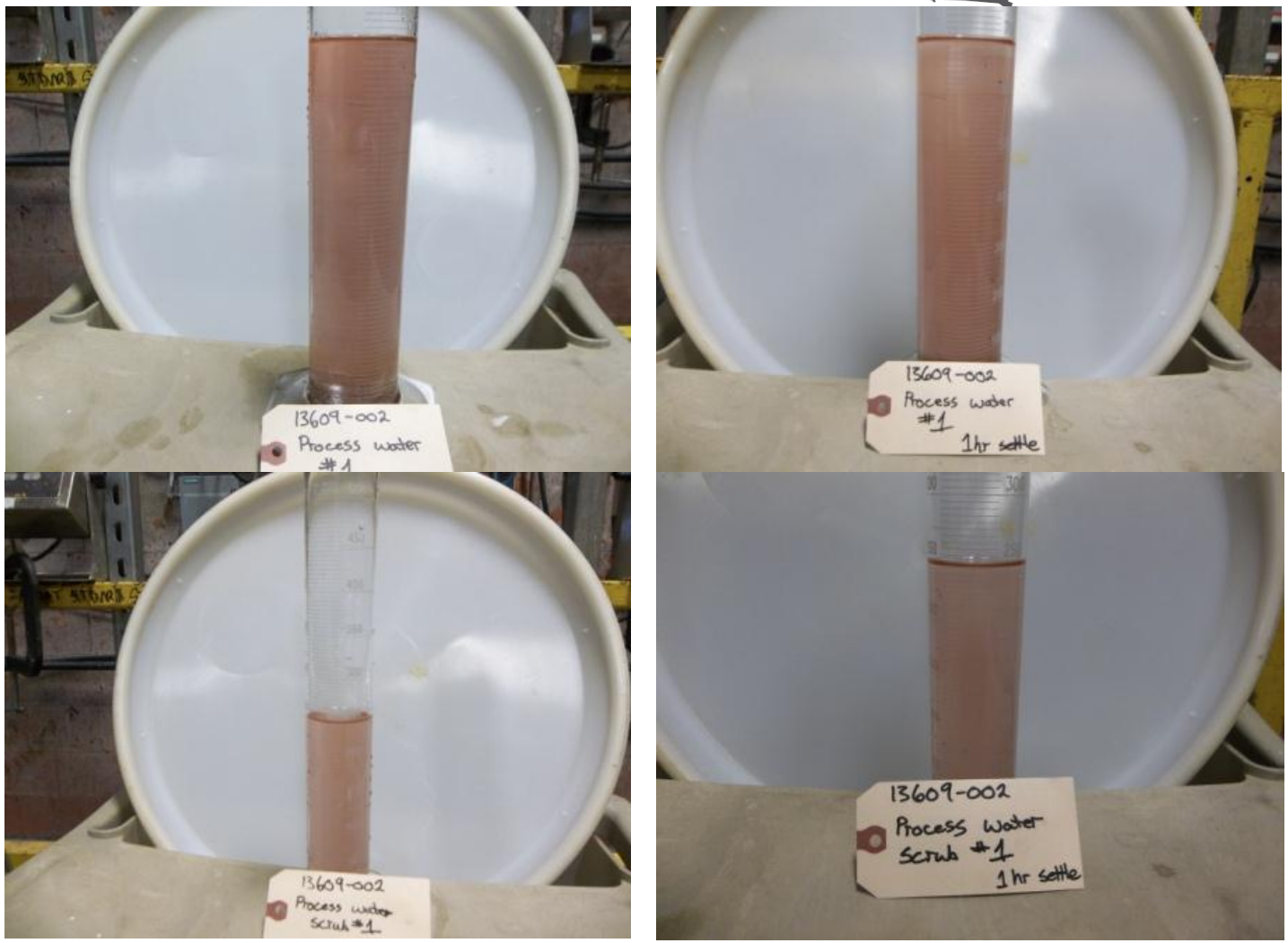

Figure 2-1: Process Water from Wet Screening only (top row) and Scrubbing Process (bottom row) after Thawing and Agitation (left column) and One Hour Later (right column)

3.0 RESULTS AND DISCUSSION

3.1 Initial Samples

All samples of the initial process water were confirmed to be compliant withMMER parameters except for Total Suspended Solids (TSS). TSS exceeded the stipulated MMER guideline by at least 9x (Table 3-1). Concentrations of total aluminum, cadmium, chromium, and iron exceed the respective CCME guidelines in all types of process water. Dissolved concentrations of these elements were in compliance with the CCME guidelines, indicating that the abovementioned exceedances are related to suspended particles. Samples exceeding the CDWQ guideline for colour also had high concentrations of TSS, ranging from 280 to 321 mg/L. On this basis, it was clear that the major water quality concerns are linked and should be addressed through the removal of TSS.

3.2 Treatability Testing

In control tests, particles were left to settle for 72 hours without the addition of any chemicals. The results indicate that TSS can decrease below the MMER guideline (15 mg/L) within 48 hours (Table 3-2). TSS measurements at the end of the tests disagree with the preliminary measurements (Table 3-1 and 3-2). For example, sample W5 taken at 72 hours shows TSS of 10 mg/L and 69 mg/L, for analyses that involved filtration of 50 ml and 500 ml, respectively. The difference between the methods likely caused this discrepancy. Because of the discrepancy, it is not clear if this settling time would be sufficient to comply with MMER guidelines for TSS without any treatment. Colour values were 7 and 10 TCU after 72 hours of settling in untreated samples from scrubber and Wilfley Table, respectively. Regardless of TCU values being below the CDWQ guideline for colour (15 TCU), the red colour is quite noticeable in these samples (Figure 3-1).

Initial testing showed that the addition of flocculants is unnecessary, and that concentrations of coagulants, Ferric Sulfate or Aluminum Sulfate, could be reduced. Reduction of coagulant concentrations to 30 ppm resulted in a decrease of TSS to the levels below 1 ppm in 4 hours (Table 3-2). The same result is achieved after 24 hours of settling at a coagulant concentration of 10 ppm. There was no noticeable red colouration in treated samples after 24 hours of settling (Figure 3-2). It should be noted that visual comparison of treated samples to the control ones provided better evaluation for colour than analytical measurements of colour. For example, sample S2-4 (6 TCU) looked significantly less coloured than S2-5 (7 TCU), regardless of the measured difference in colour between these samples of only 1 TCU as measured by the lab (Figure 3-2). In addition, measured colour values and TSS concentrations do not seem to correlate in treated samples (Table 3-2). A possible reason for lack of correlation is that the colloidal particles responsible for Red Water suspension are sub-micron is size. TSS measurement was via a 0.45 um filter method which is the commonly accepted particle size boundary between dissolved solids and total solids. Thus if a significant proportion of the “solids” were below the 0.45 um size, this could result in lack of correlation.

The current results allow development of site-specific numerical colour criteria for Red Water. The CDWQ guideline for colour of 15 TCU is high to be used as a criterion for the Red Water issue because coloration of the control samples is apparent even when their measured values are below the guideline. Based on the results of this assessment an effluent criterion for colour of 7.5 TCU, or ½ the CDWG threshold is recommended to avoid the visible red discolouration of receiving waters.

3.3 Effluent Assimilation

As Red Water is an aesthetic concern, it is important to assess the effect of the effluent in receiving waters. Based on surface water quality sampling conducted in project area lakes and streams in summer and fall 2012, the mean TSS concentration was 2.7 mg/L and the mean colour values was 27.7 TCU. Local surface waters are naturally stained with tannins from the wide-spread prevalence of organic sources such as bogs and wetlands.

With an assessment that Red Water would effectively be clarified at 7.5 TCU it would be reasonable to approach the effluent discharge to a mixing zone at a higher threshold. In such a case, 7.5 TCU would become the criterion for visible effluent breakout at the receiving water surface or at the contact with benthic sediments in the case of a submerged discharge and at the lateral boundary of a defined mixing zone. However, as the proposed Tailings Management Area (TMA) drains toward a small channel and pond catchment leading to Petisikapau Lake, there is expected to be limited vertical water column and horizontal dispersion inertia available to develop an extensive receiving water mixing zone. Further as the background colour concentrations average higher than the regulatory criteria, there is limited opportunity for colour dilution. As a result, the recommended Red Water effluent criterion remains at 7.5 TCU.

Table 3-1: Analytical Results for Initial and Treated Water Samples Collected During Metallurgical Testing

Sample ID		Guidelines		PW1		PW2		PWS1		PWS2		S2-0		S2-3		S2-4		S2-5		W0		W3		W4		W5	
Parameter	**Units**	**MMER**	**CCME FAL**	**Initial screening water (before freezing)**				**Initial scrubbing water (before freezing)**				**Scrubbing water after freezing**		**Scrubbing water after freezing and 24 hrs. settling with Aluchem at 10 ppm**		**Scrubbing water after freezing and 24 hrs. settling with Ferrichem at 10 ppm**		**Scrubbing water after freezing after 72 hrs. settling, no coagulant**		**Initial Wilfley Table water no freezing**		**Wilfley Table water after 24 hrs. settling with Aluchem at 10 ppm**		**Wilfley Table water after 24 hrs. settling with Ferrichem at 10 ppm**		**Wilfley Table water after 72 hrs. settling, no coagulant**	
Physico-chemical																											
TSS	mg/L	15		**321**		**315**		**280**		**302**		**123**		< 2		< 2		2		**123**		4		3		**69**	
TDS	mg/L			149		137		186		154		-		-		-		-		-		-		-		-	
pH	units	4.5-9.5	4.5-9.5	7.82		7.88		7.87		7.90		7.98		7.89		7.84		7.96		7.93		7.92		7.61		7.98	
Alkalinity	mg/L as CaCO3			81		82		81		80		-		-		-		-		-		-		-		-	
Conductivity	µS/cm			227		230		233		234		-		-		-		-		-		-		-		-	
Colour	TCU			36		33		26		28		9		5		6		7		9		6		4		10	
Turbidity	NTU			324		744		507		285		200		1.0		2.4		not enough sample		192		5		3		not enough sample	
Hardness	mg/L as CaCO3			93.9		93.8		95.8		93.3		-		-		-		-		-		-		-		-	
Hardness (diss)	mg/L as CaCO3			89.3		87.2		85.9		85.3		-		-		-		-		-		-		-		-	
Metals			**Total**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**	**Total**	**Diss.**
Ag	mg/L	-	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.00014	< 0.00001	0.00001	< 0.00001	0.00001	< 0.00001	0.00003	< 0.00001	0.00003	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00003	< 0.00001
Al	mg/L	-	0.1	0.88	< 0.01	0.85	< 0.01	0.65	< 0.01	0.63	< 0.01	0.46	0.02	0.26	0.15	0.03	0.02	0.04	0.01	0.17	0.03	0.30	0.16	0.02	< 0.01	0.03	0.02
As	mg/L	0.5	0.005	0.005	< 0.002	0.005	< 0.002	0.006	< 0.002	0.005	< 0.002	0.0037	0.0012	0.0008	0.0004	0.0004	0.0003	0.0019	0.0017	0.0027	0.0008	0.0006	0.0006	0.0004	0.0003	0.0014	0.0011
Ba	mg/L	-	-	0.0180	0.0084	0.0169	0.0079	0.0160	0.0081	0.0157	0.0084	0.0157	0.00854	0.00862	0.00819	0.00622	0.00519	0.0353	0.0332	0.0105	0.00297	0.00336	0.00332	0.00347	0.00325	0.00441	0.00401
Be	mg/L	-	-	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.00004	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	0.00006	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
B	mg/L	-	-	0.155	0.013	0.103	0.012	0.082	0.012	0.063	0.011	0.0109	0.0090	0.0110	0.0101	0.0120	0.0112	0.0096	0.0090	0.0127	0.0112	0.0119	0.0114	0.0128	0.0121	0.0135	0.0125
Bi	mg/L	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0002	< 0.0001	0.0003	< 0.0001	0.00041	< 0.00001	0.00013	0.00001	0.00012	< 0.00001	0.00012	< 0.00001	0.00019	< 0.00001	0.00010	< 0.00001	0.00010	< 0.00001	0.00012	< 0.00001
Ca	mg/L	-	-	30.3	29.1	30.3	28.5	30.7	27.8	29.9	27.6	34.1	30.3	31.0	31.0	32.3	30.6	32.0	30.0	41.5	40.1	42.6	40.7	42.4	40.0	43.2	40.0
Cd	mg/L	-	0.00004	0.00005	< 0.00003	0.00005	< 0.00003	0.00009	< 0.00003	0.00006	< 0.00003	0.00058	0.00010	0.00038	0.00034	0.00011	0.00004	0.00013	0.00010	0.00034	0.00013	0.00013	0.00013	0.00015	0.00013	0.00010	0.00009
Co	mg/L	-	0.004	0.00254	0.00029	0.00275	0.00026	0.00397	0.00023	0.00387	0.00024	0.00147	0.000031	0.000073	0.000044	0.000457	0.000049	0.000064	0.000035	0.000891	0.000068	0.000085	0.000080	0.000834	0.000795	0.000188	0.000144
Cr	mg/L	-	0.001	0.006	< 0.005	0.006	< 0.005	0.006	< 0.005	0.005	< 0.005	0.0020	0.0007	0.0007	0.0006	0.0006	< 0.0005	0.0007	0.0006	0.0012	< 0.0005	0.0005	0.0005	0.0006	< 0.0005	0.0009	< 0.0005
Cu	mg/L	0.3	0.0028	0.008	< 0.005	0.007	< 0.005	0.008	< 0.005	0.008	< 0.005	0.0128	0.0047	0.0087	0.0083	0.0057	0.0046	0.0069	0.0071	0.0066	0.0059	0.0052	0.0066	0.0040	0.0039	0.0107	0.0099
Fe	mg/L	-	0.3	8.92	0.063	9.17	0.100	8.70	0.066	8.46	0.052	8.01	0.013	0.020	< 0.003	0.47	< 0.003	0.12	< 0.003	7.33	0.012	0.093	< 0.003	0.57	< 0.003	0.25	< 0.003
Hg	mg/L	-	0.000026	-	0.00001	-	0.00001	-	0.00003	-	< 0.00001	-	< 0.00001	-	< 0.00001	-	< 0.00001	-	< 0.00001	-	< 0.00001	-	< 0.00001	-	< 0.00001	-	< 0.00001
K	mg/L	-	-	1.71	1.47	1.74	1.48	1.88	1.58	1.84	1.58	2.05	1.84	1.71	1.72	2.81	2.71	1.92	1.83	5.96	5.78	6.09	5.84	6.06	5.78	6.17	5.74
Li	mg/L	-	-	0.002	< 0.001	0.002	< 0.001	0.002	< 0.001	0.002	< 0.001	0.002	0.001	< 0.001	< 0.001	0.001	0.001	0.001	0.001	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Mg	mg/L	-	-	4.44	4.02	4.38	3.88	4.62	4.01	4.53	3.98	4.70	4.20	4.32	4.31	4.54	4.30	4.46	4.19	4.20	4.05	4.28	4.11	4.30	4.08	4.33	4.03
Mn	mg/L	-	-	0.294	0.0023	0.286	0.0025	0.248	0.0009	0.231	0.0007	0.144	0.00056	0.00289	0.00094	0.00864	0.00019	0.00303	0.00037	1.33	0.00817	0.0268	0.0143	0.0798	0.0731	0.0535	0.0220
Mo	mg/L	-	0.073	< 0.0001	0.0002	< 0.0001	0.0002	< 0.0001	0.0002	< 0.0001	0.0002	0.00005	0.00031	0.00030	0.00031	0.00027	0.00029	0.00069	0.00031	0.00020	0.00067	0.00073	0.00075	0.00058	0.00055	0.00065	0.00078
Na	mg/L	-	-	7.70	7.47	7.87	7.46	8.77	7.82	8.48	7.85	8.86	8.11	8.65	8.59	9.83	9.15	8.72	8.13	32.2	31.1	33.5	31.6	33.1	30.9	33.5	30.8
Ni	mg/L	0.5	0.113	0.003	< 0.001	0.003	< 0.001	0.003	< 0.001	0.003	< 0.001	0.0029	0.0009	0.0012	0.0011	0.0016	0.0016	0.0011	0.0009	0.0030	0.0013	0.0015	0.0015	0.0026	0.0023	0.0019	0.0017
P	mg/L			0.096	< 0.009	0.103	< 0.009	0.092	< 0.009	0.088	< 0.009	0.297	0.204	0.023	< 0.009	0.631	0.509	0.220	0.196	0.069	0.014	0.010	0.012	< 0.009	< 0.009	0.025	0.012
Pb	mg/L	0.2	0.0063	0.0022	< 0.0002	0.0022	< 0.0002	0.0032	< 0.0002	0.0033	0.0002	0.00259	0.00013	0.00022	0.00011	0.00023	0.00008	0.00041	0.00011	0.00236	0.00009	0.00015	0.00011	0.00016	0.00004	0.00065	0.00013
Sb	mg/L	-		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	< 0.0002	< 0.0002
Se	mg/L	-	0.001	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	0.00012	0.00008
Si	mg/L	-	-	4.06	2.26	4.05	2.23	3.84	2.26	3.76	2.26	3.54	2.17	2.03	2.00	2.30	2.15	2.32	2.16	3.19	2.48	2.52	2.38	2.41	2.24	2.67	2.46
Sn	mg/L	-	-	0.0004	0.0002	0.0004	0.0001	0.0008	0.0004	0.0008	0.0004	0.00058	0.00062	0.0244	0.0220	0.0168	0.0154	0.0182	0.0170	0.00029	0.00044	0.0253	0.0235	0.0348	0.0275	0.0261	0.0236
Sr	mg/L	-	-	0.108	0.0979	0.108	0.0944	0.105	0.0916	0.104	0.0911	0.107	0.0964	0.0988	0.0981	0.102	0.0957	0.0982	0.0957	0.156	0.148	0.155	0.149	0.155	0.147	0.158	0.147
Ti	mg/L	-	-	0.025	< 0.001	0.024	< 0.001	0.018	< 0.001	0.018	< 0.001	0.0117	< 0.0001	0.0002	< 0.0001	0.0009	< 0.0001	0.0006	0.0001	0.0040	< 0.0001	0.0003	< 0.0001	0.0006	< 0.0001	0.0004	0.0002
Th	mg/L	-	-	-	-	-	-	-	-	-	-	0.000065	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	0.000017	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004
Tl	mg/L	-	0.0008	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
U	mg/L	-	0.015	0.00160	0.00048	0.00109	0.00047	0.00100	0.00045	0.00093	0.00046	0.000636	0.000470	0.000169	0.000156	0.000205	0.000161	0.000483	0.000482	0.000690	0.000599	0.000489	0.000476	0.000327	0.000291	0.000624	0.000586
V	mg/L	-	-	0.0035	< 0.0003	0.0034	< 0.0003	0.0037	< 0.0003	0.0034	< 0.0003	0.00272	0.00024	0.00154	0.00029	0.00215	0.00123	0.00043	0.00048	0.00146	0.00036	0.00035	0.00025	0.00136	0.00037	0.00041	0.00046
W	mg/L	-	-	-	-	-	-	-	-	-	-	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	0.00006	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Y	mg/L	-	-	-	-	-	-	-	-	-	-	0.000569	0.000009	0.000005	< 0.000001	0.000004	0.000001	0.000070	0.000030	0.000593	0.000007	0.000014	0.000004	0.000010	0.000002	0.000033	0.000009
Zn	mg/L	0.5	0.03	0.012	0.004	0.014	0.004	0.016	0.006	0.019	< 0.002	0.052	0.005	0.006	0.005	0.005	< 0.002	0.008	0.006	0.078	0.022	0.017	0.012	0.028	0.022	0.024	0.020

Notes:
Diss. - dissolved concentrations
CCME FAL - Canadian Council of Ministers of the Environment, Protection of Aquatic Life Guidelines
MMER - Metal Mining Effluent Regulation (MMER 2002)
Exceedances of MMER are bolded and ones for CCME are highlighted. Exceedances of Drinking Water Quality Guideline for Color are underlined

Table 3-2: Results of Treatability Tests for Total Suspended Solids (TSS)

Sample ID	Treatment Details	Sample Time After Treatment (hrs)	TSS (ppm)
S1-1	Aluchem 10 (PAC) - 30 ppm, Mar. 19/13 11:30 am, pH=7.36, Scrubber 1	4 24	0 0
S1-2	Ferrichem DWG - 30 ppm, Mar. 19/13 11:30 am, pH=7.06, Scrubber 1	4 24	0 0
S1-3	Aluchem 10 (PAC) - 10 ppm, Mar. 19/13 11:30 am, pH=7.60, Scrubber 1	4 24	1 0
S1-4	Ferrichem DWG - 10 ppm, Mar. 19/13 11:30 am, pH=7.56, Scrubber 1	4 24	1 0
S1-5	Untreated, pH = 7.89, Scrubber 1	4 24 48 72	20 20 10 10
S2-1	Aluchem 10 (PAC) - 30 ppm, Mar. 19/13 10:50 am, pH=7.29, Scrubber 2	4 24	0 0
S2-2	Ferrichem DWG - 30 ppm, Mar. 19/13 10:55 am, pH=6.78, Scrubber 2	4 24	0 0
S2-3	Aluchem 10 (PAC) - 10 ppm, Mar. 19/13 11:15 am, pH=7.39, Scrubber 2	4 24	1 0
S2-4	Ferrichem DWG - 10 ppm, Mar. 19/13 11:15 am, pH=6.95, Scrubber 2	4 24	1 0
S2-5	Untreated, pH = 7.30, Scrubber 2	4 24 47=8 72	20 20 10 10
W1	Aluchem 10 (PAC) - 30 ppm, Mar. 19/13 11:50 am, pH=7.40, Wilfley Tails	4 24	0 0
W2	Ferrichem DWG - 30 ppm, Mar. 19/13 11:50 am, pH=6.94, Wilfley Tails	4 24	0 0
W3	Aluchem 10 (PAC) - 10 ppm, Mar. 19/13 11:50 am, pH=7.48, Scrubber 2	4 24	1 0
W4	Ferrichem DWG - 10 ppm, Mar. 19/13 11:50 am, pH=7.35, Wilfley Tails	4 24	1 0
W5	Untreated, pH = 7.58, Wilfley Tails	4 24 48 72	30 20 10 10
Exceedances of MMER Guideline for TSS are bolded			

Figure 3-1: Control Samples after 72 hours of Testing

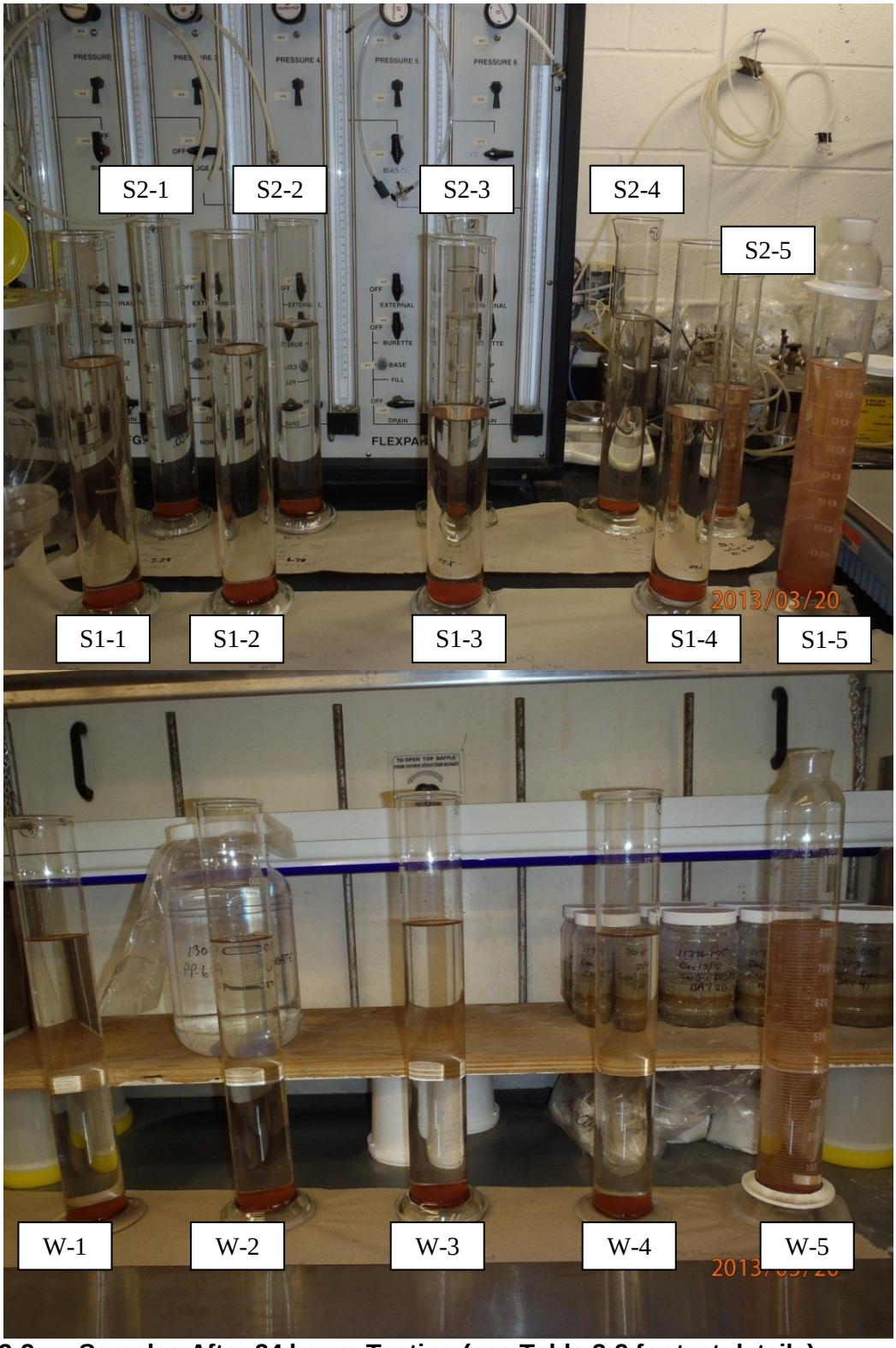

Figure 3-2: Samples After 24 hours Testing (see Table 3-2 for test details)

4.0 CONCLUSIONS

- Raw effluent quality concerns such as red coloration and elevated metal concentrations are linked and can be concomitantly addressed through removal of Total Suspended Solids (TSS), which may exceed the Metal Mining Effluent Regulation Guideline by an order of magnitude. The recommended effluent criterion for colour is 7.5 TCU.

- At the tailings facility drainage discharge point with receiving waters there is expected to be limited assimilation or dilution potential due to lower flows, limited mixing depth and high background colour thresholds.

- It is not clear if settling time over three days would be sufficient to reduce TSS below the MMER guidelines without any treatment. In addition, the red colour ranges between 7 and 10 TCU, marginally exceeding the criterion in these control tests.

- Treatment with coagulants, Ferric Sulfate or Aluminum Sulfate at concentrations of 10 mg/L, followed by 24 hours of settling, reduced TSS to at least 4 mg/L, which is below the MMER Guideline (15 mg/L) and resulted in clarification of the effluent below the recommended criterion for colour. Flocculant addition is not required for the treatment.

5.0 RECOMMENDATIONS

Further settling testing in the laboratory is recommended to confirm that treatment is required and cannot be replaced by larger settling ponds. During the recommended tests, TSS should be analyzed in duplicate, using methods providing higher precision. If the tests continue to indicate the necessity fortreatment with coagulants, on-site testing should be completed to adjust concentrations of selected chemicals to site conditions. CNS has the capability and experience in such testing and can supply the necessary equipment and chemicals (Attachment 4). It is currently recommended that Red Water treatment be included in the feasibility estimates with treatment costs obtained from CNS.

6.0 REFERENCES

Canadian Council of Ministers of the Environment (CCME) 1999. Canadian Environmental Quality Guidelines for the Protection Environmental and Human Health. Report ISBN 1-896997-34-1. Publication No. 1299 Winnipeg, Manitoba. With updates to April 2013.

Health Canada. 2012. Guidelines for Canadian Drinking Water Quality Summary Table. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. August 2012.

Metal Mining Effluent Regulations under Fisheries Act 2002. SOR/2002-222. Department of Justice Canada.

Canada Gazette. 2009. Vol. 143, No. 4 – February 18, Registration, SOR/2009-27 February 5, 2009.

7.0 CLOSURE

This report was prepared on behalf of Labec Century Iron Ore Corporation. The report may not be relied upon by any other person or entity without the express written consent of Stantec Consulting Ltd. and Labec Century Iron Ore Corporation.

Any use which a third party makes of this report, or any reliance on decisions made based on it, is the responsibility of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with accepted scientific practices current at the time the work was performed. The conclusions and recommendations presented represent the best judgment of Stantec Consulting Ltd. based on the data obtained from the work and on the site conditions encountered at the time the work was performed at the specific sampling, testing, and/or observation locations.

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ATTACHMENT 1: SGS MEMO ON PROCESS WATER GENERATION

MEMO

To: Simon-David Durand, Soutex

From: Thomas Davies

Date: April 16, 2013

Copies: Danielle Bouffard and Mathieu Girard (both Soutex), Nikolay Sidenko (Stantec)

Re: Process Water Generation

Dear Simon-David,

As requested, the following briefly describes the general steps taken in order to generate the process water samples tested by Stantec.

PW1 and PW2: Bulk sample #2 was wet screened at 28 mesh, and the undersize and oversize was collected. The undersize was allowed to settle overnight prior to being decanted. 1 drum of the decanted water was collected and stored. The undersize material was then submitted to Wilfley table testing, generating three streams (concentrate, middlings and tailings). The tailings stream was allowed to settle overnight and the water decanted, with 1 drum of water collected. The two drums were then agitated and mixed into 50:50 proportions, to generate two drums of combined screen/Wilfley tails process water. One sub-sample was collected from each drum, while the water was being mixed, and submitted for environmental testing.

PWS1 and PWS2, Scrubber #1 and Scrubber #2: Bulk sample #2 was scrubbed at 50% solids for 30 minutes and the product was discharged onto a 28 mesh screen. Additional water was added to aid the screening, and the undersize and oversize was collected. The undersize was allowed to settle overnight prior to being decanted. 1 drum of the decanted water was collected and stored. The undersize material was then submitted to Wilfley table testing, generating three streams (concentrate, middlings and tailings). The tailings stream was allowed to settle overnight and the water decanted, with 1 drum of water collected. The two drums were then agitated and mixed into 50:50 proportions, to generate two drums of combined scrub/screen/Wilfley tails process water. One sub-sample was collected from each drum, while the water was being mixed, and submitted for environmental testing (PWS1 and PWS2). Further samples were collected from each drum at a later date (Scrubber #1 and Scrubber #2).

Wilfley Tails: 57-62% Comp was scrubbed at 50% solids for 30 minutes and the product was discharged onto a 10 mesh screen. The undersize material was then submitted to Wilfley table testing, generating three streams (concentrate, middlings and tailings). The tailings stream was allowed to settle for a few hours, and the water decanted. A 20-L pail of process water was collected for environmental testing.

Please feel free to contact me if you have any questions.

Kind regards,

Thomas Davies, M.Sc.

Mineral Services
Metallurgist, Mineral Processing

SGS Canada Inc.
Lakefield Site
185 Concession St.
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Lakefield, ON K0L 2H0

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Fax : +01 705 652 6365
E-mail: thomas.davies@sgs.com

ATTACHMENT 2: CNS TREATABILITY TESTING REPORT

SEPT-ILES, APRIL 2ND, 2013

Mr. Nikolay Sidenko, Ph.D. P.Geo
Senior Environmental Geochemist
Stantec

REPORT FOR LAB ANAYSIS - RED WATER AT JOYCE LAKE MINE

Dear Mr. Sidenko,

Please find enclosed our report for the lab work that was completed on March 19, 2013 on the 3 different samples of Red Water that were provided to us from the Joyce Lake Mine. As you will see, we are confident that we have the Chemistry that will meet your needs should you need to treat this water in the near future.

Should you have any concerns or questions, please do not hesitate to contact us at your earliest convenience.

Yours truly,

Bruno Côté, Ing. /P.Eng
CNS inc
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Fax : 418-847-5876
Courriel/Email : bcote@cns7.com
http://www.cns7.com

Serge Baril, Ing. /P.Eng
SNF Canada Ltd.
Cell: 514-757-3484
Courriel/Email : sbaril@snf-floerger.com

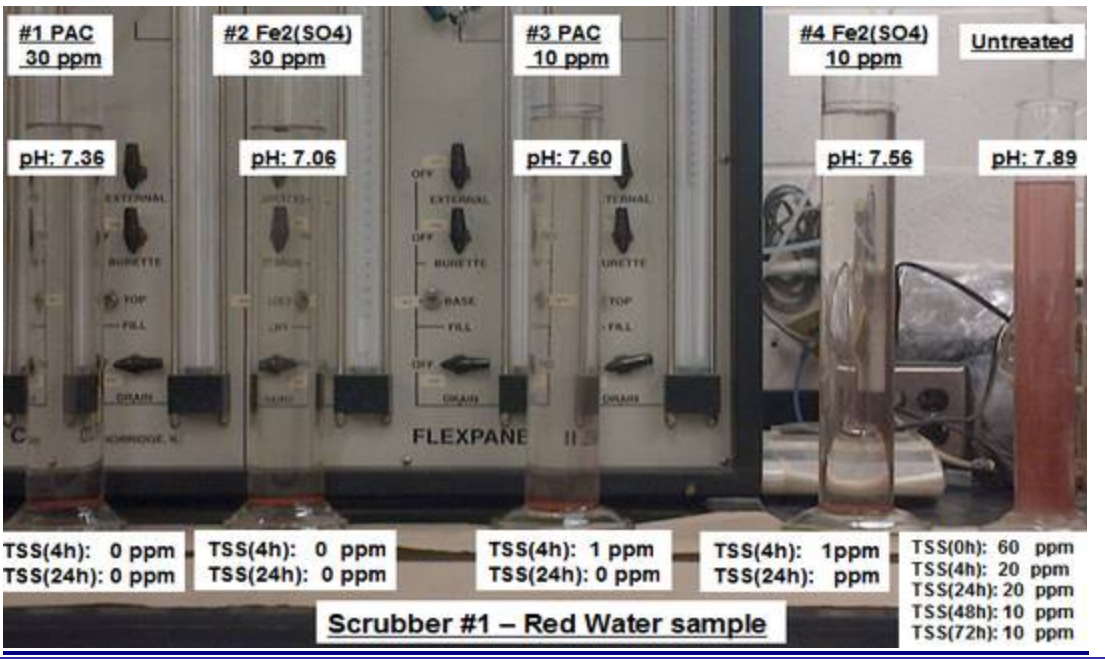
Results

Each sample were tested for TSS by SGS technician, Mr. Jesse Lepine

Scrubber#1: 60 ppm
Scrubber#2: 80 ppm
Wilfley tails: 120 ppm

The 3 samples of red water were pretty easy to treat. We started with our normal program: Ferric Sulfate @80ppm or PAC @ 60ppm + Flomin 920MC (floc) @ 1 ppm and the settling rate was very fast, maybe too fast (see Jar test pictures) since we were informed that the mine my have 5 days retention time in the field.

Then, we repeated the tests in 4 cylinders for each samples and we added only a coagulant with no Flocculant. (See results for Scrubber #1)



Again, the results obtained on the Scrubber #1 sample showed that with only 10 ppm of coagulant (Ferric Sulfate or PAC) with can achieve a TSS level of less than 1 ppm after only 4 hrs.

Then, the same testing were done with the 2 other samples and similar results were obtained

Sample I.D	Chemicals & dosage	Ph	Sample Time after Treatment (hrs)	TSS (ppm)
Scrubber #2	Aluchem 10 (PAC) - 30 ppm	7.29	4 24	0 0
	Ferrichem DWG - 30 ppm	6.78	4 24	0 0
	Aluchem 10 (PAC) - 10 ppm	7.39	4 24	1 0
	Ferrichem DWG - 10 ppm	6.95	4 24	1 0
	Untreated, pH = 7.30	7.30	4 24 48 72	20 20 10 10
Wilfley Tails	Aluchem 10 (PAC) - 30 ppm	7.40	4 24	1 0
	Ferrichem DWG - 30 ppm	6.94	4 24	0 0
	Aluchem 10 (PAC) - 10 ppm	7.48	4 24	1 0
	Ferrichem DWG - 10 ppm	7.35	4 24	1 0
	Untreated		4 24 48 72	30 20 10 10

Conclusion

Once again, we would like to thank you for the opportunity you gave us to test our different chemistries on the Red Water for your Lake Joyce project. Based on the results, and considering that you will have 5 days retention time in your basin, our tests demonstrated that the mine should not have any problems to achieve the 15 ppm target on their red water.

However, should the conditions in the field change, please feel free to contact us at anytime.

Best Regards,

Bruno Côté, Ing. /P.Eng
CNS inc
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http://www.cns7.com/

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ATTACHMENT 3: CERTIFICATES OF ANALYSIS FOR PROCESS WATER

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

February-15-13

Labec Century Iron Ore Inc
Attn : Ricky Chan

170 University Avenue,Suite 602
Toronto, ON
M5H 3B3, Canada

Phone: 416-977-3188 Ex 105
Fax:416-977-8002

Date Rec. : 12 February 2013
LR Report: **CA10282-FEB13**
Reference: ML-ARD Assessment-Joyce Lake PM120008

Copy: #1

CERTIFICATE OF ANALYSIS

DRAFT

Analysis	5: Process Water 1 PW1	6: Process Water 2 PW2	7: Process Water Scrub 1 PWS1	8: Process Water Scrub 2 PWS2
Sample Date & Time	Date:N/A	Date:N/A	Date:N/A	Date:N/A
Temperature Upon Receipt [°C]	18.0	18.0	18.0	18.0
Total Suspended Solids [mg/L]	321	315	280	302
Total Dissolved Solids [mg/L]	149	137	186	154
pH [no unit]	7.82	7.88	7.87	7.90
Alkalinity [mg/L as CaCO3]	81	82	81	80
Conductivity [µS/cm]	227	230	233	234
Colour [TCU]	36	33	26	28
Turbidity [NTU]	324	744	507	285
Mercury (dissolved) [mg/L]	0.00001	0.00001	0.00003	< 0.00001
Hardness [mg/L as CaCO3]	93.9	93.8	95.8	93.3
Hardness (dissolved) [mg/L as CaCO3]	89.3	87.2	85.9	85.3
Silver (total) [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Silver (dissolved) [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Aluminum (total) [mg/L]	0.88	0.85	0.65	0.63
Aluminum (dissolved) [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01
Arsenic (total) [mg/L]	0.005	0.005	0.006	0.005
Arsenic (dissolved) [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002
Barium (total) [mg/L]	0.0180	0.0169	0.0160	0.0157
Barium (dissolved) [mg/L]	0.0084	0.0079	0.0081	0.0084
Beryllium (total) [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Beryllium (dissolved) [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Boron (total) [mg/L]	0.155	0.103	0.082	0.063
Boron (dissolved) [mg/L]	0.013	0.012	0.012	0.011
Bismuth (total) [mg/L]	< 0.0001	< 0.0001	0.0002	0.0003
Bismuth (dissolved) [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Calcium (total) [mg/L]	30.3	30.3	30.7	29.9

OnLine LIMS

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA10282-FEB13**

Analysis	5: Process Water 1 PW1	6: Process Water 2 PW2	7: Process Water Scrub 1 PWS1	8: Process Water Scrub 2 PWS2
Calcium (dissolved) [mg/L]	29.1	28.5	27.8	27.6
Cadmium (total) [mg/L]	0.00005	0.00005	0.00009	0.00006
Cadmium (dissolved) [mg/L]	< 0.00003	< 0.00003	< 0.00003	< 0.00003
Cobalt (total) [mg/L]	0.00254	0.00275	0.00397	0.00387
Cobalt (dissolved) [mg/L]	0.00029	0.00026	0.00023	0.00024
Chromium (total) [mg/L]	0.006	0.006	0.006	0.005
Chromium (dissolved) [mg/L]	< 0.005	< 0.005	< 0.005	< 0.005
Copper (total) [mg/L]	0.008	0.007	0.008	0.008
Copper (dissolved) [mg/L]	< 0.005	< 0.005	< 0.005	< 0.005
Iron (total) [mg/L]	8.92	9.17	8.70	8.46
Iron (dissolved) [mg/L]	0.063	0.100	0.066	0.052
Potassium (total) [mg/L]	1.71	1.74	1.88	1.84
Potassium (dissolved) [mg/L]	1.47	1.48	1.58	1.58
Lithium (total) [mg/L]	0.002	0.002	0.002	0.002
Lithium (dissolved) [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium (total) [mg/L]	4.44	4.38	4.62	4.53
Magnesium (dissolved) [mg/L]	4.02	3.88	4.01	3.98
Manganese (total) [mg/L]	0.294	0.286	0.248	0.231
Manganese (dissolved) [mg/L]	0.0023	0.0025	0.0009	0.0007
Molybdenum (total) [mg/L]	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum (dissolved) [mg/L]	0.0002	0.0002	0.0002	0.0002
Sodium (total) [mg/L]	7.70	7.87	8.77	8.48
Sodium (dissolved) [mg/L]	7.47	7.46	7.82	7.85
Nickel (total) [mg/L]	0.003	0.003	0.003	0.003
Nickel (dissolved) [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001
Phosphorus (total) [mg/L]	0.096	0.103	0.092	0.088
Phosphorus (dissolved) [mg/L]	< 0.009	< 0.009	< 0.009	< 0.009
Lead (total) [mg/L]	0.0022	0.0022	0.0032	0.0033
Lead (dissolved) [mg/L]	< 0.0002	< 0.0002	< 0.0002	0.0002
Antimony (total) [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002
Antimony (dissolved) [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002
Selenium (total) [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01
Selenium (dissolved) [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01
Silicon (total) [mg/L]	4.06	4.05	3.84	3.76
Silicon (dissolved) [mg/L]	2.26	2.23	2.26	2.26
Tin (total) [mg/L]	0.0004	0.0004	0.0008	0.0008
Tin (dissolved) [mg/L]	0.0002	0.0001	0.0004	0.0004
Strontium (total) [mg/L]	0.108	0.108	0.105	0.104
Strontium (dissolved) [mg/L]	0.0979	0.0944	0.0916	0.0911
Titanium (total) [mg/L]	0.025	0.024	0.018	0.018
Titanium (dissolved) [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001
Thallium (total) [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002
Thallium (dissolved) [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002

SGS Canada Inc.
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Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA10282-FEB13**

Analysis	5: Process Water 1 PW1	6: Process Water 2 PW2	7: Process Water Scrub 1 PWS1	8: Process Water Scrub 2 PWS2
Uranium (total) [mg/L]	0.00160	0.00109	0.00100	0.00093
Uranium (dissolved) [mg/L]	0.00048	0.00047	0.00045	0.00046
Vanadium (total) [mg/L]	0.0035	0.0034	0.0037	0.0034
Vanadium (dissolved) [mg/L]	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Zinc (total) [mg/L]	0.012	0.014	0.016	0.019
Zinc (dissolved) [mg/L]	0.004	0.004	0.006	< 0.002

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
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April-24-13

Labec Century Iron Ore Inc
Attn : Ghislain Arel

Date Rec. : 26 March 2013
LR Report: **CA14629-MAR13**

Copy: #2

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: S2-0	6: S2-3	7: S2-4	8: S2-5	9: W0	10: W3	11: W4	12: W5	21: Method Reporting Limit	22: QC - Blank	23: QC - STD % Recovery	24: QC - DUP % Recovery
Sample Date & Time			26-Mar-13	26-Mar-13	26-Mar-13	26-Mar-13	26-Mar-13	26-Mar-13	26-Mar-13	26-Mar-13				
Temperature Upon Receipt [°C]	---	---	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	---	---	---	---
Total Suspended Solids [mg/L]	01-Apr-13	15:30	123	< 2	< 2	2	123	4	3	69	2	< 2	98%	100%
pH [no unit]	28-Mar-13	12:04	7.98	7.89	7.84	7.96	7.93	7.92	7.61	7.98	---	---	100%	100%
Colour [TCU]	27-Mar-13	14:39	9	5	6	7	7	6	4	10	3	< 3	100%	90%
Colour [TCU]	19-Apr-13	14:18	8	---	---	---	9	---	---	---	---	< 3	100%	100%
Turbidity [NTU]	24-Apr-13	09:07	200	1.03	2.35	nss	192	5.01	3.08	nss	---	< 0.10	100%	104%
Mercury (dissolved) [mg/L]	28-Mar-13	14:30	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001	98%	100%
Silver (total) [mg/L]	01-Apr-13	08:11	0.00014	0.00001	0.00001	0.00003	0.00003	< 0.00001	< 0.00001	0.00003	0.00001	< 0.00001	104%	100%
Silver (dissolved) [mg/L]	01-Apr-13	08:11	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	---	---	---	---
Aluminum (total) [mg/L]	28-Mar-13	08:14	0.46	0.26	0.03	0.04	0.17	0.30	0.02	0.03	0.01	< 0.01	97%	99%
Aluminum (dissolved) [mg/L]	28-Mar-13	08:14	0.02	0.15	0.02	0.01	0.03	0.16	< 0.01	0.02	---	---	---	---
Arsenic (total) [mg/L]	01-Apr-13	13:45	0.0037	0.0008	0.0004	0.0019	0.0027	0.0006	0.0004	0.0014	0.0002	0.0002	101%	103%
Arsenic (dissolved) [mg/L]	01-Apr-13	13:45	0.0012	0.0004	0.0003	0.0017	0.0008	0.0006	0.0003	0.0011	---	---	---	---
Barium (total) [mg/L]	01-Apr-13	08:12	0.0157	0.00862	0.00622	0.0353	0.0105	0.00336	0.00347	0.00441	0.00001	< 0.00001	106%	101%
Barium (dissolved) [mg/L]	01-Apr-13	08:12	0.00854	0.00819	0.00519	0.0332	0.00297	0.00332	0.00325	0.00401	---	---	---	---
Beryllium (total) [mg/L]	01-Apr-13	08:12	0.00004	< 0.00002	< 0.00002	< 0.00002	0.00006	< 0.00002	< 0.00002	< 0.00002	0.00002	< 0.00002	104%	109%
Beryllium (dissolved) [mg/L]	01-Apr-13	08:12	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	---	---	---	---
Boron (total) [mg/L]	01-Apr-13	08:12	0.0109	0.0110	0.0120	0.0096	0.0127	0.0119	0.0128	0.0135	0.0002	< 0.0002	100%	97%
Boron (dissolved) [mg/L]	01-Apr-13	08:12	0.0090	0.0101	0.0112	0.0090	0.0112	0.0114	0.0121	0.0125	---	---	---	---
Bismuth (total) [mg/L]	01-Apr-13	08:12	0.00041	0.00013	0.00012	0.00012	0.00019	0.00010	0.00010	0.00012	0.00001	< 0.00001	106%	101%
Bismuth (dissolved) [mg/L]	01-Apr-13	08:12	< 0.00001	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	---	---	---	---
Calcium (total) [mg/L]	28-Mar-13	08:14	34.1	31.0	32.3	32.0	41.5	42.6	42.4	43.2	0.02	< 0.02	103%	99%
Calcium (dissolved) [mg/L]	28-Mar-13	08:14	30.3	31.0	30.6	30.0	40.1	40.7	40.0	40.0	---	---	---	---

OnLine LIMS

SGS Canada Inc.
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LR Report : **CA14629-MAR13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: S2-0	6: S2-3	7: S2-4	8: S2-5	9: W0	10: W3	11: W4	12: W5	21: Method Reporting Limit	22: QC - Blank	23: QC - STD % Recovery	24: QC - DUP % Recovery
Cadmium (total) [mg/L]	01-Apr-13	08:12	0.000582	0.000384	0.000114	0.000129	0.000343	0.000128	0.000149	0.000098	0.000003	0.000007	104%	90%
Cadmium (dissolved) [mg/L]	01-Apr-13	08:12	0.000098	0.000337	0.000044	0.000100	0.000128	0.000127	0.000125	0.000090	---	---	---	---
Cobalt (total) [mg/L]	01-Apr-13	08:12	0.00147	0.000073	0.000457	0.000064	0.000891	0.000085	0.000834	0.000188	0.000002	0.000006	102%	96%
Cobalt (dissolved) [mg/L]	01-Apr-13	08:12	0.000031	0.000044	0.000049	0.000035	0.000068	0.000080	0.000795	0.000144	---	---	---	---
Chromium (total) [mg/L]	01-Apr-13	08:12	0.0020	0.0007	0.0006	0.0007	0.0012	0.0005	0.0006	0.0009	0.0005	< 0.0005	104%	89%
Chromium (dissolved) [mg/L]	01-Apr-13	08:12	0.0007	0.0006	< 0.0005	0.0006	< 0.0005	0.0005	< 0.0005	< 0.0005	---	---	---	---
Copper (total) [mg/L]	01-Apr-13	08:13	0.0128	0.0087	0.0057	0.0069	0.0066	0.0052	0.0040	0.0107	0.0005	< 0.0005	98%	119%
Copper (dissolved) [mg/L]	01-Apr-13	08:13	0.0047	0.0083	0.0046	0.0071	0.0059	0.0066	0.0039	0.0099	---	---	---	---
Iron (total) [mg/L]	28-Mar-13	08:14	8.01	0.020	0.467	0.124	7.33	0.093	0.567	0.249	0.003	< 0.003	100%	100%
Iron (total) [mg/L]	17-Apr-13	12:56	---	---	---	0.125	---	---	---	0.228		< 0.003	101%	98%
Iron (dissolved) [mg/L]	28-Mar-13	08:14	0.013	< 0.003	< 0.003	< 0.003	0.012	< 0.003	< 0.003	< 0.003	---	---	---	---
Potassium (total) [mg/L]	28-Mar-13	08:14	2.05	1.71	2.81	1.92	5.96	6.09	6.06	6.17	0.006	< 0.006	92%	99%
Potassium (dissolved) [mg/L]	28-Mar-13	08:14	1.84	1.72	2.71	1.83	5.78	5.84	5.78	5.74	---	---	---	---
Lithium (total) [mg/L]	01-Apr-13	08:13	0.002	< 0.001	0.001	0.001	0.003	0.003	0.003	0.003	0.001	< 0.001	102%	99%
Lithium (dissolved) [mg/L]	01-Apr-13	08:13	0.001	< 0.001	0.001	0.001	0.003	0.003	0.003	0.003	---	---	---	---
Magnesium (total) [mg/L]	28-Mar-13	08:14	4.70	4.32	4.54	4.46	4.20	4.28	4.30	4.33	0.001	< 0.001	96%	100%
Magnesium (dissolved) [mg/L]	28-Mar-13	08:14	4.20	4.31	4.30	4.19	4.05	4.11	4.08	4.03	---	---	---	---
Manganese (total) [mg/L]	01-Apr-13	08:13	0.144	0.00289	0.00864	0.00303	1.33	0.0268	0.0798	0.0535	0.00001	< 0.00001	103%	100%
Manganese (dissolved) [mg/L]	01-Apr-13	08:13	0.00056	0.00094	0.00019	0.00037	0.00817	0.0143	0.0731	0.0220	---	---	---	---
Molybdenum (total) [mg/L]	02-Apr-13	09:14	0.00005	0.00030	0.00027	0.00069	0.00020	0.00073	0.00058	0.00065	0.00001	< 0.00001	106%	102%
Molybdenum (dissolved) [mg/L]	02-Apr-13	09:14	0.00031	0.00031	0.00029	0.00031	0.00067	0.00075	0.00055	0.00078	---	---	---	---
Sodium (total) [mg/L]	28-Mar-13	08:15	8.86	8.65	9.83	8.72	32.2	33.5	33.1	33.5	0.01	< 0.01	92%	101%
Sodium (dissolved) [mg/L]	28-Mar-13	08:15	8.11	8.59	9.15	8.13	31.1	31.6	30.9	30.8	---	---	---	---
Nickel (total) [mg/L]	01-Apr-13	13:47	0.0029	0.0012	0.0016	0.0011	0.0030	0.0015	0.0026	0.0019	0.0001	< 0.0001	99%	104%
Nickel (dissolved) [mg/L]	01-Apr-13	13:47	0.0009	0.0011	0.0016	0.0009	0.0013	0.0015	0.0023	0.0017	---	---	---	---
Phosphorus (total) [mg/L]	28-Mar-13	08:15	0.297	0.023	0.631	0.220	0.069	0.010	< 0.009	0.025	0.009	< 0.009	98%	99%
Phosphorus (dissolved) [mg/L]	28-Mar-13	08:15	0.204	< 0.009	0.509	0.196	0.014	0.012	< 0.009	0.012	---	---	---	---
Lead (total) [mg/L]	01-Apr-13	08:13	0.00259	0.00022	0.00023	0.00041	0.00236	0.00015	0.00016	0.00065	0.00002	< 0.00002	103%	108%
Lead (dissolved) [mg/L]	01-Apr-13	08:13	0.00013	0.00011	0.00008	0.00011	0.00009	0.00011	0.00004	0.00013	---	---	---	---
Antimony (total) [mg/L]	01-Apr-13	08:13	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002	< 0.0002	0.0002	0.0002	< 0.0002	107%	100%
Antimony (dissolved) [mg/L]	01-Apr-13	08:13	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	---	---	---
Selenium (total) [mg/L]	05-Apr-13	15:25	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	0.00012	0.00004	< 0.00004	99%	121%
Selenium (diss) [mg/L]	05-Apr-13	15:25	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004	0.00008	---	---	---	---
Silicon (total) [mg/L]	28-Mar-13	08:15	3.54	2.03	2.30	2.32	3.19	2.52	2.41	2.67	0.01	< 0.01	108%	1005
Silicon (dissolved) [mg/L]	28-Mar-13	08:15	2.17	2.00	2.15	2.16	2.48	2.38	2.24	2.46	---	---	---	---
Tin (total) [mg/L]	01-Apr-13	08:14	0.00058	0.0244	0.0168	0.0182	0.00029	0.0253	0.0348	0.0261	0.00001	< 0.00001	106%	103%
Tin (dissolved) [mg/L]	01-Apr-13	08:14	0.00062	0.0220	0.0154	0.0170	0.00044	0.0235	0.0275	0.0236	---	---	---	---
Strontium (total) [mg/L]	28-Mar-13	08:15	0.107	0.0988	0.102	0.0982	0.156	0.155	0.155	0.158	0.0001	< 0.0001	94%	99%
Strontium (dissolved) [mg/L]	28-Mar-13	08:15	0.0964	0.0981	0.0957	0.0957	0.148	0.149	0.147	0.147	---	---	---	---

OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14629-MAR13**

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: S2-0	6: S2-3	7: S2-4	8: S2-5	9: W0	10: W3	11: W4	12: W5	21: Method Reporting Limit	22: QC - Blank	23: QC - STD % Recovery	24: QC - DUP % Recovery
Titanium (total) [mg/L]	01-Apr-13	08:14	0.0117	0.0002	0.0009	0.0006	0.0040	0.0003	0.0006	0.0004	0.0001	< 0.0001	107%	92%
Titanium (dissolved) [mg/L]	01-Apr-13	08:14	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	0.0002	---	---	---	---
Thorium (total) [mg/L]	01-Apr-13	08:14	0.000065	< 0.000004	< 0.000004	< 0.000004	0.000017	< 0.000004	< 0.000004	< 0.000004	0.000004	< 0.000004	107%	100%
Thorium (dissolved) [mg/L]	01-Apr-13	08:14	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	< 0.000004	---	---	---	---
Thallium (total) [mg/L]	01-Apr-13	08:14	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0002	< 0.0002	106%	100%
Thallium (dissolved) [mg/L]	01-Apr-13	08:14	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	---	---	---	---
Uranium (total) [mg/L]	01-Apr-13	08:14	0.000636	0.000169	0.000205	0.000483	0.000690	0.000489	0.000327	0.000624	0.000001	< 0.000001	105%	100%
Uranium (dissolved) [mg/L]	01-Apr-13	08:14	0.000470	0.000156	0.000161	0.000482	0.000599	0.000476	0.000291	0.000586	---	---	---	---
Vanadium (total) [mg/L]	01-Apr-13	13:47	0.00272	0.00154	0.00215	0.00043	0.00146	0.00035	0.00136	0.00041	0.00003	< 0.00003	102%	102%
Vanadium (dissolved) [mg/L]	01-Apr-13	13:47	0.00024	0.00029	0.00123	0.00048	0.00036	0.00025	0.00037	0.00046	---	---	---	---
Tungsten (total) [mg/L]	01-Apr-13	08:14	< 0.00003	< 0.00003	< 0.00003	0.00006	< 0.00003	< 0.00003	< 0.00003	< 0.00003	0.00003	< 0.00003	107%	98%
Tungsten (dissolved) [mg/L]	01-Apr-13	08:14	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	< 0.00003	---	---	---	---
Yttrium (total) [mg/L]	01-Apr-13	08:14	0.000569	0.000005	0.000004	0.000070	0.000593	0.000014	0.000010	0.000033	0.000001	< 0.000001	99%	1005
Yttrium (dissolved) [mg/L]	01-Apr-13	08:14	0.000009	< 0.000001	0.000001	0.000030	0.000007	0.000004	0.000002	0.000009	---	---	---	---
Zinc (total) [mg/L]	28-Mar-13	08:15	0.052	0.006	0.005	0.008	0.078	0.017	0.028	0.024	0.002	< 0.002	99%	100%
Zinc (dissolved) [mg/L]	28-Mar-13	08:15	0.005	0.005	< 0.002	0.006	0.022	0.012	0.022	0.020	---	---	---	---

NSS - insufficient sample volume for test

Brian Graham B.Sc.
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March-19-13

Labec Century Iron Ore Inc
Attn : Ghislain Arel

1200 McGill College Avenue, Suite 1900
Montreal, QC
H3B 4G7, Canada

Phone: 514-228-5034
Fax:514-228-5643

Date Rec. : 13 March 2013
LR Report: **CA11034-MAR13**
Reference: PM120008

Copy: #!

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: Process Water Scrub #1 5 days
Sample Date & Time			13-Mar-13
Temperature Upon Receipt [°C]			14.0
Total Suspended Solids [mg/L]	15-Mar-13	15:35	3
Turbidity [NTU]	14-Mar-13	14:38	30.8
Colour [TCU]	19-Mar-13	11:47	14
Iron (total) [mg/L]	15-Mar-13	10:10	0.242
Iron (dissolved) [mg/L]	15-Mar-13	10:10	0.083

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

Labec Century Iron Ore Inc.
SGS Ref. No. 11007-MAR13

TEST REPORT

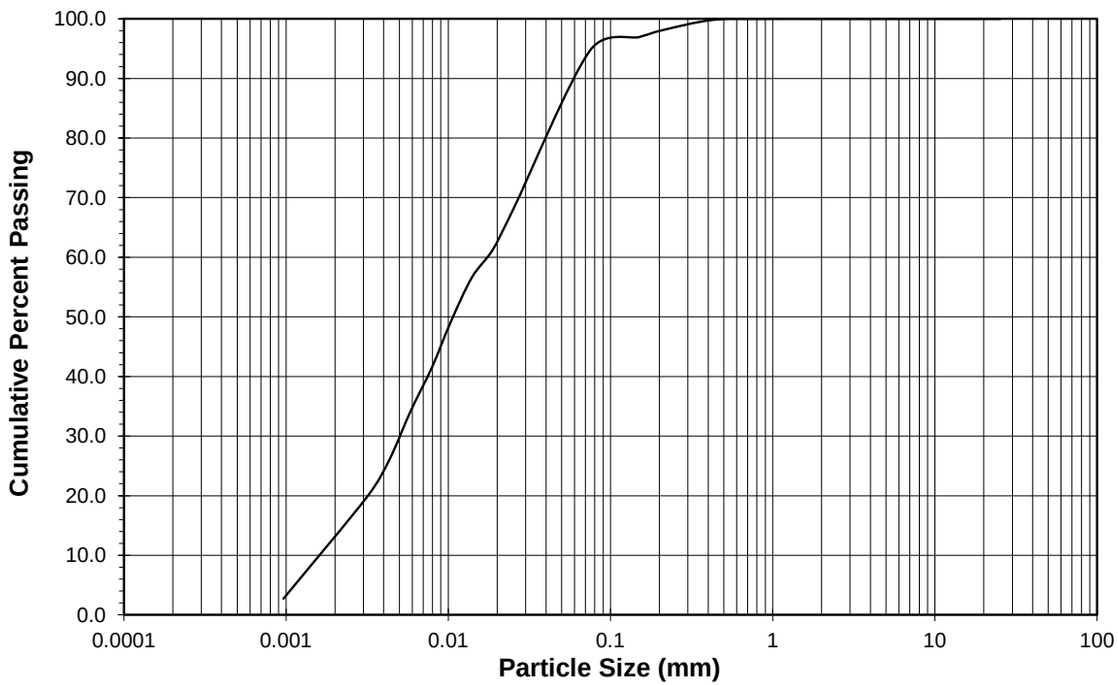
Particle Size Analysis by Hydrometer

Sample ID: Tailings 1 BS2T1
Date Completed: Mar. 7/13
Reference: ASTM D 422, SOP 7-18-6

Specific Gravity: 4.73

Sieve Size (Tyler)	Particle Size (mm)	Weight Passing %
1"	25.400	100.0
1/2"	12.500	100.0
3/8"	9.500	100.0
#4	4.750	100.0
#9	2.000	100.0
#20	0.850	100.0
#35	0.425	99.8
#65	0.212	98.1
#100	0.150	96.9
#200	0.075	94.7
-	0.025	68.1
-	0.019	61.3
-	0.014	56.6
-	0.010	49.1
-	0.008	41.6
-	0.006	34.1
-	0.004	25.9
-	0.003	19.8
-	0.001	2.7

Particle Size Distribution



Note: Correction factors for SG's less than 2.45 and greater than 2.85 are calculated

J. Lepine
Project Technician, Environmental Testing

B. Bowman
Senior Technologist, Environmental Testing

Labec Century Iron Ore Inc.
SGS Ref. No. 11007-MAR13

TEST REPORT

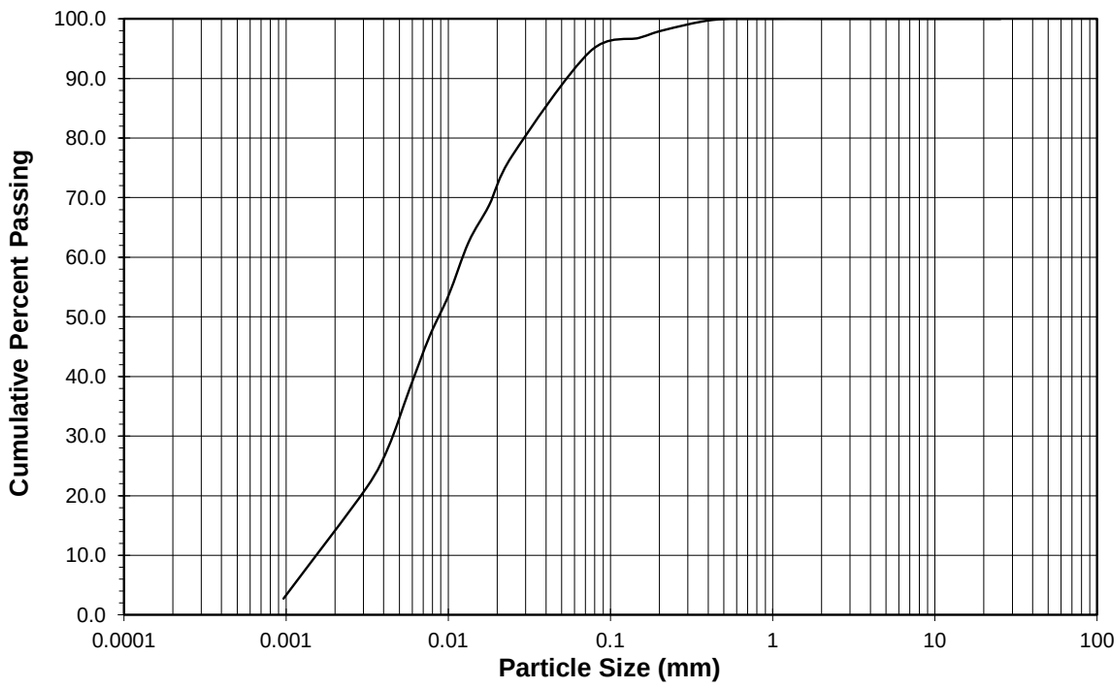
Particle Size Analysis by Hydrometer

Sample ID: Tailings 2 BS2T2
Date Completed: Mar.7/13
Reference: ASTM D 422, SOP 7-18-6

Specific Gravity: 4.75

Sieve Size (Tyler)	Particle Size (mm)	Weight Passing %
1"	25.400	100.0
1/2"	12.500	100.0
3/8"	9.500	100.0
#4	4.750	100.0
#9	2.000	100.0
#20	0.850	100.0
#35	0.425	99.8
#65	0.212	98.1
#100	0.150	96.8
#200	0.075	94.5
-	0.025	77.0
-	0.018	68.7
-	0.013	62.6
-	0.010	53.6
-	0.008	46.7
-	0.006	37.8
-	0.004	28.2
-	0.003	21.3
-	0.001	2.7

Particle Size Distribution



Note: Correction factors for SG's less than 2.45 and greater than 2.85 are calculated

J. Lepine
Project Technician, Environmental Testing

B. Bowman
Senior Technologist, Environmental Testing

Labec Century Iron Ore Inc.
SGS Ref. No. 11007-MAR13

TEST REPORT

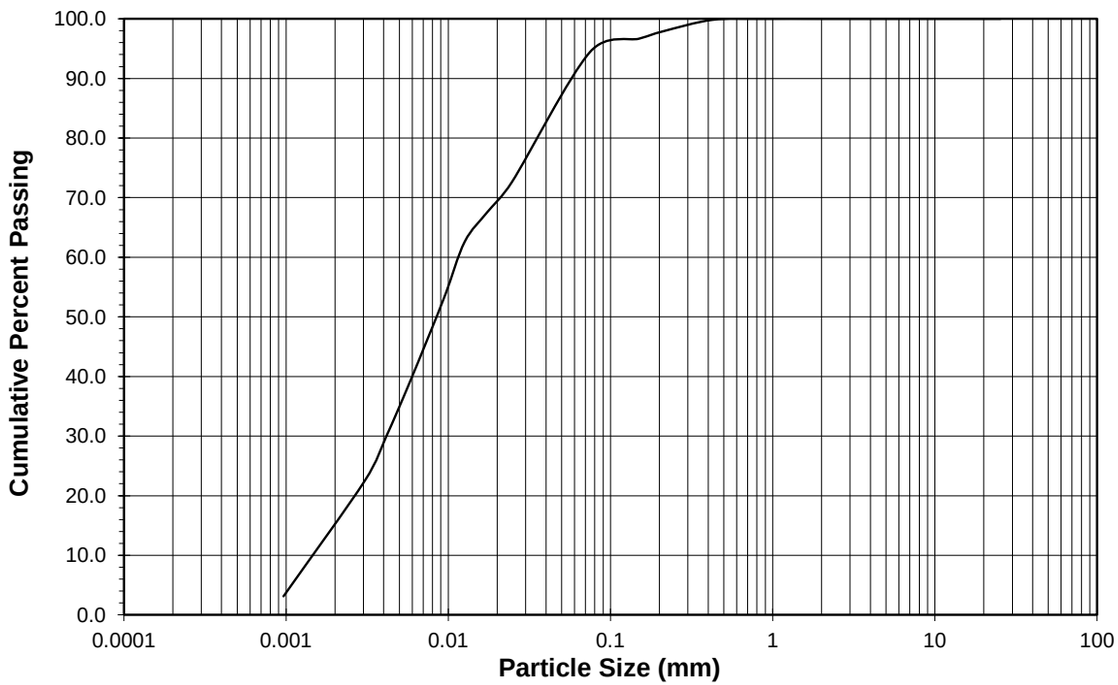
Particle Size Analysis by Hydrometer

Sample ID: Tailings 3 BS2T3
Date Completed: Mar.7/13
Reference: ASTM D 422, SOP 7-18-6

Specific Gravity: 4.70

Sieve Size (Tyler)	Particle Size (mm)	Weight Passing %
1"	25.400	100.0
1/2"	12.500	100.0
3/8"	9.500	100.0
#4	4.750	100.0
#9	2.000	100.0
#20	0.850	100.0
#35	0.425	99.8
#65	0.212	97.9
#100	0.150	96.7
#200	0.075	94.5
-	0.025	72.6
-	0.017	67.6
-	0.013	62.6
-	0.010	53.8
-	0.007	46.3
-	0.006	38.2
-	0.004	30.1
-	0.003	22.5
-	0.001	3.1

Particle Size Distribution



Note: Correction factors for SG's less than 2.45 and greater than 2.85 are calculated

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ATTACHMENT 4: EXAMPLES OF MOBILE EQUIPMENT USED BY CNS FOR TAILINGS EFFLUENT TREATMENT

CNS


2 Lignes de traitement
avec mélangeurs statiques
Pompes doseuses Réactifs