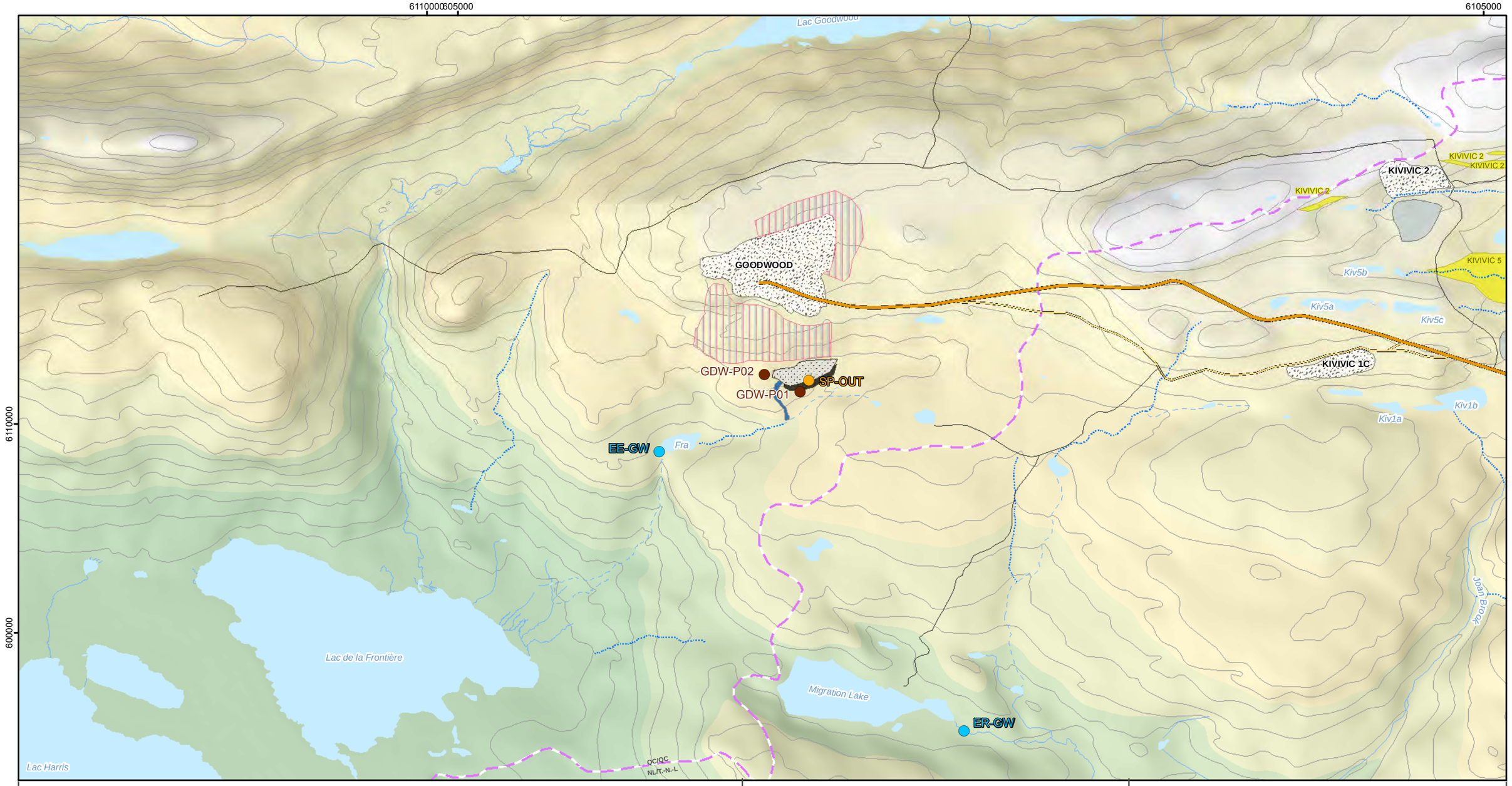
APPENDICES

Appendix I. Figures

Figure 1. Water Quality Monitoring Stations

Figure 2. Proposed Sediment Monitoring Program

Figure 3. Air Quality Monitoring Stations



Water Monitoring Stations

- Effluent / Effluent
- Groundwater / Eau souterraine
- Surface Water / Eau de surface
- Provincial border / Frontière provinciale
- Waterbody / Plan d'eau
- Permanent Watercourse / Cours d'eau permanent
- Intermittent Watercourse / Cours d'eau intermittent
- Storm Runoff / Chenal torrentiel
- Contour interval / Courbe de niveau
- Haul road / Main access road / Route de halage / Route d'accès principale
- DSO4 bypass road / Route de contournement
- Other Access Road / Autre route d'accès

Pit / Deposit / Waste Dump

- Deposit / Gisement

TSMC existing infrastructure / Infrastructure existante

- Pit / Fosse
- Sedimentation pond / Bassin de sédimentation
- Spillway / Evacuateur de crue
- Dike / Digue
- Dump / Halde

TSMC projected infrastructure / Infrastructure projetée

- Dump / Halde

FILE, PROJECT, DATE, AUTHOR:
GH-0983 , PR185-42-19, 2019-03-20, jfbrisard

0 350 700 1 050 1 400
Meters
UTM 19N NAD 83

SCALE: 1:25 000

SOURCES:
Government of Canada, NTDB, 1:50,000, 1979
Government of Newfoundland-and-Labrador and Government of Quebec, Boundary used for claims
New Millennium Capital Corp., Mining sites and roads
Groupe Hémisphères, Hydrology and wetlands update, 2010

Gouvernement du Canada, BNDT, 1/50 000, 1979
Gouvernement de Terre-Neuve-et-Labrador et gouvernement du Québec, frontière utilisée pour les titres miniers
New Millennium Capital Corp., gisements et routes
Groupe Hémisphères, mise à jour de l'hydrologie et des millieux humides, 2010

2018 ANNUAL REPORT - PROJECT 2A (GOODWOOD) QUEBEC / RAPPORT ANNUEL 2018 – PROJET 2A (GOODWOOD) QUÉBEC

Stations de suivi de la qualité de l'eau - DSO4 / Water Quality Monitoring Stations - DSO4

Groupe Hemispheres
5731, rue Saint-Louis, Bureau 201, Lévis (QC) Canada, G6V 4E2
1453, rue Beaubien est, Bureau 301, Montréal (QC) Canada, H2G 3C6

Figure 1

6110000 605000 6105000

6110000

600000

Lac Goodwood

KIVIVIC 2

KIVIVIC 2

KIVIVIC 2

KIVIVIC 5

GOODWOOD

Kiv5b

Kiv5a

Kiv5c

KIVIVIC 1C

Kiv1b

Kiv1a

SEE-GW

BER1-GW

BEE-GW

Lac de la Frontière

Migration Lake

SER-GW

BER2-GW

Joan Brook

Lac Harris

QC|QC

NL|T.-N.-L

Sediment Monitoring Stations

- Benthos
- Sediment / Sédiment
- Provincial border / Frontière provinciale
- Waterbody / Plan d'eau
- Permanent Watercourse / Cours d'eau permanent
- Intermittent Watercourse / Cours d'eau intermittent
- Storm Runoff / Chenal torrentiel
- Contour interval / Courbe de niveau
- Haul road / Main access road / Route de halage / Route d'accès principale
- DSO4 bypass road / Route de contournement
- Other Access Road / Autre route d'accès

Pit / Deposit / Waste Dump

- Deposit / Gisement

TSMC existing infrastructure / Infrastructure existante

- Pit / Fosse
- Sedimentation pond / Bassin de sédimentation
- Spillway / Evacuateur de crue
- Dike / Digue
- Dump / Halde

TSMC projected infrastructure / Infrastructure projetée

- Dump / Halde

FILE, PROJECT, DATE, AUTHOR:
GH-0983 , PR185-42-19, 2019-03-21, jfbrisard

0 350 700 1 050 1 400

Meters

UTM 19N NAD 83

SCALE: 1:25 000

SOURCES:
Government of Canada, NTDB, 1:50,000, 1979
Government of Newfoundland-and-Labrador and Government of Quebec, Boundary used for claims
New Millennium Capital Corp., Mining sites and roads
Groupe Hémisphères, Hydrology and wetlands update, 2010

Gouvernement du Canada, BNDT, 1/50 000, 1979
Gouvernement de Terre-Neuve-et-Labrador et gouvernement du Québec, frontière utilisée pour les titres miniers
New Millennium Capital Corp., gisements et routes
Groupe Hémisphères, mise à jour de l'hydrologie et des millieux humides, 2010

2018 ANNUAL REPORT - PROJECT 2A (GOODWOOD) QUEBEC / RAPPORT ANNUEL 2018 – PROJET 2A (GOODWOOD) QUÉBEC

Proposition d'un programme de suivi des sédiments - DSO4 / Proposition of a sediment monitoring program - DSO4

Groupe Hemispheres
5731, rue Saint-Louis, Bureau 201, Lévis (QC) Canada, G6V 4E2
1453, rue Beaubien est, Bureau 301, Montréal (QC) Canada, H2G 3C6

Figure 2

6110000 610000 6105000 615000

605000 615000

6110000 6100000

LEROY 1
Leroy a
Ruisseau Leroy1
Rivière Goodwood
Petit lac Goodwood
Lac Goodwood
AQS2
AQS1
AQS3
AQS4
AQS5
GOODWOOD
KIVIVIC 2
KIVIVIC 2
KIVIVIC 2
KIVIVIC 5
KIVIVIC 1C
KIVIVIC 3N
KIVIVIC 3S
KIVIVIC 4
SUNNY 1
SUNNY 1
Joan Lake
Kiv5b
Kiv5a
Kiv5c
Kiv1b
Kiv1a
Joan Brook
Joan Brook
Complex
KM24
QC/QC
NL/T.-N.-L
QC/QC
NL/T.-N.-L
QC/QC
NL/T.-N.-L
Ruisseau Rocky
Rocky Pond
Sun1d
Sun1c
Sun1b
Sun1a
Sun1e
Lac*Foggy
Ruisseau Foggy
Ruisseau La Potardière
Kivivic Brook
Lac de la Frontière
Migration Lake

Legend / légende

Air Monitoring Stations

- Air Quality Station / Station de la qualité de l'air
- Provincial border / Frontière provinciale
- Waterbody / Plan d'eau
- Stream / Cours d'eau
- Contour interval / Courbe de niveau
- Haul road / Main access road / Route de halage / Route d'accès principale
- DSO4 bypass road / Route de contournement
- Other Access Road / Autre route d'accès
- TSMC facilities / Installations

Pit / Deposit / Waste Dump

- Deposit / Gisement

TSMC existing infrastructure / Infrastructure existante

- Pit / Fosse
- Sedimentation pond / Bassin de sédimentation
- Spillway / Evacuateur de crue
- Dike / Digue
- Dump / Halde

TSMC projected infrastructure / Infrastructure projetée

- Dump / Halde

FILE, PROJECT, DATE, AUTHOR:
GH-0983 , PR185-42-19, 2019-03-13, jfbrisard

N

0 350 700 1 050 1 400
Meters
UTM 19N NAD 83

SCALE: 1:35 000

SOURCES:
Government of Canada, NTDB, 1:50,000, 1979
Government of Newfoundland-and-Labrador and Government of Quebec, Boundary used for claims
New Millennium Capital Corp., Mining sites and roads
Groupe Hémisphères, Hydrology and wetlands update, 2010

Gouvernement du Canada, BNDT, 1/50 000, 1979
Gouvernement de Terre-Neuve-et-Labrador et gouvernement du Québec, frontière utilisée pour les titres miniers
New Millennium Capital Corp., gisements et routes
Groupe Hémisphères, mise à jour de l'hydrologie et des millieux humides, 2010

2018 ANNUAL REPORT - PROJECT 2A (GOODWOOD) QUEBEC / RAPPORT ANNUEL 2018 – PROJET 2A (GOODWOOD) QUÉBEC

Stations de suivi de la qualité de l'air - DSO4 / Air Quality Monitoring Stations - DSO4

Groupe Hémisphères
5731, rue Saint-Louis, Bureau 201, Lévis (QC) Canada, G6V 4E2
1453, rue Beaubien est, Bureau 301, Montréal (QC) Canada, H2G 3C6

Figure 3

Appendix II. Analysis Certificates

A. Blasting Report

2018

Event Report

Date/Time MicL at 11:52:59 September 7, 2018
Trigger Source Geo: 7.000 mm/s, Mic: 110.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 9.0 sec (Auto=3Sec) at 2048 sps
Operator/Setup: Operator/factory.MMB

Serial Number UM12242 V 10-87 Micromate DIN
Battery Level 3.8 Volts
Unit Calibration June 30, 2017 by Instantel
File Name UM12242_20180907115259.IDFW

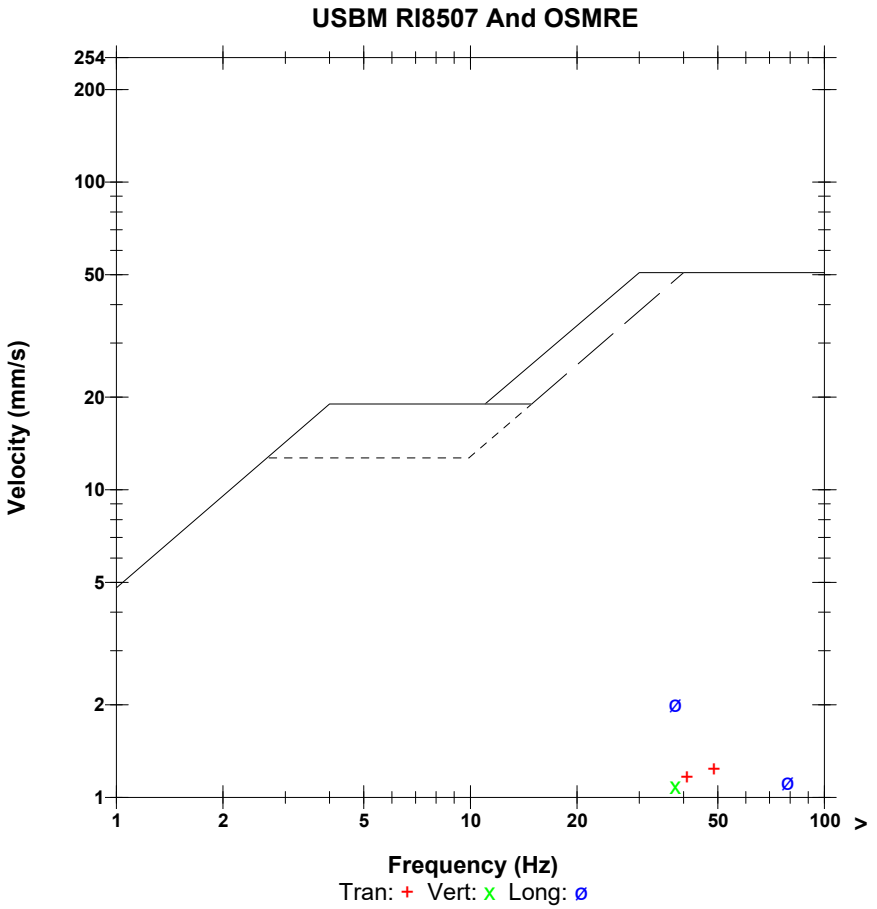
Post Event Notes
GD-743-17

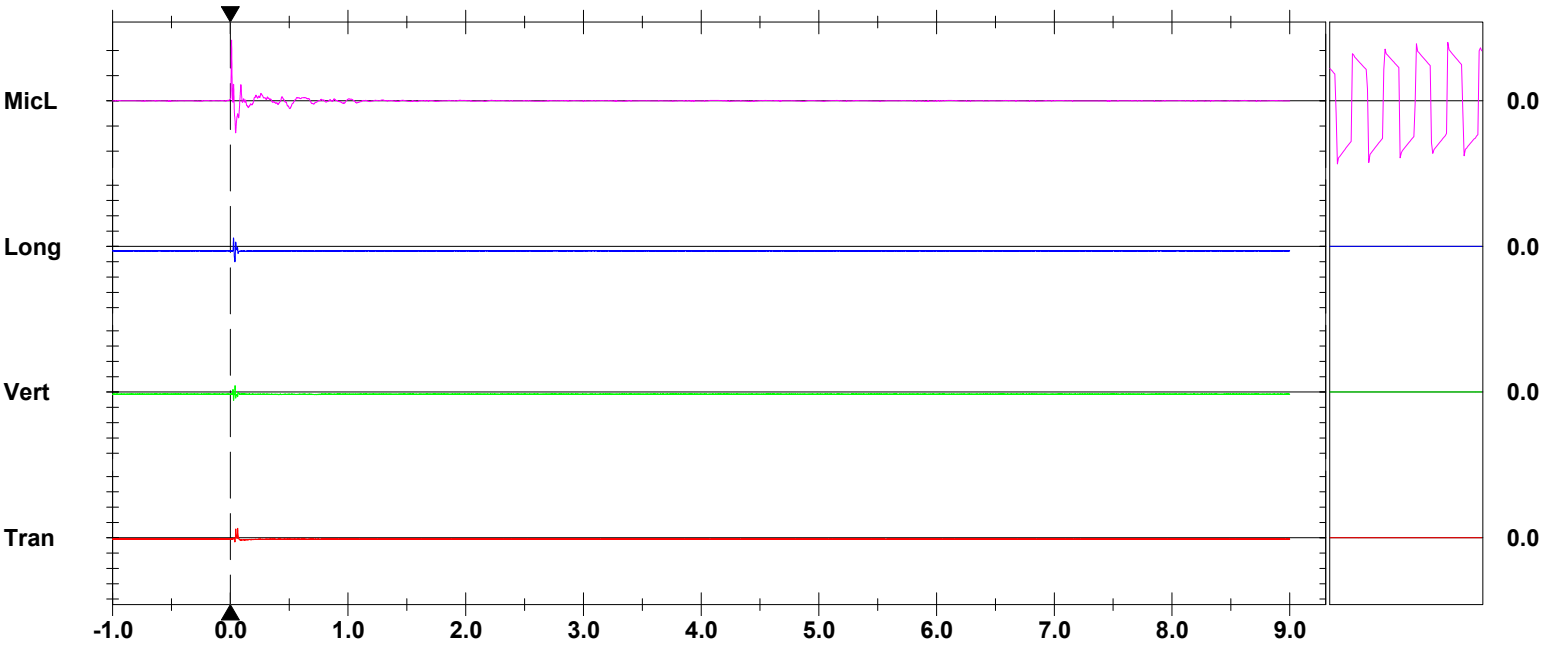
Notes
Location:
Client:
User Name:
General:

Microphone Linear Weighting
PSPL 141.6 dB(L) at 0.010 sec
ZC Freq 9.3 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1643 mv)

	Tran	Vert	Long	
PPV	1.237	1.088	2.010	mm/s
ZC Freq	49	38	38	Hz
Time (Rel. to Trig)	0.063	0.028	0.039	sec
Peak Acceleration	0.048	0.053	0.071	g
Peak Displacement	0.088	0.150	0.296	mm
Sensor Check	Passed	Passed	Passed	
Frequency	0.0	0.0	0.0	Hz
Overswing Ratio	0.0	0.0	0.0	

Peak Vector Sum 2.195 mm/s at 0.040 sec





Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 100.00 pa.(L)/div Sensor Check
Trigger =

Format © 1995-2015 Xmark Corporation

Event Report

Date/Time	MicL at 12:54:56 September 3, 2018
Trigger Source	Geo: 7.000 mm/s, Mic: 110.0 dB(L)
Range	Geo: 254.0 mm/s
Record Time	9.0 sec (Auto=3Sec) at 2048 sps
Operator/Setup:	Operator/factory.MMB

Notes
Location:
Client:
User Name:
General:

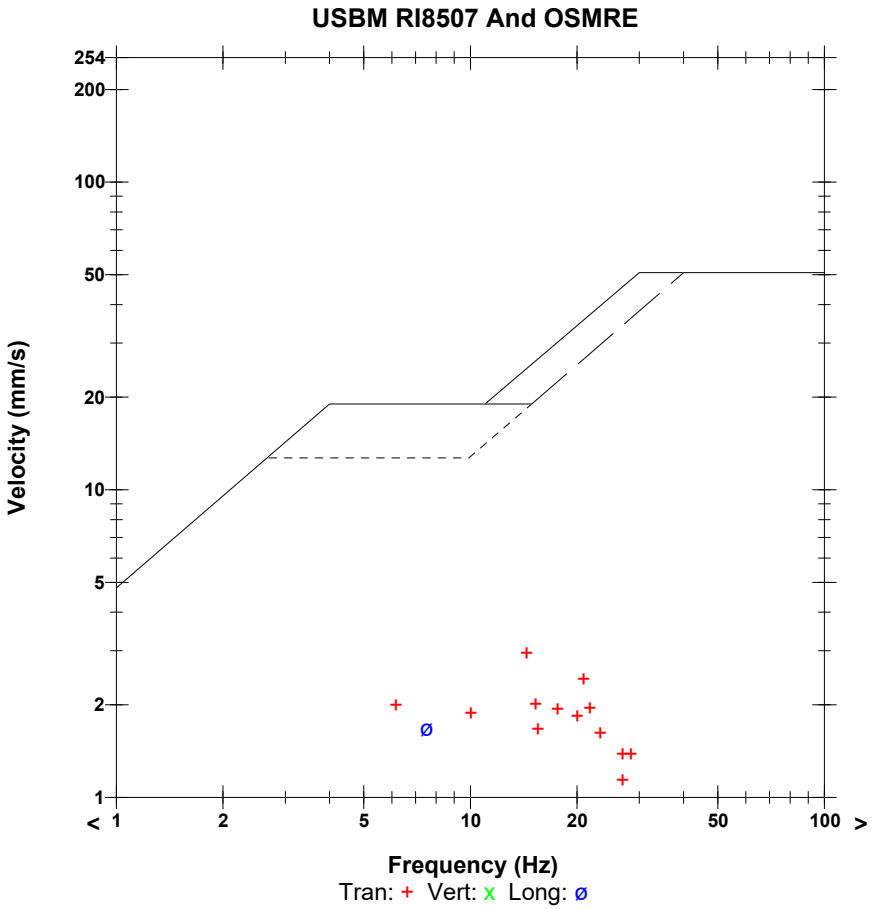
Serial Number	UM12242 V 10-87 Micromate ISEE
Battery Level	3.8 Volts
Unit Calibration	June 30, 2017 by Instantel
File Name	UM12242_20180903125456.IDFW

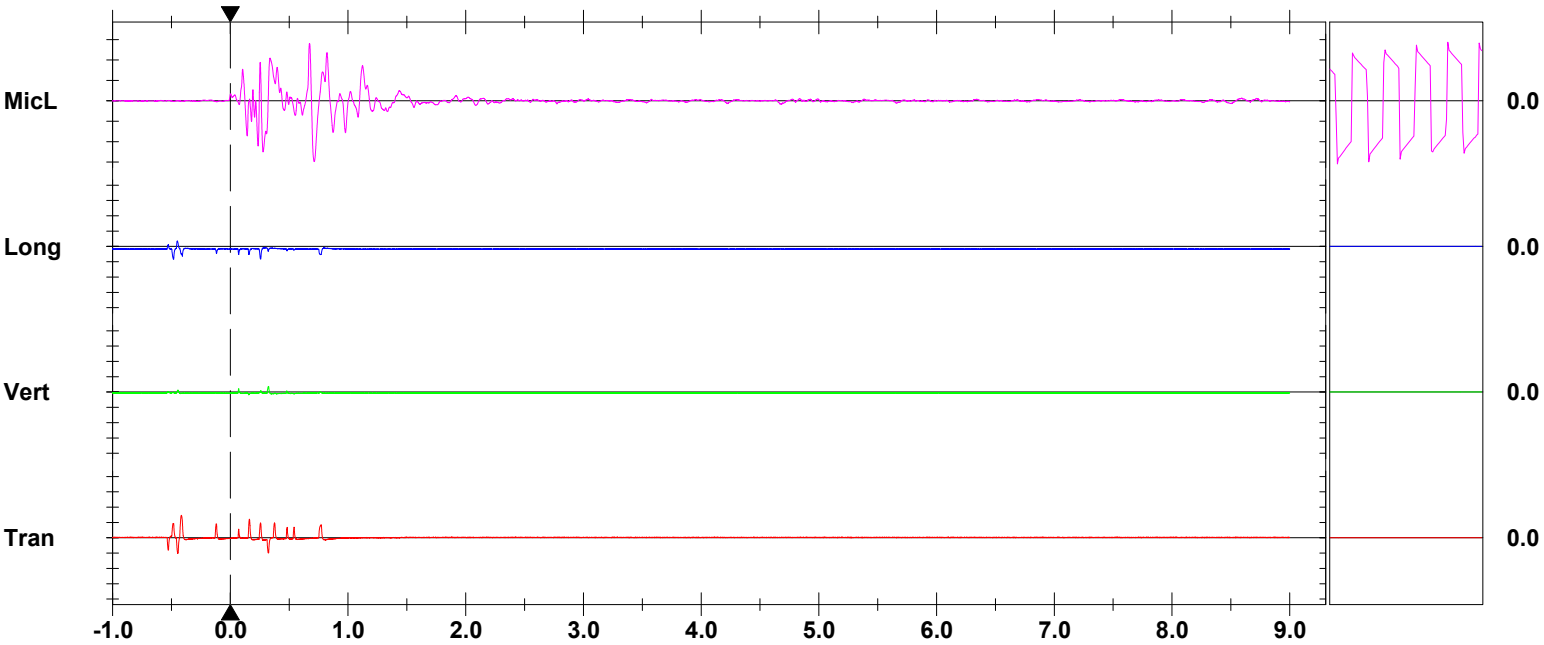
Post Event Notes
GD-743-14

Microphone	Linear Weighting
PSPL	129.5 dB(L) at 0.713 sec
ZC Freq	7.7 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1335 mv)

	Tran	Vert	Long	
PPV	2.940	0.733	1.679	mm/s
ZC Freq	14.4	27	7.5	Hz
Time (Rel. to Trig)	-0.415	0.324	-0.482	sec
Peak Acceleration	0.054	0.020	0.026	g
Peak Displacement	0.029	0.035	0.080	mm
Sensor Check	Passed	Passed	Passed	
Frequency	0.0	0.0	0.0	Hz
Overswing Ratio	0.0	0.0	0.0	

Peak Vector Sum 3.104 mm/s at -0.416 sec





Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 20.00 pa.(L)/div Sensor Check
Trigger =

Format © 1995-2015 Xmark Corporation

Event Report

Date/Time MicL at 12:22:53 August 16, 2018
Trigger Source Geo: 7.000 mm/s, Mic: 6.325 pa.(L)
Range Geo: 254.0 mm/s
Record Time 9.0 sec (Auto=3Sec) at 2048 sps
Operator/Setup: Operator/factory.MMB

Serial Number UM12242 V 10-87 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration June 30, 2017 by Instantel
File Name UM12242_20180816122253.IDFW

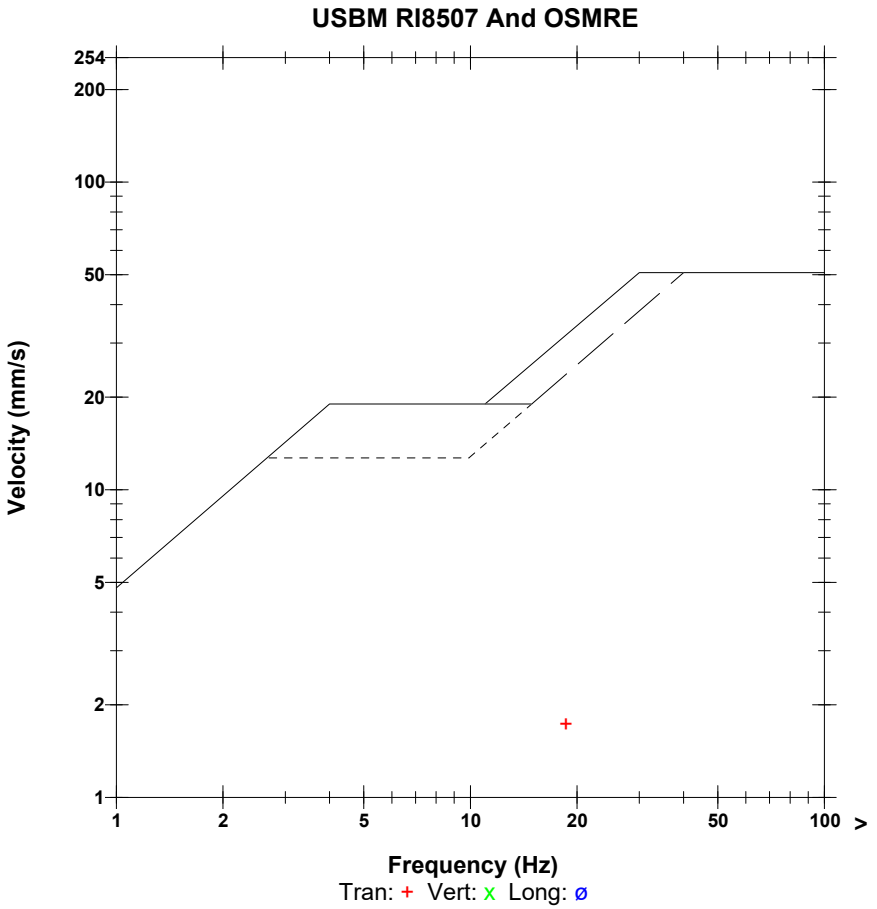
Post Event Notes
GD-743-13

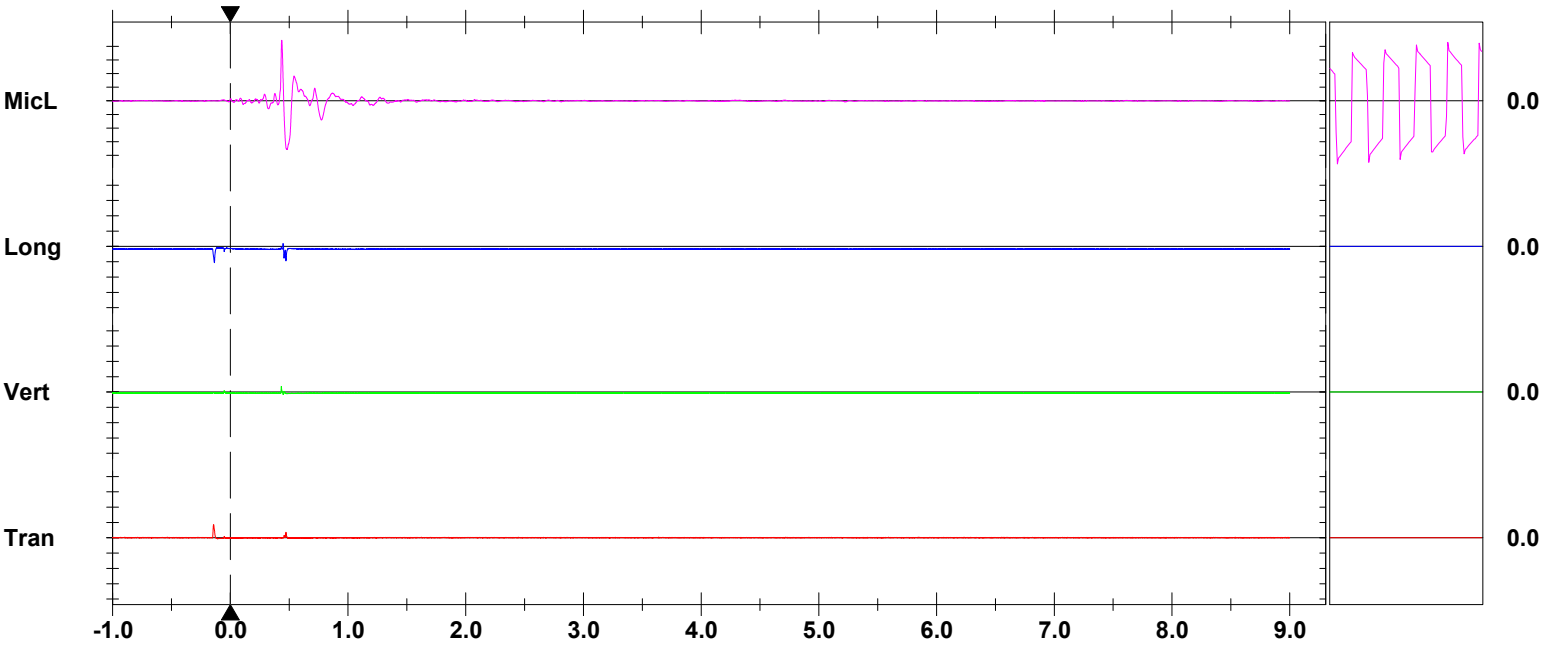
Notes
Location:
Client:
User Name:
General:

Microphone Linear Weighting
PSPL 223.1 pa.(L) at 0.437 sec
ZC Freq 13.3 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1372 mv)

	Tran	Vert	Long	
PPV	1.734	0.741	2.112	mm/s
ZC Freq	18.6	47	<1.0	Hz
Time (Rel. to Trig)	-0.142	0.434	-0.135	sec
Peak Acceleration	0.043	0.038	0.049	g
Peak Displacement	0.011	0.061	0.262	mm
Sensor Check	Passed	Passed	Passed	
Frequency	0.0	0.0	0.0	Hz
Overswing Ratio	0.0	0.0	0.0	

Peak Vector Sum 2.355 mm/s at -0.136 sec





Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 50.00 pa.(L)/div Sensor Check
Trigger =

Format © 1995-2015 Xmark Corporation

Event Report

Date/Time MicL at 12:13:50 August 18, 2018
Trigger Source Geo: 7.000 mm/s, Mic: 6.325 pa.(L)
Range Geo: 254.0 mm/s
Record Time 9.0 sec (Auto=3Sec) at 2048 sps
Operator/Setup: Operator/factory.MMB

Serial Number UM12242 V 10-87 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration June 30, 2017 by Instantel
File Name UM12242_20180818121350.IDFW

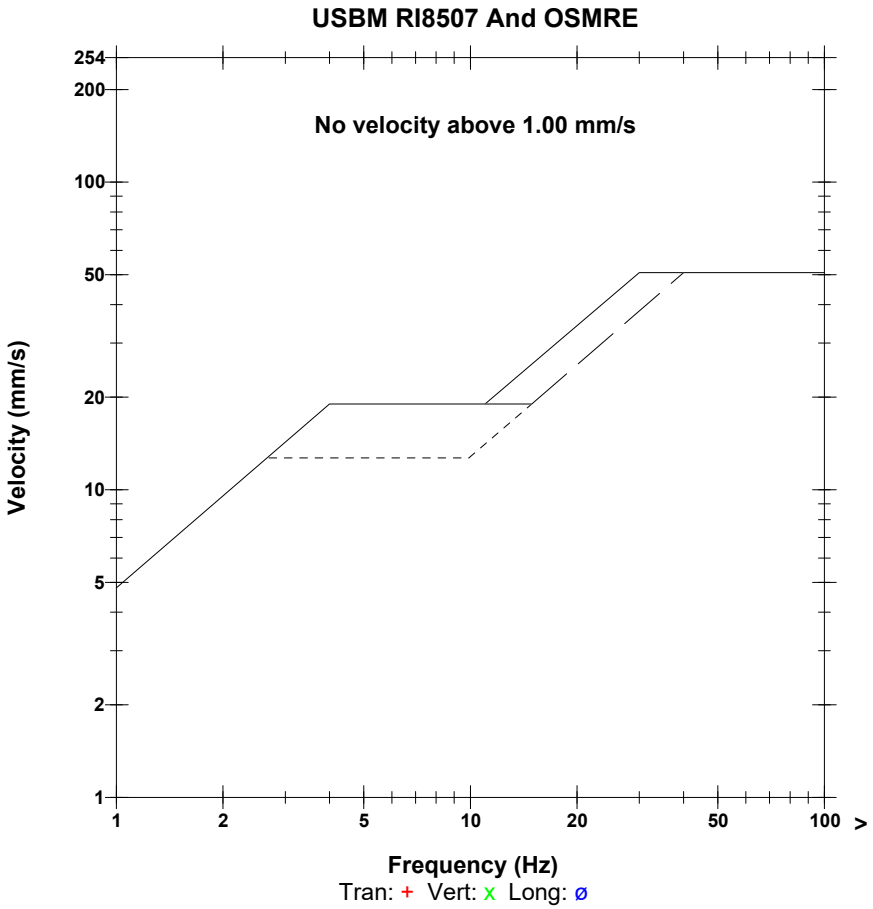
Post Event Notes
GD-733-05B

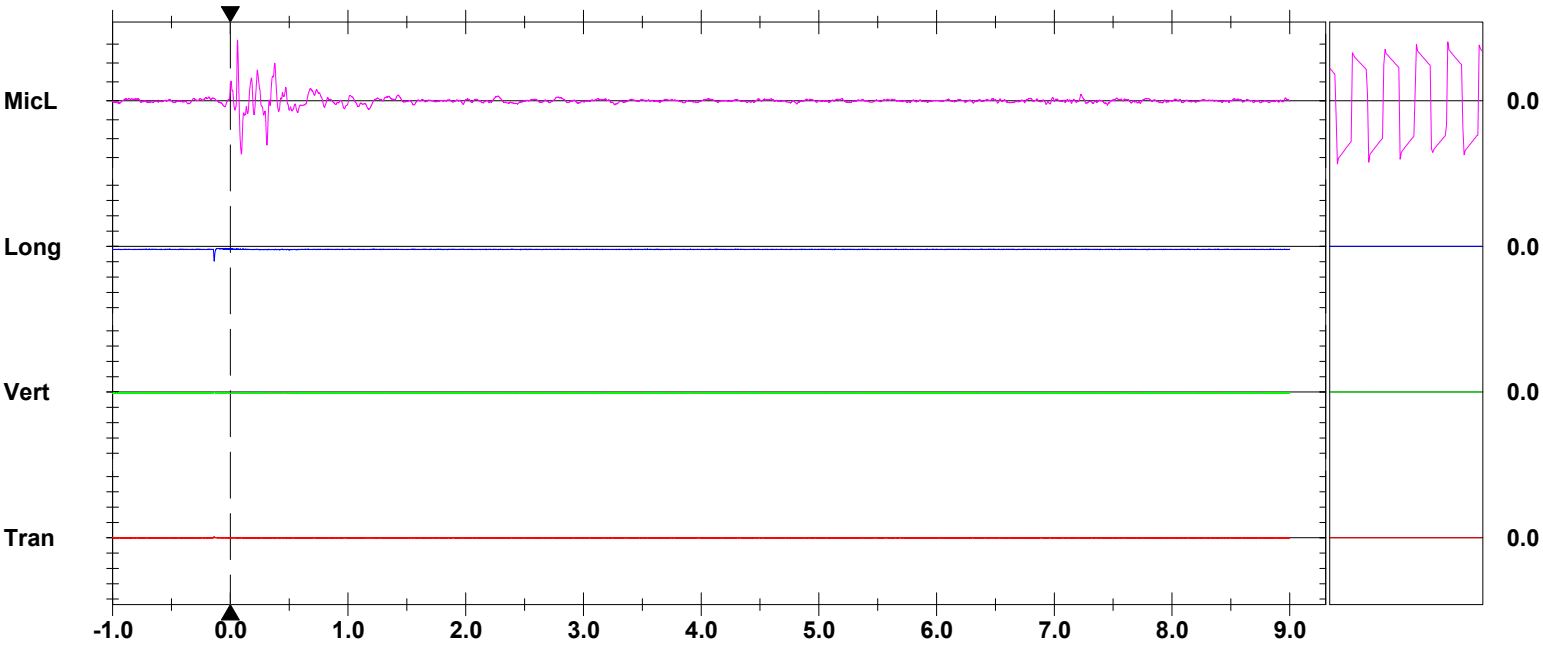
Notes
Location:
Client:
User Name:
General:

Microphone Linear Weighting
PSPL 32.13 pa.(L) at 0.061 sec
ZC Freq 21 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1452 mv)

	Tran	Vert	Long	
PPV	0.150	0.213	1.931	mm/s
ZC Freq	30	N/A	N/A	Hz
Time (Rel. to Trig)	-0.140	0.347	-0.137	sec
Peak Acceleration	0.013	0.015	0.035	g
Peak Displacement	0.001	0.067	0.000	mm
Sensor Check	Passed	Passed	Passed	
Frequency	0.0	0.0	0.0	Hz
Overswing Ratio	0.0	0.0	0.0	

Peak Vector Sum 1.934 mm/s at -0.137 sec
N/A: Not Applicable





Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Sensor Check
Trigger =

Format © 1995-2015 Xmark Corporation

Event Report

Date/Time	MicL at 12:03:55 September 10, 2018
Trigger Source	Geo: 7.000 mm/s, Mic: 110.0 dB(L)
Range	Geo: 254.0 mm/s
Record Time	35.474 sec (Auto=3Sec) at 2048 sps
Operator/Setup:	Operator/TATA.MMB

Serial Number	UM12242 V 10-87 Micromate DIN
Battery Level	3.8 Volts
Unit Calibration	June 30, 2017 by Instantel
File Name	__TEMP.EVT

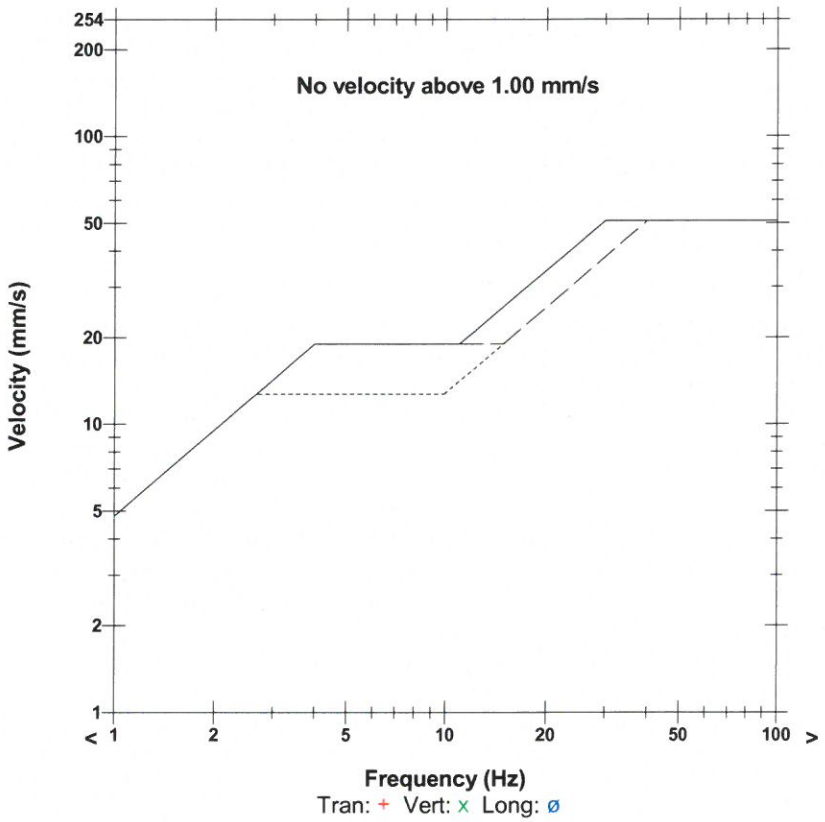
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Client:
User Name:
General:

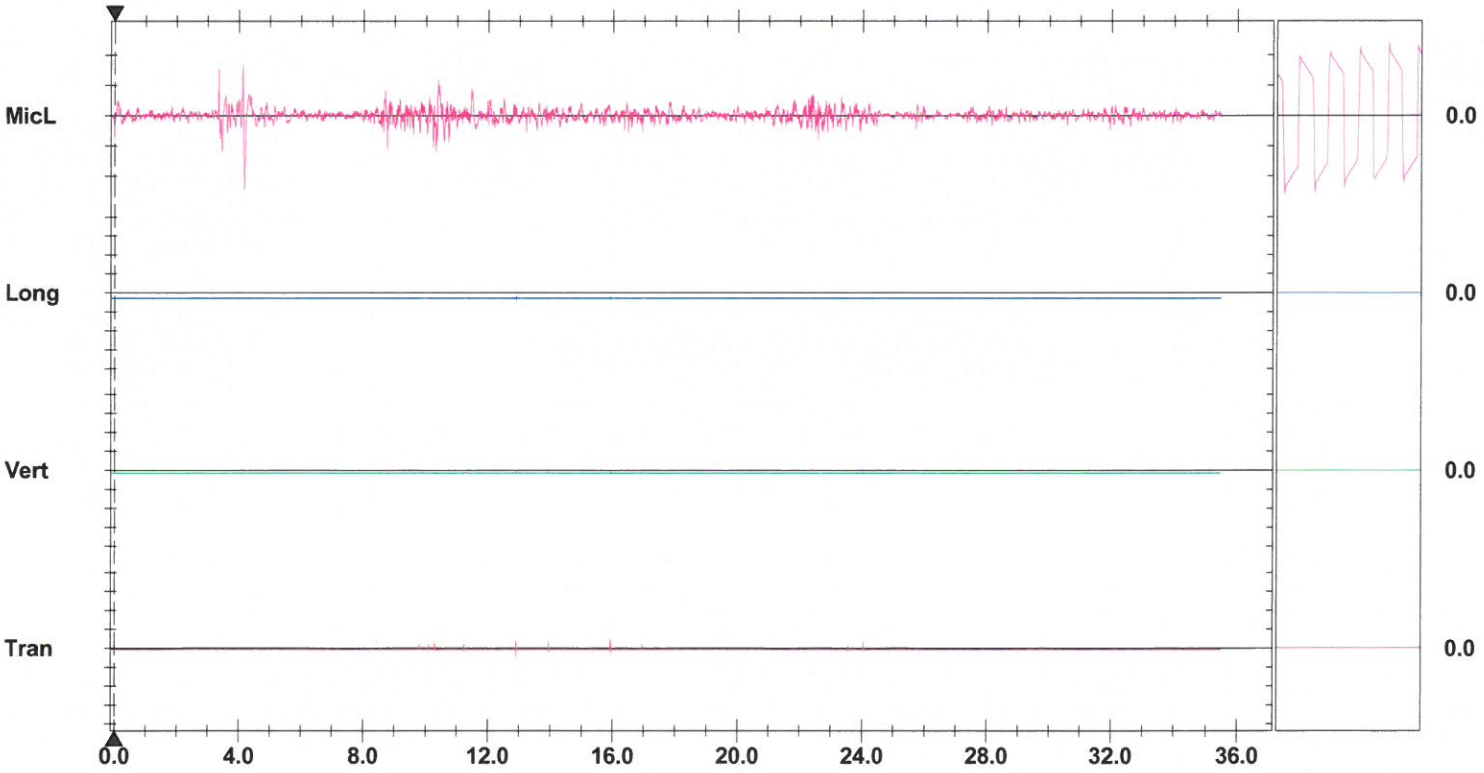
Microphone	Linear Weighting
PSPL	127.9 dB(L) at 4.183 sec
ZC Freq	5.8 Hz
Channel Test	Passed (Freq = 19.7 Hz Amp = 1537 mv)

	Tran	Vert	Long	
PPV	0.938	0.339	0.765	mm/s
ZC Freq	73	N/A	N/A	Hz
Time (Rel. to Trig)	12.915	11.736	12.915	sec
Peak Acceleration	0.071	0.018	0.023	g
Peak Displacement	0.810	0.000	0.000	mm
Sensor Check	Passed	Passed	Passed	
Frequency	0.0	0.0	0.0	Hz
Overswing Ratio	0.0	0.0	0.0	

Peak Vector Sum 1.226 mm/s at 12.915 sec
N/A: Not Applicable

USBM RI8507 And OSMRE





Time Scale: 1.00 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 20.00 pa.(L)/div
Trigger = ▶——◀

Sensor Check

Format © 1995-2015 Xmark Corporation

Event Report

Date/Time MicL at 18:25:18 August 27, 2018
Trigger Source Geo: 7.000 mm/s, Mic: 6.325 pa.(L)
Range Geo: 254.0 mm/s
Record Time 9.0 sec (Auto=3Sec) at 2048 sps
Operator/Setup: Operator/factory.MMB

Serial Number UM12242 V 10-87 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration June 30, 2017 by Instantel
File Name UM12242_20180827182518.IDFW

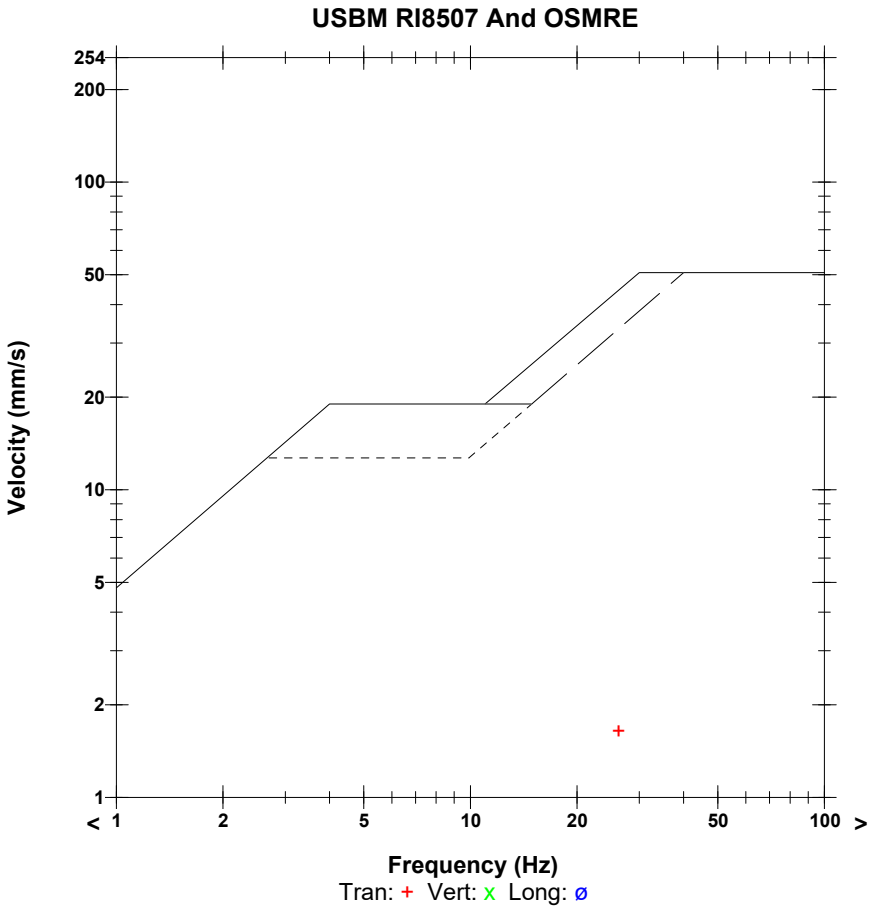
Post Event Notes
GD-723-02

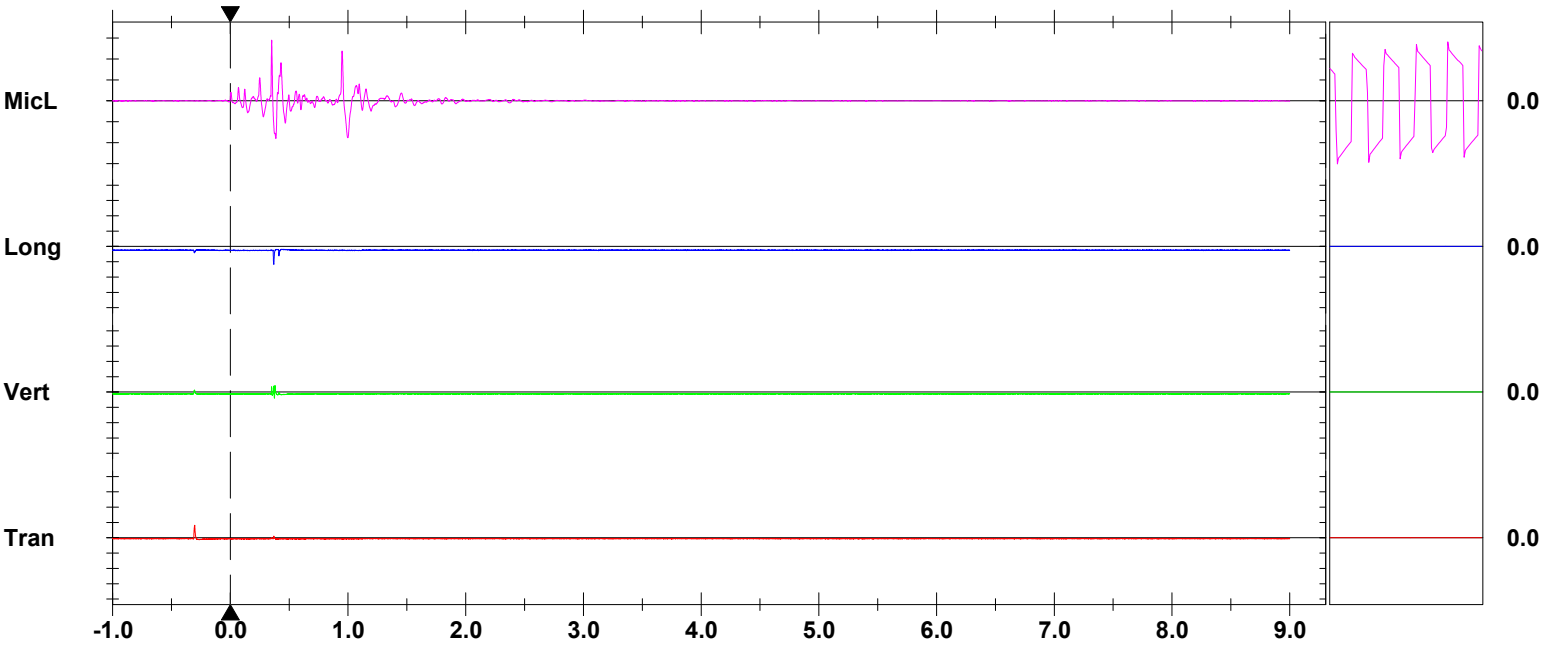
Notes
Location:
Client:
User Name:
General:

Microphone Linear Weighting
PSPL 145.1 pa.(L) at 0.352 sec
ZC Freq 9.3 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1480 mv)

	Tran	Vert	Long	
PPV	1.639	0.875	2.357	mm/s
ZC Freq	26	57	N/A	Hz
Time (Rel. to Trig)	-0.302	0.380	0.369	sec
Peak Acceleration	0.036	0.077	0.058	g
Peak Displacement	0.043	0.078	0.000	mm
Sensor Check	Passed	Passed	Passed	
Frequency	0.0	0.0	0.0	Hz
Overswing Ratio	0.0	0.0	0.0	

Peak Vector Sum 2.478 mm/s at 0.369 sec
N/A: Not Applicable





Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 50.00 pa.(L)/div Sensor Check
Trigger =

Format © 1995-2015 Xmark Corporation

Event Report

Date/Time MicL at 18:09:28 July 26, 2018
Trigger Source Geo: 7.000 mm/s, Mic: 6.325 pa.(L)
Range Geo: 254.0 mm/s
Record Time 9.0 sec (Auto=3Sec) at 2048 sps
Operator/Setup: Operator/factory.MMB

Serial Number UM12242 V 10-87 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration June 30, 2017 by Instantel
File Name UM12242_20180726180928.IDFW

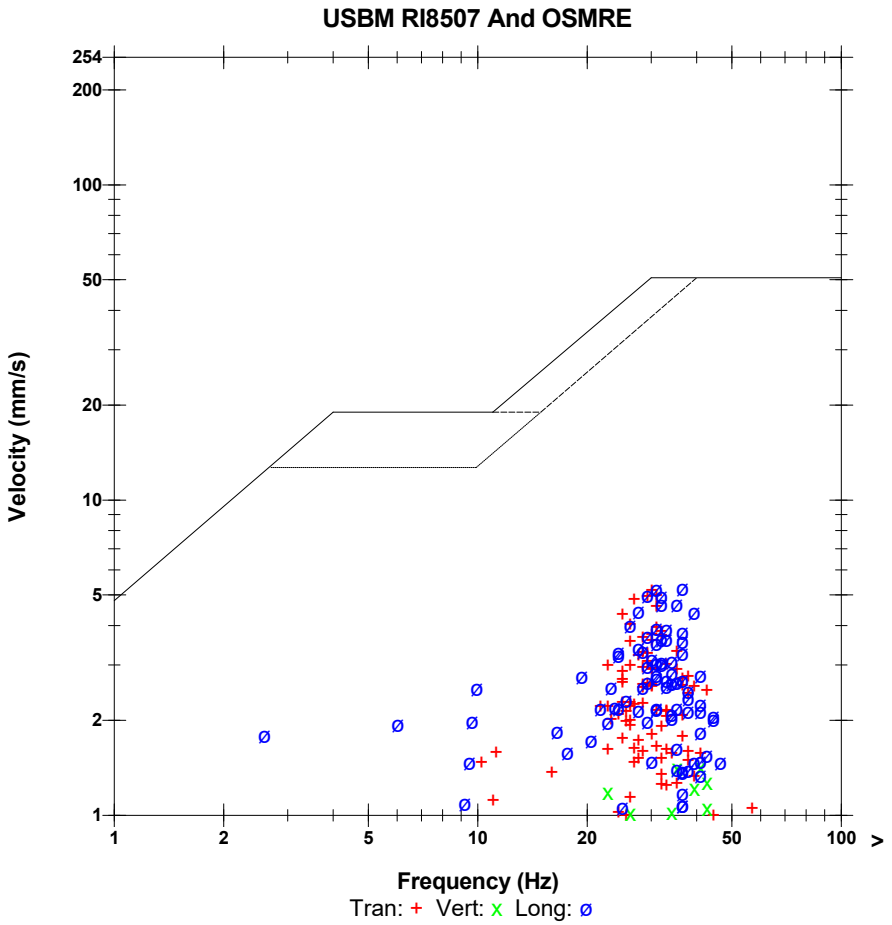
Post Event Notes
GD-723-01 B

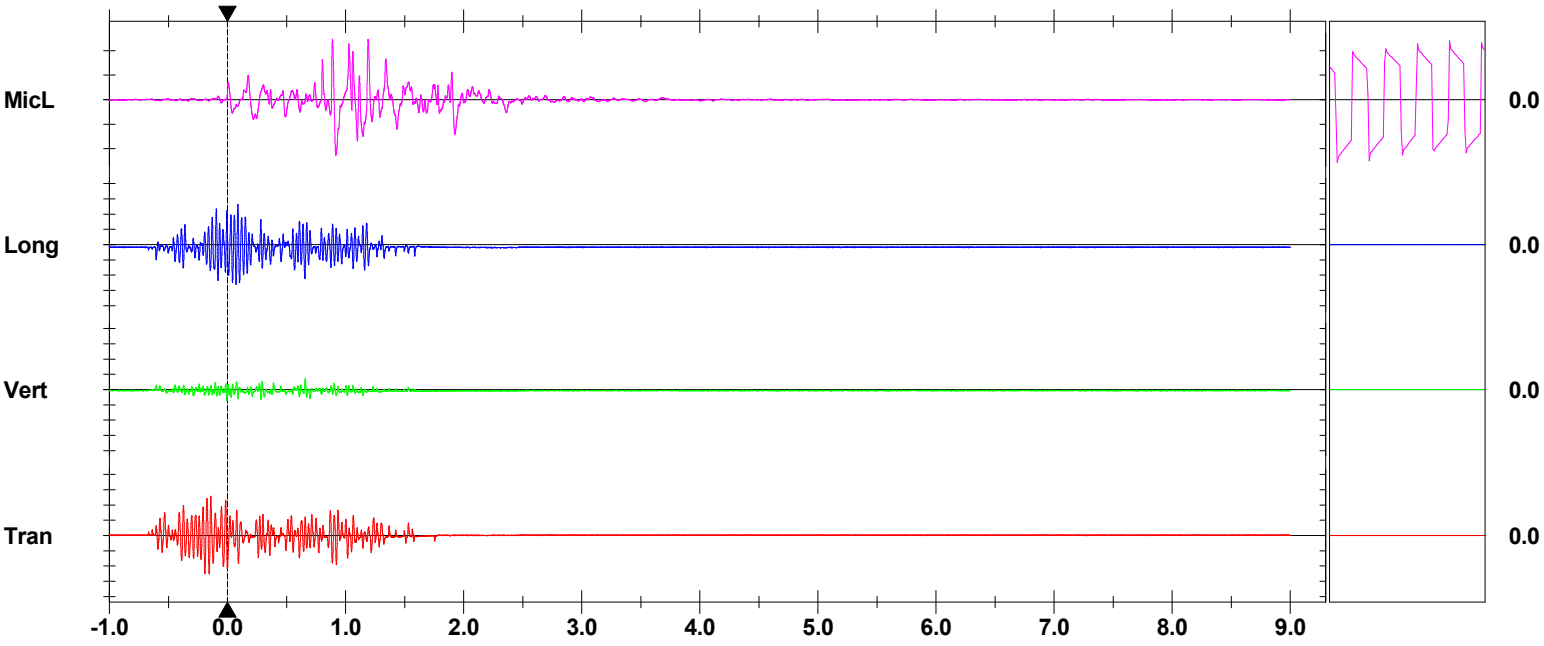
Notes
Location:
Client:
User Name:
General:

Microphone Linear Weighting
PSPL 49.37 pa.(L) at 0.889 sec
ZC Freq 23 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1349 mv)

	Tran	Vert	Long	
PPV	5.178	1.427	5.265	mm/s
ZC Freq	30	41	37	Hz
Time (Rel. to Trig)	-0.141	-0.005	0.088	sec
Peak Acceleration	0.132	0.069	0.184	g
Peak Displacement	0.028	0.023	0.082	mm
Sensor Check	Passed	Passed	Passed	
Frequency	0.0	0.0	0.0	Hz
Overswing Ratio	0.0	0.0	0.0	

Peak Vector Sum 5.902 mm/s at -0.142 sec





Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 20.00 pa.(L)/div
Trigger = ▶----------◀

Sensor Check

Format © 1995-2015 Xmark Corporation

B. Water Quality

2015

Becquerel
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Success Through Science®

Your Project #: B541030

Attention:Mathieu Letourneau

Maxxam Analytique Sainte Foy
2690, avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Report Date: 2015/07/29
Report #: R3611493
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5E5138
Received: 2015/07/23, 14:49

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Radium-226	1	N/A	2015/07/28	BQL SOP-00006, BQL SOP-00017, BQL SOP-00032	Alpha Spectrometry

Remarks:

Becquerel is an ISO 17025 accredited laboratory for certain tests listed within the scope of accreditation. This test report shall not be reproduced, except in full, without written approval of Becquerel Laboratories Inc.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Simona Vatamanescu,
Email: SVatamanescu@maxxam.ca
Phone# (905)826-3080

==========

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Report Date: 2015/07/29

Maxxam Analytique Sainte Foy
Client Project #: B541030

RESULTS OF ANALYSES OF WATER

Maxxam ID		ARE964		
Sampling Date		2015/07/21 07:50		
	Units	DSO4-ER-GW-1	RDL	QC Batch
Radium-226	Bq/L	<0.0050	0.0050	4119008

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Becquerel Laboratories. A Maxxam Company 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.becquerellabs.com

Report Date: 2015/07/29

Maxxam Analytique Sainte Foy
Client Project #: B541030

GENERAL COMMENTS

Radium-226 results have not been corrected for blanks.

Results relate only to the items tested.

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Report Date: 2015/07/29

Maxxam Analytique Sainte Foy
Client Project #: B541030

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
4119008	FA5	Spiked Blank	Radium-226	2015/07/28		101	%	85 - 115
4119008	FA5	Method Blank	Radium-226	2015/07/28	<0.0050		Bq/L	
4119008	FA5	RPD	Radium-226	2015/07/28	NC		%	N/A

N/A = Not Applicable

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

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 (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).

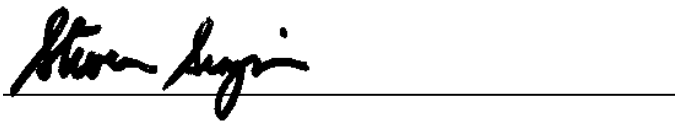
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Report Date: 2015/07/29

Maxxam Analytique Sainte Foy
Client Project #: B541030

VALIDATION SIGNATURE PAGE

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



Steven Simpson, Becquerel

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Your P.O. #: 2200000596
Your Project #: GOODWOOD
Site#: TSMC
Site Location: DSO4-2A
Your C.O.C. #: 123185-02-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2015/09/09
Report #: R2046830
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B541030
Received: 2015/07/22, 09:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2015/07/22	QUE SOP-00142	MA.303-TitrAuto 2.1m
Anions (1)*	1	N/A	2015/07/23	STL SOP-00014	MA300-Ions 1.3 R2 m
Biochemical Oxygen Demand (5 days)*	1	2015/07/23	2015/07/28	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	1	2015/07/24	2015/07/24	QUE SOP-00209	MA400–HYD 1.1 R1 m
Total Cyanide*	1	2015/07/24	2015/07/24	QUE SOP-00143	MA 300-CN 1.2 R2 m
Chemical Oxygen Demand (1)*	1	2015/07/28	2015/07/28	STL SOP-00009	MA315-DCO 1.1 R3 m
Conductivity*	1	N/A	2015/07/22	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2015/07/27	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)***	1	2015/07/23	2015/07/23	STL SOP-00243	SM 21 5310-B m
Fluoride*	1	N/A	2015/07/22	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)***	1	2015/07/27	2015/07/28	STL SOP-00042	MA200-Hg 1.1 R1 m
Total Suspended Solids*	1	2015/07/23	2015/07/23	QUE SOP-00111	SM 22 2540D m
Total Extractable Metals (Low Level)*	1	2015/07/23	2015/07/23	QUE SOP-00132	MA 200-Met 1.2 R5 m
Ammonia Nitrogen (1)*	1	N/A	2015/07/24	STL SOP-00040	MA300–N 2.0 R2 m
Nitrate and/or Nitrite (1)*	1	N/A	2015/07/23	STL SOP-00014	MA300-Ions 1.3 R2 m
pH*	1	N/A	2015/07/22	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus Low Level by ICP-MS*	1	2015/07/23	2015/07/23	QUE SOP-00132	MA 200-Met 1.2 R5 m
Radium 226 LOW LEVEL (2)	1	N/A	N/A		
Reactive Silica (SiO2)***	1	N/A	2015/07/27	QUE SOP-00132	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN) (1)*	1	2015/07/27	2015/07/28	STL SOP-00043	MA300-NTPT 2.0 R1 m
Total Organic Carbon (1, 4)*	1	N/A	2015/07/23	STL SOP-00243	SM 21 5310-B m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam - Becquerel
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

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Your P.O. #: 2200000596
Your Project #: GOODWOOD
Site#: TSMC
Site Location: DSO4-2A
Your C.O.C. #: 123185-02-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2015/09/09
Report #: R2046830
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B541030
Received: 2015/07/22, 09:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Mathieu Letourneau, B. Sc., Chemist,
Email: MLetourneau@maxxam.ca
Phone# (418) 658-5784 Ext:6432

==========

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Maxxam Job #: B541030
Report Date: 2015/09/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4-2A
Your P.O. #: 2200000596
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		BC9550		
Sampling Date		2015/07/21 07:50		
COC Number		123185-02-01		
	Units	**DSO4-ER-GW-1**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1484748
Surrogate Recovery (%)				
1-Chlorooctadecane	%	96	N/A	1484748

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

2015/09/09 13:46

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Maxxam Job #: B541030
Report Date: 2015/09/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4-2A
Your P.O. #: 2200000596
Sampler Initials: JFD

METALS (SURFACE WATER)

Maxxam ID		BC9550		
Sampling Date		2015/07/21 07:50		
COC Number		123185-02-01		
	Units	DSO4-ER-GW-1	RDL	QC Batch
METALS				
Mercury (Hg)	mg/L	<0.00001	0.00001	1485573
Total phosphorous	mg/L	0.006	0.002	1484197

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B541030
Report Date: 2015/09/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4-2A
Your P.O. #: 2200000596
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		BC9550		
Sampling Date		2015/07/21 07:50		
COC Number		123185-02-01		
	Units	DSO4-ER-GW-1	RDL	QC Batch
METALS ICP-MS				
Aluminum (Al)	ug/L	14	10	1484144
Antimony (Sb)	ug/L	<1.0	1.0	1484144
Silver (Ag)	ug/L	<1.0	1.0	1484144
Arsenic (As)	ug/L	<1.0	1.0	1484144
Barium (Ba)	ug/L	<2.0	2.0	1484144
Boron (B)	ug/L	<50	50	1484144
Cadmium (Cd)	ug/L	<0.20	0.20	1484144
Calcium (Ca)	ug/L	<500	500	1484144
Chromium (Cr)	ug/L	<5.0	5.0	1484144
Cobalt (Co)	ug/L	<1.0	1.0	1484144
Copper (Cu)	ug/L	<1.0	1.0	1484144
Total Hardness (CaCO3)	ug/L	<1000	1000	1484144
Tin (Sn)	ug/L	<2.0	2.0	1484144
Iron (Fe)	ug/L	<60	60	1484144
Magnesium (Mg)	ug/L	<100	100	1484144
Manganese (Mn)	ug/L	10	1.0	1484144
Molybdenum (Mo)	ug/L	<1.0	1.0	1484144
Nickel (Ni)	ug/L	<2.0	2.0	1484144
Lead (Pb)	ug/L	<0.50	0.50	1484144
Potassium (K)	ug/L	<500	500	1484144
Selenium (Se)	ug/L	<3.0	3.0	1484144
Sodium (Na)	ug/L	<500	500	1484144
Thallium (Tl)	ug/L	<2.0	2.0	1484144
Titanium (Ti)	ug/L	<10	10	1484144
Uranium (U)	ug/L	<1.0	1.0	1484144
Vanadium (V)	ug/L	<2.0	2.0	1484144
Zinc (Zn)	ug/L	<7.0	7.0	1484144

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2015/09/09 13:46

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Maxxam Job #: B541030
Report Date: 2015/09/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4-2A
Your P.O. #: 2200000596
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		BC9550		
Sampling Date		2015/07/21 07:50		
COC Number		123185-02-01		
	Units	**DSO4-ER-GW-1**	**RDL**	**QC Batch**
CONVENTIONALS				
BOD5	mg/L	<4	4	1484361
COD	mg/L	10	10	1485944
Conductivity	mS/cm	0.002	0.001	1483752
Dissolved organic carbon	mg/L	1.7	0.2	1484331
Fluoride (F)	mg/L	<0.1	0.1	1483850
Hexavalent Chromium (Cr 6+)	mg/L	<0.008	0.008	1485591
Nitrates (N-NO3-)	mg/L	<0.02	0.02	1484339
Nitrites (N-NO2-)	mg/L	<0.02	0.02	1484339
Nitrogen ammonia (N-NH3)	mg/L	<0.02	0.02	1484813
pH	pH	6.49	N/A	1483748
Reactive silica (SiO2)	mg/L	<0.1	0.1	1485632
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	0.40	1485514
Total Cyanide (CN)	mg/L	<0.01	0.01	1484905
Total Organic Carbon	mg/L	1.5	0.2	1484618
Alkalinity Total (as CaCO3) pH 4.5	mg/L	2	1	1483750
Chloride (Cl)	mg/L	0.14	0.05	1484340
Sulfates (SO4)	mg/L	<0.5	0.5	1484340
Total suspended solids (TSS)	mg/L	<2	2	1484268

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

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Maxxam Job #: B541030
Report Date: 2015/09/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4-2A
Your P.O. #: 2200000596
Sampler Initials: JFD

GENERAL COMMENTS

Condition of sample(s) upon receipt: GOOD

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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Maxxam Job #: B541030
Report Date: 2015/09/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4-2A
Your P.O. #: 2200000596
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1483748	CG0	QC Standard	pH	2015/07/22		98	%
1483750	CG0	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2015/07/22		84	%
1483750	CG0	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2015/07/22	<1		mg/L
1483752	CG0	QC Standard	Conductivity	2015/07/22		104	%
1483752	CG0	Method Blank	Conductivity	2015/07/22	<0.001		mS/cm
1483850	CG0	QC Standard	Fluoride (F)	2015/07/22		95	%
1483850	CG0	Method Blank	Fluoride (F)	2015/07/22	<0.1		mg/L
1484144	NS	QC Standard	Aluminum (Al)	2015/07/23		107	%
			Antimony (Sb)	2015/07/23		108	%
			Arsenic (As)	2015/07/23		110	%
			Barium (Ba)	2015/07/23		106	%
			Boron (B)	2015/07/23		87	%
			Cadmium (Cd)	2015/07/23		102	%
			Calcium (Ca)	2015/07/23		102	%
			Chromium (Cr)	2015/07/23		106	%
			Cobalt (Co)	2015/07/23		106	%
			Copper (Cu)	2015/07/23		108	%
			Iron (Fe)	2015/07/23		108	%
			Magnesium (Mg)	2015/07/23		107	%
			Manganese (Mn)	2015/07/23		106	%
			Molybdenum (Mo)	2015/07/23		101	%
			Nickel (Ni)	2015/07/23		108	%
			Lead (Pb)	2015/07/23		105	%
			Potassium (K)	2015/07/23		110	%
			Selenium (Se)	2015/07/23		103	%
			Sodium (Na)	2015/07/23		109	%
			Thallium (Tl)	2015/07/23		108	%
			Uranium (U)	2015/07/23		99	%
			Vanadium (V)	2015/07/23		104	%
			Zinc (Zn)	2015/07/23		106	%
1484144	NS	Spiked Blank	Aluminum (Al)	2015/07/23		108	%
			Antimony (Sb)	2015/07/23		100	%
			Silver (Ag)	2015/07/23		94	%
			Arsenic (As)	2015/07/23		105	%
			Barium (Ba)	2015/07/23		100	%
			Boron (B)	2015/07/23		90	%
			Cadmium (Cd)	2015/07/23		99	%
			Calcium (Ca)	2015/07/23		96	%
			Chromium (Cr)	2015/07/23		99	%
			Cobalt (Co)	2015/07/23		99	%
			Copper (Cu)	2015/07/23		101	%
			Tin (Sn)	2015/07/23		97	%
			Iron (Fe)	2015/07/23		104	%
			Magnesium (Mg)	2015/07/23		105	%
			Manganese (Mn)	2015/07/23		101	%
			Molybdenum (Mo)	2015/07/23		99	%
			Nickel (Ni)	2015/07/23		99	%
			Lead (Pb)	2015/07/23		101	%
			Potassium (K)	2015/07/23		105	%
			Selenium (Se)	2015/07/23		103	%

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Maxxam Job #: B541030
Report Date: 2015/09/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4-2A
Your P.O. #: 2200000596
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Sodium (Na)	2015/07/23		101	%
			Thallium (Tl)	2015/07/23		102	%
			Titanium (Ti)	2015/07/23		99	%
			Uranium (U)	2015/07/23		99	%
			Vanadium (V)	2015/07/23		99	%
			Zinc (Zn)	2015/07/23		101	%
1484144	NS	Method Blank	Aluminum (Al)	2015/07/23	<10		ug/L
			Antimony (Sb)	2015/07/23	<1.0		ug/L
			Silver (Ag)	2015/07/23	<1.0		ug/L
			Arsenic (As)	2015/07/23	<1.0		ug/L
			Barium (Ba)	2015/07/23	<2.0		ug/L
			Boron (B)	2015/07/23	<50		ug/L
			Cadmium (Cd)	2015/07/23	<0.20		ug/L
			Calcium (Ca)	2015/07/23	<500		ug/L
			Chromium (Cr)	2015/07/23	<5.0		ug/L
			Cobalt (Co)	2015/07/23	<1.0		ug/L
			Copper (Cu)	2015/07/23	<1.0		ug/L
			Total Hardness (CaCO3)	2015/07/23	<1000		ug/L
			Tin (Sn)	2015/07/23	<2.0		ug/L
			Iron (Fe)	2015/07/23	<60		ug/L
			Magnesium (Mg)	2015/07/23	<100		ug/L
			Manganese (Mn)	2015/07/23	<1.0		ug/L
			Molybdenum (Mo)	2015/07/23	<1.0		ug/L
			Nickel (Ni)	2015/07/23	<2.0		ug/L
			Lead (Pb)	2015/07/23	<0.50		ug/L
			Potassium (K)	2015/07/23	<500		ug/L
			Selenium (Se)	2015/07/23	<3.0		ug/L
			Sodium (Na)	2015/07/23	<500		ug/L
			Thallium (Tl)	2015/07/23	<2.0		ug/L
			Titanium (Ti)	2015/07/23	<10		ug/L
			Uranium (U)	2015/07/23	<1.0		ug/L
			Vanadium (V)	2015/07/23	<2.0		ug/L
			Zinc (Zn)	2015/07/23	<7.0		ug/L
1484197	NS	QC Standard	Total phosphorous	2015/07/23		108	%
1484197	NS	Spiked Blank	Total phosphorous	2015/07/23		107	%
1484197	NS	Method Blank	Total phosphorous	2015/07/23	<0.002		mg/L
1484268	MCC	Spiked Blank	Total suspended solids (TSS)	2015/07/23		99	%
1484268	MCC	Method Blank	Total suspended solids (TSS)	2015/07/23	<2		mg/L
1484331	MR4	Spiked Blank	Dissolved organic carbon	2015/07/23		102	%
1484331	MR4	Method Blank	Dissolved organic carbon	2015/07/23	0.3, RDL=0.2		mg/L
1484339	JEM	Spiked Blank	Nitrates (N-NO3-)	2015/07/23		104	%
			Nitrites (N-NO2-)	2015/07/23		109	%
1484339	JEM	Method Blank	Nitrates (N-NO3-)	2015/07/23	<0.02		mg/L
			Nitrites (N-NO2-)	2015/07/23	<0.02		mg/L
1484340	JEM	Spiked Blank	Chloride (Cl)	2015/07/23		99	%
			Sulfates (SO4)	2015/07/23		106	%
1484340	JEM	Method Blank	Chloride (Cl)	2015/07/23	0.07, RDL=0.05		mg/L

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Maxxam Job #: B541030
Report Date: 2015/09/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4-2A
Your P.O. #: 2200000596
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Sulfates (SO4)	2015/07/23	<0.5		mg/L
1484361	CA3	Spiked Blank	BOD5	2015/07/28		104	%
1484361	CA3	Spiked Blank DUP	BOD5	2015/07/28		103	%
1484361	CA3	Method Blank	BOD5	2015/07/28	<2		mg/L
1484361	CA3	Method Blank DUP	BOD5	2015/07/28	<2		mg/L
1484618	MR4	QC Standard	Total Organic Carbon	2015/07/23		103	%
1484618	MR4	Spiked Blank	Total Organic Carbon	2015/07/23		101	%
1484618	MR4	Method Blank	Total Organic Carbon	2015/07/23	<0.2		mg/L
1484748	MEP	Spiked Blank	1-Chlorooctadecane	2015/07/24		95	%
			Petroleum Hydrocarbons (C10-C50)	2015/07/24		89	%
1484748	MEP	Method Blank	1-Chlorooctadecane	2015/07/24		105	%
			Petroleum Hydrocarbons (C10-C50)	2015/07/24	<100		ug/L
1484813	DKH	Spiked Blank	Nitrogen ammonia (N-NH3)	2015/07/24		106	%
1484813	DKH	Method Blank	Nitrogen ammonia (N-NH3)	2015/07/24	<0.02		mg/L
1484905	CB8	QC Standard	Total Cyanide (CN)	2015/07/24		93	%
1484905	CB8	Method Blank	Total Cyanide (CN)	2015/07/24	<0.01		mg/L
1485514	DKH	QC Standard	TKN Total Kjeldahl Nitrogen	2015/07/28		103	%
1485514	DKH	Spiked Blank	TKN Total Kjeldahl Nitrogen	2015/07/28		103	%
1485514	DKH	Method Blank	TKN Total Kjeldahl Nitrogen	2015/07/28	<0.40		mg/L
1485573	JS2	QC Standard	Mercury (Hg)	2015/07/28		109	%
1485573	JS2	Spiked Blank	Mercury (Hg)	2015/07/28		100	%
1485573	JS2	Method Blank	Mercury (Hg)	2015/07/28	<0.00001		mg/L
1485591	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2015/07/27		94	%
1485591	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2015/07/27		99	%
1485591	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2015/07/27	<0.008		mg/L
1485632	CG0	QC Standard	Reactive silica (SiO2)	2015/07/27		96	%
1485632	CG0	Method Blank	Reactive silica (SiO2)	2015/07/27	0.1, RDL=0.1		mg/L
1485944	LD2	Matrix Spike	COD	2015/07/28		100	%
1485944	LD2	QC Standard	COD	2015/07/28		99	%
1485944	LD2	Spiked Blank	COD	2015/07/28		99	%
1485944	LD2	Method Blank	COD	2015/07/28	<10		mg/L

RDL = Reportable Detection Limit

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

2015/09/09 13:46

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Maxxam Job #: B541030
Report Date: 2015/09/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4-2A
Your P.O. #: 2200000596
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

Anne-Marie Giroux, Analyste I

Dochka Koleva Hristova, B.Sc., Chemist

Miryam Assayag

Marc Bouchard, B.Sc., Biochimiste, Québec

Maria Chrifi Alaoui, B.Sc., Chemist

Madina Hamrouni, B.Sc., Chemist

Veronic Beausejour, B.Sc., Chemist, Supervisor

2015/09/09 13:46

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Maxxam Job #: B541030
Report Date: 2015/09/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4-2A
Your P.O. #: 2200000596
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE(CONT'D)

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

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Your P.O. #: 2200000596
Your Project #: GOODWOOD
Site#: TSMC
Site Location: DSO4 2B
Your C.O.C. #: 123184-01-02

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2015/10/01
Report #: R2056326
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B549383
Received: 2015/08/25, 09:00

Sample Matrix: WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Extractible Trace Metals by ICP-MS (1)	2	2015/08/27	2015/08/28	STL SOP-00006	MA203-Mét Tra1.1 m

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2015/08/25	QUE SOP-00142	MA.303-TitrAuto 2.1m
Anions (1)*	1	N/A	2015/08/27	STL SOP-00014	MA300-Ions 1.3 R2 m
Biochemical Oxygen Demand (5 days)*	1	2015/08/26	2015/08/31	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	1	2015/08/25	2015/08/27	QUE SOP-00209	MA400–HYD 1.1 R1 m
Total Cyanide*	1	2015/08/28	2015/08/28	QUE SOP-00143	MA 300-CN 1.2 R2 m
Chemical Oxygen Demand (1)*	1	2015/08/28	2015/08/28	STL SOP-00009	MA315-DCO 1.1 R3 m
Conductivity*	1	N/A	2015/08/25	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2015/08/28	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)***	1	2015/08/26	2015/08/26	STL SOP-00243	SM 21 5310-B m
Fluoride*	1	N/A	2015/08/25	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Suspended Solids*	1	2015/08/27	2015/08/27	QUE SOP-00111	SM 22 2540D m
Total Extractible Trace Metals by ICP-MS (1)	1	2015/08/27	2015/08/28	STL SOP-00006	MA203-Mét Tra1.1 m
Ammonia Nitrogen (1)*	1	N/A	2015/08/27	STL SOP-00040	MA300–N 2.0 R2 m
Nitrate and/or Nitrite (1)*	1	N/A	2015/08/27	STL SOP-00014	MA300-Ions 1.3 R2 m
pH*	1	N/A	2015/08/25	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus Low Level by ICP-MS*	1	2015/08/28	2015/08/28	QUE SOP-00132	MA 200-Met 1.2 R5 m
Radium 226 LOW LEVEL (2)	1	N/A	N/A		
Reactive Silica (SiO2)***	1	N/A	2015/09/01	QUE SOP-00132	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN) (1)*	1	2015/08/28	2015/08/28	STL SOP-00043	MA300-NTPT 2.0 R1 m
Total Organic Carbon (1, 4)*	1	N/A	2015/08/27	STL SOP-00243	SM 21 5310-B m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: 2200000596
Your Project #: GOODWOOD
Site#: TSMC
Site Location: DSO4 2B
Your C.O.C. #: 123184-01-02

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2015/10/01
Report #: R2056326
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B549383
Received: 2015/08/25, 09:00

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Sub from Quebec to Becquerel
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Mathieu Letourneau, B. Sc., Chemist,
Email: MLetourneau@maxxam.ca
Phone# (418) 658-5784 Ext:6432

==========

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (WATER)

Maxxam ID		BG7180		BG7181		
Sampling Date		2015/08/24 08:05		2015/08/24 08:05		
COC Number		123184-01-02		123184-01-02		
	Units	DSO4-ER-GW-2 -FB BTN-0001	RDL	DSO4-ER-GW-2 -TB BTP-0002	RDL	QC Batch
METALS						
Aluminum (Al)	ug/L	4.5	0.5	1.2	0.5	1499769
Antimony (Sb)	ug/L	<0.005	0.005	<0.005	0.005	1499769
Silver (Ag)	ug/L	<0.003	0.003	<0.003	0.003	1499769
Arsenic (As)	ug/L	<0.08	0.08	<0.08	0.08	1499769
Barium (Ba)	ug/L	<0.03	0.03	<0.03	0.03	1499769
Boron (B)	ug/L	<0.3	0.3	<0.3	0.3	1499769
Cadmium (Cd)	ug/L	<0.006	0.006	<0.006	0.006	1499769
Calcium (Ca)	ug/L	22	20	<20	20	1499769
Chromium (Cr)	ug/L	<0.04	0.04	<0.04	0.04	1499769
Cobalt (Co)	ug/L	<0.008	0.008	<0.008	0.008	1499769
Copper (Cu)	ug/L	0.06	0.05	0.07	0.05	1499769
Tin (Sn)	ug/L	<0.05	0.05	<0.05	0.05	1499769
Iron (Fe)	ug/L	0.8	0.5	0.8	0.5	1499769
Magnesium (Mg)	ug/L	<10	10	<10	10	1499769
Manganese (Mn)	ug/L	<0.03	0.03	<0.03	0.03	1499769
Mercury (Hg)	ug/L	<0.002	0.002	<0.002	0.002	1499769
Molybdenum (Mo)	ug/L	<0.01	0.01	<0.01	0.01	1499769
Nickel (Ni)	ug/L	<0.03	0.03	<0.03	0.03	1499769
Lead (Pb)	ug/L	<0.01	0.01	<0.01	0.01	1499769
Potassium (K)	ug/L	<10	10	<10	10	1499769
Selenium (Se)	ug/L	<0.05	0.05	<0.05	0.05	1499769
Sodium (Na)	ug/L	<10	10	<10	10	1499769
Thallium (Tl)	ug/L	<0.01	0.01	<0.01	0.01	1499769
Titanium (Ti)	ug/L	<0.5	0.5	<0.4	0.4	1499769
Uranium (U)	ug/L	<0.001	0.001	<0.001	0.001	1499769
Vanadium (V)	ug/L	<0.05	0.05	<0.05	0.05	1499769
Zinc (Zn)	ug/L	0.9	0.5	<0.5	0.5	1499769
Total Hardness (CaCO3)	ug/L	58	40	<40	40	1499769

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		BG7090		
Sampling Date		2015/08/24 08:05		
COC Number		123184-01-02		
	Units	**DSO4-ER-GW-2**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1498592
Surrogate Recovery (%)				
1-Chlorooctadecane	%	110	N/A	1498592

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

2015/10/01 15:05

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

METALS (SURFACE WATER)

Maxxam ID		BG7090		
Sampling Date		2015/08/24 08:05		
COC Number		123184-01-02		
	Units	DSO4-ER-GW-2	RDL	QC Batch
METALS				
Total phosphorous	mg/L	0.012	0.002	1500466

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2015/10/01 15:05

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		BG7090	BG7090		
Sampling Date		2015/08/24 08:05	2015/08/24 08:05		
COC Number		123184-01-02	123184-01-02		
	Units	DSO4-ER-GW-2	DSO4-ER-GW-2 Lab-Dup	RDL	QC Batch
METALS					
Aluminum (Al)	ug/L	22	22	0.5	1499769
Antimony (Sb)	ug/L	<0.005	0.005	0.005	1499769
Silver (Ag)	ug/L	<0.003	<0.003	0.003	1499769
Arsenic (As)	ug/L	<0.08	<0.08	0.08	1499769
Barium (Ba)	ug/L	0.72	0.72	0.03	1499769
Boron (B)	ug/L	0.5	0.5	0.3	1499769
Cadmium (Cd)	ug/L	<0.006	<0.006	0.006	1499769
Calcium (Ca)	ug/L	110	110	20	1499769
Chromium (Cr)	ug/L	<0.04	<0.04	0.04	1499769
Cobalt (Co)	ug/L	0.042	0.040	0.008	1499769
Copper (Cu)	ug/L	0.18	0.18	0.05	1499769
Tin (Sn)	ug/L	<0.05	<0.05	0.05	1499769
Iron (Fe)	ug/L	160	170	0.5	1499769
Magnesium (Mg)	ug/L	71	75	10	1499769
Manganese (Mn)	ug/L	25	27	0.03	1499769
Mercury (Hg)	ug/L	<0.002	<0.002	0.002	1499769
Molybdenum (Mo)	ug/L	<0.01	<0.01	0.01	1499769
Nickel (Ni)	ug/L	0.14	0.14	0.03	1499769
Lead (Pb)	ug/L	0.04	0.04	0.01	1499769
Potassium (K)	ug/L	63	63	10	1499769
Selenium (Se)	ug/L	<0.05	<0.05	0.05	1499769
Sodium (Na)	ug/L	81	82	10	1499769
Thallium (Tl)	ug/L	<0.01	<0.01	0.01	1499769
Titanium (Ti)	ug/L	<0.4	<0.4	0.4	1499769
Uranium (U)	ug/L	0.004	0.004	0.001	1499769
Vanadium (V)	ug/L	<0.05	<0.05	0.05	1499769
Zinc (Zn)	ug/L	0.8	0.8	0.5	1499769
Total Hardness (CaCO3)	ug/L	570	590	40	1499769

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		BG7090		
Sampling Date		2015/08/24 08:05		
COC Number		123184-01-02		
	Units	**DSO4-ER-GW-2**	**RDL**	**QC Batch**
CONVENTIONALS				
BOD5	mg/L	<4	4	1499101
COD	mg/L	<10	10	1500479
Conductivity	mS/cm	0.003	0.001	1498710
Dissolved organic carbon	mg/L	2.2	0.2	1499264
Fluoride (F)	mg/L	<0.1	0.1	1498719
Hexavalent Chromium (Cr 6+)	mg/L	<0.008	0.008	1500560
Nitrates (N-NO3-)	mg/L	<0.02	0.02	1499390
Nitrites (N-NO2-)	mg/L	<0.02	0.02	1499390
Nitrogen ammonia (N-NH3)	mg/L	0.08	0.02	1499884
pH	pH	6.91	N/A	1498705
Reactive silica (SiO2)	mg/L	<0.1	0.1	1501881
TKN Total Kjeldahl Nitrogen	mg/L	0.45	0.40	1500485
Total Cyanide (CN)	mg/L	<0.01	0.01	1500557
Total Organic Carbon	mg/L	2.2	0.2	1499576
Alkalinity Total (as CaCO3) pH 4.5	mg/L	3	1	1498706
Chloride (Cl)	mg/L	<0.05	0.05	1499393
Sulfates (SO4)	mg/L	<0.5	0.5	1499393
Total suspended solids (TSS)	mg/L	2	2	1499849

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

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

GENERAL COMMENTS

Condition of sample(s) upon receipt: GOOD

Version 2: following client's request, the project # was changed to DSO4 2B.

TOTAL EXTRACTABLE METALS (WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1498592	MH5	Spiked Blank	1-Chlorooctadecane	2015/08/26		88	%
			Petroleum Hydrocarbons (C10-C50)	2015/08/26		102	%
1498592	MH5	Method Blank	1-Chlorooctadecane	2015/08/26		111	%
			Petroleum Hydrocarbons (C10-C50)	2015/08/26	<100		ug/L
1498705	AG5	QC Standard	pH	2015/08/25		100	%
1498706	AG5	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2015/08/25		106	%
1498706	AG5	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2015/08/25	<1		mg/L
1498710	AG5	QC Standard	Conductivity	2015/08/25		104	%
1498710	AG5	Method Blank	Conductivity	2015/08/25	<0.001		mS/cm
1498719	AG5	QC Standard	Fluoride (F)	2015/08/25		94	%
1498719	AG5	Method Blank	Fluoride (F)	2015/08/25	<0.1		mg/L
1499101	CA3	Spiked Blank	BOD5	2015/08/31		107	%
1499101	CA3	Spiked Blank DUP	BOD5	2015/08/31		113	%
1499101	CA3	Method Blank	BOD5	2015/08/31	<2		mg/L
1499101	CA3	Method Blank DUP	BOD5	2015/08/31	<2		mg/L
1499264	MR4	Spiked Blank	Dissolved organic carbon	2015/08/26		98	%
1499264	MR4	Method Blank	Dissolved organic carbon	2015/08/26	0.4, RDL=0.2		mg/L
1499390	JEM	Spiked Blank	Nitrates (N-NO3-)	2015/08/27		96	%
			Nitrites (N-NO2-)	2015/08/27		107	%
1499390	JEM	Method Blank	Nitrates (N-NO3-)	2015/08/27	<0.02		mg/L
			Nitrites (N-NO2-)	2015/08/27	<0.02		mg/L
1499393	JEM	Spiked Blank	Chloride (Cl)	2015/08/26		103	%
			Sulfates (SO4)	2015/08/26		112	%
1499393	JEM	Method Blank	Chloride (Cl)	2015/08/26	<0.05		mg/L
			Sulfates (SO4)	2015/08/26	<0.5		mg/L
1499576	MR4	QC Standard	Total Organic Carbon	2015/08/27		106	%
1499576	MR4	Spiked Blank	Total Organic Carbon	2015/08/27		106	%
1499576	MR4	Method Blank	Total Organic Carbon	2015/08/27	<0.2		mg/L
1499769	SC5	Matrix Spike	Aluminum (Al)	2015/08/28		NC	%
			Antimony (Sb)	2015/08/28		109	%
			Silver (Ag)	2015/08/28		105	%
			Arsenic (As)	2015/08/28		103	%
			Barium (Ba)	2015/08/28		102	%
			Boron (B)	2015/08/28		94	%
			Cadmium (Cd)	2015/08/28		106	%
			Calcium (Ca)	2015/08/28		NC	%
			Chromium (Cr)	2015/08/28		103	%
			Cobalt (Co)	2015/08/28		112	%
			Copper (Cu)	2015/08/28		106	%
			Tin (Sn)	2015/08/28		105	%
			Iron (Fe)	2015/08/28		101	%
			Magnesium (Mg)	2015/08/28		NC	%
			Manganese (Mn)	2015/08/28		NC	%
			Mercury (Hg)	2015/08/28		105	%
			Molybdenum (Mo)	2015/08/28		108	%
			Nickel (Ni)	2015/08/28		111	%
			Lead (Pb)	2015/08/28		109	%
			Potassium (K)	2015/08/28		110	%
			Selenium (Se)	2015/08/28		111	%

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Sodium (Na)	2015/08/28		NC	%
			Thallium (Tl)	2015/08/28		107	%
			Titanium (Ti)	2015/08/28		109	%
			Uranium (U)	2015/08/28		99	%
			Vanadium (V)	2015/08/28		97	%
			Zinc (Zn)	2015/08/28		97	%
1499769	SC5	Spiked Blank	Aluminum (Al)	2015/08/28		123 (1)	%
			Antimony (Sb)	2015/08/28		103	%
			Silver (Ag)	2015/08/28		101	%
			Arsenic (As)	2015/08/28		101	%
			Barium (Ba)	2015/08/28		103	%
			Boron (B)	2015/08/28		89	%
			Cadmium (Cd)	2015/08/28		98	%
			Calcium (Ca)	2015/08/28		100	%
			Chromium (Cr)	2015/08/28		102	%
			Cobalt (Co)	2015/08/28		108	%
			Copper (Cu)	2015/08/28		108	%
			Tin (Sn)	2015/08/28		103	%
			Iron (Fe)	2015/08/28		100	%
			Magnesium (Mg)	2015/08/28		111	%
			Manganese (Mn)	2015/08/28		120	%
			Mercury (Hg)	2015/08/28		98	%
			Molybdenum (Mo)	2015/08/28		103	%
			Nickel (Ni)	2015/08/28		101	%
			Lead (Pb)	2015/08/28		103	%
			Potassium (K)	2015/08/28		109	%
			Selenium (Se)	2015/08/28		99	%
			Sodium (Na)	2015/08/28		106	%
			Thallium (Tl)	2015/08/28		102	%
			Titanium (Ti)	2015/08/28		103	%
			Uranium (U)	2015/08/28		95	%
			Vanadium (V)	2015/08/28		105	%
			Zinc (Zn)	2015/08/28		101	%
1499769	SC5	Method Blank	Aluminum (Al)	2015/08/28	0.9, RDL=0.5		ug/L
			Antimony (Sb)	2015/08/28	<0.005		ug/L
			Silver (Ag)	2015/08/28	<0.003		ug/L
			Arsenic (As)	2015/08/28	<0.08		ug/L
			Barium (Ba)	2015/08/28	<0.03		ug/L
			Boron (B)	2015/08/28	<0.3		ug/L
			Cadmium (Cd)	2015/08/28	<0.006		ug/L
			Calcium (Ca)	2015/08/28	<20		ug/L
			Chromium (Cr)	2015/08/28	<0.04		ug/L
			Cobalt (Co)	2015/08/28	<0.008		ug/L
			Copper (Cu)	2015/08/28	<0.05		ug/L
			Tin (Sn)	2015/08/28	<0.05		ug/L
			Iron (Fe)	2015/08/28	<0.5		ug/L
			Magnesium (Mg)	2015/08/28	<10		ug/L
			Manganese (Mn)	2015/08/28	<0.03		ug/L
			Mercury (Hg)	2015/08/28	<0.002		ug/L

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Molybdenum (Mo)	2015/08/28	<0.01		ug/L
			Nickel (Ni)	2015/08/28	<0.03		ug/L
			Lead (Pb)	2015/08/28	<0.01		ug/L
			Potassium (K)	2015/08/28	<10		ug/L
			Selenium (Se)	2015/08/28	<0.05		ug/L
			Sodium (Na)	2015/08/28	<10		ug/L
			Thallium (Tl)	2015/08/28	<0.01		ug/L
			Titanium (Ti)	2015/08/28	<0.4		ug/L
			Uranium (U)	2015/08/28	<0.001		ug/L
			Vanadium (V)	2015/08/28	<0.05		ug/L
			Zinc (Zn)	2015/08/28	<0.5		ug/L
			Total Hardness (CaCO3)	2015/08/28	<40		ug/L
1499849	MCC	Spiked Blank	Total suspended solids (TSS)	2015/08/27		89	%
1499849	MCC	Method Blank	Total suspended solids (TSS)	2015/08/27	<2		mg/L
1499884	DKH	Spiked Blank	Nitrogen ammonia (N-NH3)	2015/08/27		101	%
1499884	DKH	Method Blank	Nitrogen ammonia (N-NH3)	2015/08/27	<0.02		mg/L
1500466	NS	QC Standard	Total phosphorous	2015/08/28		100	%
1500466	NS	Spiked Blank	Total phosphorous	2015/08/28		99	%
1500466	NS	Method Blank	Total phosphorous	2015/08/28	<0.002		mg/L
1500479	LD2	QC Standard	COD	2015/08/28		99	%
1500479	LD2	Spiked Blank	COD	2015/08/28		98	%
1500479	LD2	Method Blank	COD	2015/08/28	<10		mg/L
1500485	DKH	QC Standard	TKN Total Kjeldahl Nitrogen	2015/08/28		100	%
1500485	DKH	Spiked Blank	TKN Total Kjeldahl Nitrogen	2015/08/28		101	%
1500485	DKH	Method Blank	TKN Total Kjeldahl Nitrogen	2015/08/28	<0.40		mg/L
1500557	CB8	QC Standard	Total Cyanide (CN)	2015/08/28		89	%
1500557	CB8	Method Blank	Total Cyanide (CN)	2015/08/28	<0.01		mg/L
1500560	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2015/08/28		99	%
1500560	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2015/08/28		105	%
1500560	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2015/08/28	<0.008		mg/L
1501881	DP3	QC Standard	Reactive silica (SiO2)	2015/09/01		85	%
1501881	DP3	Method Blank	Reactive silica (SiO2)	2015/09/01	<0.1		mg/L

RDL = Reportable Detection Limit

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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).

(1) Recovery or relative percent difference (RPD) for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

David Provencher, B.Sc., Chemist

Miryam Assayag

Marilyn Blanc, B. Sc., Chemist

Madina Hamrouni, B.Sc., Chemist

Steliana Calestru, B.Sc. Chemist

Veronic Beausejour, B.Sc., Chemist, Supervisor

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Maxxam Job #: B549383
Report Date: 2015/10/01

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2B
Your P.O. #: 2200000596
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE(CONT'D)

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

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Your P.O. #: 2200000596
Your Project #: GOODWOOD
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 123184-01-02

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2015/09/28
Report #: R2055083
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B549383
Received: 2015/08/25, 09:00

Sample Matrix: WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Extractible Trace Metals by ICP-MS (1)	2	2015/08/27	2015/08/28	STL SOP-00006	MA203-Mét Tra1.1 m

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2015/08/25	QUE SOP-00142	MA.303-TitrAuto 2.1m
Anions (1)*	1	N/A	2015/08/27	STL SOP-00014	MA300-Ions 1.3 R2 m
Biochemical Oxygen Demand (5 days)*	1	2015/08/26	2015/08/31	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	1	2015/08/25	2015/08/27	QUE SOP-00209	MA400–HYD 1.1 R1 m
Total Cyanide*	1	2015/08/28	2015/08/28	QUE SOP-00143	MA 300-CN 1.2 R2 m
Chemical Oxygen Demand (1)*	1	2015/08/28	2015/08/28	STL SOP-00009	MA315-DCO 1.1 R3 m
Conductivity*	1	N/A	2015/08/25	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2015/08/28	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)***	1	2015/08/26	2015/08/26	STL SOP-00243	SM 21 5310-B m
Fluoride*	1	N/A	2015/08/25	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Suspended Solids*	1	2015/08/27	2015/08/27	QUE SOP-00111	SM 22 2540D m
Total Extractible Trace Metals by ICP-MS (1)	1	2015/08/27	2015/08/28	STL SOP-00006	MA203-Mét Tra1.1 m
Ammonia Nitrogen (1)*	1	N/A	2015/08/27	STL SOP-00040	MA300–N 2.0 R2 m
Nitrate and/or Nitrite (1)*	1	N/A	2015/08/27	STL SOP-00014	MA300-Ions 1.3 R2 m
pH*	1	N/A	2015/08/25	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus Low Level by ICP-MS*	1	2015/08/28	2015/08/28	QUE SOP-00132	MA 200-Met 1.2 R5 m
Radium 226 LOW LEVEL (2)	1	N/A	N/A		
Reactive Silica (SiO2)***	1	N/A	2015/09/01	QUE SOP-00132	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN) (1)*	1	2015/08/28	2015/08/28	STL SOP-00043	MA300-NTPT 2.0 R1 m
Total Organic Carbon (1, 4)*	1	N/A	2015/08/27	STL SOP-00243	SM 21 5310-B m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: 2200000596
Your Project #: GOODWOOD
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 123184-01-02

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2015/09/28
Report #: R2055083
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B549383
Received: 2015/08/25, 09:00

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Sub from Quebec to Becquerel
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Mathieu Letourneau, B. Sc., Chemist,
Email: MLetourneau@maxxam.ca
Phone# (418) 658-5784 Ext:6432

==========

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Maxxam Job #: B549383
Report Date: 2015/09/28

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (WATER)

Maxxam ID		BG7180		BG7181		
Sampling Date		2015/08/24 08:05		2015/08/24 08:05		
COC Number		123184-01-02		123184-01-02		
	Units	DSO4-ER-GW-2 -FB BTN-0001	RDL	DSO4-ER-GW-2 -TB BTP-0002	RDL	QC Batch
METALS						
Aluminum (Al)	ug/L	4.5	0.5	1.2	0.5	1499769
Antimony (Sb)	ug/L	<0.005	0.005	<0.005	0.005	1499769
Silver (Ag)	ug/L	<0.003	0.003	<0.003	0.003	1499769
Arsenic (As)	ug/L	<0.08	0.08	<0.08	0.08	1499769
Barium (Ba)	ug/L	<0.03	0.03	<0.03	0.03	1499769
Boron (B)	ug/L	<0.3	0.3	<0.3	0.3	1499769
Cadmium (Cd)	ug/L	<0.006	0.006	<0.006	0.006	1499769
Calcium (Ca)	ug/L	22	20	<20	20	1499769
Chromium (Cr)	ug/L	<0.04	0.04	<0.04	0.04	1499769
Cobalt (Co)	ug/L	<0.008	0.008	<0.008	0.008	1499769
Copper (Cu)	ug/L	0.06	0.05	0.07	0.05	1499769
Tin (Sn)	ug/L	<0.05	0.05	<0.05	0.05	1499769
Iron (Fe)	ug/L	0.8	0.5	0.8	0.5	1499769
Magnesium (Mg)	ug/L	<10	10	<10	10	1499769
Manganese (Mn)	ug/L	<0.03	0.03	<0.03	0.03	1499769
Mercury (Hg)	ug/L	<0.002	0.002	<0.002	0.002	1499769
Molybdenum (Mo)	ug/L	<0.01	0.01	<0.01	0.01	1499769
Nickel (Ni)	ug/L	<0.03	0.03	<0.03	0.03	1499769
Lead (Pb)	ug/L	<0.01	0.01	<0.01	0.01	1499769
Potassium (K)	ug/L	<10	10	<10	10	1499769
Selenium (Se)	ug/L	<0.05	0.05	<0.05	0.05	1499769
Sodium (Na)	ug/L	<10	10	<10	10	1499769
Thallium (Tl)	ug/L	<0.01	0.01	<0.01	0.01	1499769
Titanium (Ti)	ug/L	<0.5	0.5	<0.4	0.4	1499769
Uranium (U)	ug/L	<0.001	0.001	<0.001	0.001	1499769
Vanadium (V)	ug/L	<0.05	0.05	<0.05	0.05	1499769
Zinc (Zn)	ug/L	0.9	0.5	<0.5	0.5	1499769
Total Hardness (CaCO3)	ug/L	58	40	<40	40	1499769

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2015/09/28 22:03

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Maxxam Job #: B549383
Report Date: 2015/09/28

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		BG7090		
Sampling Date		2015/08/24 08:05		
COC Number		123184-01-02		
	Units	**DSO4-ER-GW-2**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1498592
Surrogate Recovery (%)				
1-Chlorooctadecane	%	110	N/A	1498592

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

2015/09/28 22:03

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

METALS (SURFACE WATER)

Maxxam ID		BG7090		
Sampling Date		2015/08/24 08:05		
COC Number		123184-01-02		
	Units	DSO4-ER-GW-2	RDL	QC Batch
METALS				
Total phosphorous	mg/L	0.012	0.002	1500466

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2015/09/28 22:03

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		BG7090	BG7090		
Sampling Date		2015/08/24 08:05	2015/08/24 08:05		
COC Number		123184-01-02	123184-01-02		
	Units	DSO4-ER-GW-2	DSO4-ER-GW-2 Lab-Dup	RDL	QC Batch
METALS					
Aluminum (Al)	ug/L	22	22	0.5	1499769
Antimony (Sb)	ug/L	<0.005	0.005	0.005	1499769
Silver (Ag)	ug/L	<0.003	<0.003	0.003	1499769
Arsenic (As)	ug/L	<0.08	<0.08	0.08	1499769
Barium (Ba)	ug/L	0.72	0.72	0.03	1499769
Boron (B)	ug/L	0.5	0.5	0.3	1499769
Cadmium (Cd)	ug/L	<0.006	<0.006	0.006	1499769
Calcium (Ca)	ug/L	110	110	20	1499769
Chromium (Cr)	ug/L	<0.04	<0.04	0.04	1499769
Cobalt (Co)	ug/L	0.042	0.040	0.008	1499769
Copper (Cu)	ug/L	0.18	0.18	0.05	1499769
Tin (Sn)	ug/L	<0.05	<0.05	0.05	1499769
Iron (Fe)	ug/L	160	170	0.5	1499769
Magnesium (Mg)	ug/L	71	75	10	1499769
Manganese (Mn)	ug/L	25	27	0.03	1499769
Mercury (Hg)	ug/L	<0.002	<0.002	0.002	1499769
Molybdenum (Mo)	ug/L	<0.01	<0.01	0.01	1499769
Nickel (Ni)	ug/L	0.14	0.14	0.03	1499769
Lead (Pb)	ug/L	0.04	0.04	0.01	1499769
Potassium (K)	ug/L	63	63	10	1499769
Selenium (Se)	ug/L	<0.05	<0.05	0.05	1499769
Sodium (Na)	ug/L	81	82	10	1499769
Thallium (Tl)	ug/L	<0.01	<0.01	0.01	1499769
Titanium (Ti)	ug/L	<0.4	<0.4	0.4	1499769
Uranium (U)	ug/L	0.004	0.004	0.001	1499769
Vanadium (V)	ug/L	<0.05	<0.05	0.05	1499769
Zinc (Zn)	ug/L	0.8	0.8	0.5	1499769
Total Hardness (CaCO3)	ug/L	570	590	40	1499769

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		BG7090		
Sampling Date		2015/08/24 08:05		
COC Number		123184-01-02		
	Units	**DSO4-ER-GW-2**	**RDL**	**QC Batch**
CONVENTIONALS				
BOD5	mg/L	<4	4	1499101
COD	mg/L	<10	10	1500479
Conductivity	mS/cm	0.003	0.001	1498710
Dissolved organic carbon	mg/L	2.2	0.2	1499264
Fluoride (F)	mg/L	<0.1	0.1	1498719
Hexavalent Chromium (Cr 6+)	mg/L	<0.008	0.008	1500560
Nitrates (N-NO3-)	mg/L	<0.02	0.02	1499390
Nitrites (N-NO2-)	mg/L	<0.02	0.02	1499390
Nitrogen ammonia (N-NH3)	mg/L	0.08	0.02	1499884
pH	pH	6.91	N/A	1498705
Reactive silica (SiO2)	mg/L	<0.1	0.1	1501881
TKN Total Kjeldahl Nitrogen	mg/L	0.45	0.40	1500485
Total Cyanide (CN)	mg/L	<0.01	0.01	1500557
Total Organic Carbon	mg/L	2.2	0.2	1499576
Alkalinity Total (as CaCO3) pH 4.5	mg/L	3	1	1498706
Chloride (Cl)	mg/L	<0.05	0.05	1499393
Sulfates (SO4)	mg/L	<0.5	0.5	1499393
Total suspended solids (TSS)	mg/L	2	2	1499849

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

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

GENERAL COMMENTS

Condition of sample(s) upon receipt: GOOD

TOTAL EXTRACTABLE METALS (WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

2015/09/28 22:03

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1498592	MH5	Spiked Blank	1-Chlorooctadecane	2015/08/26		88	%
			Petroleum Hydrocarbons (C10-C50)	2015/08/26		102	%
1498592	MH5	Method Blank	1-Chlorooctadecane	2015/08/26		111	%
			Petroleum Hydrocarbons (C10-C50)	2015/08/26	<100		ug/L
1498705	AG5	QC Standard	pH	2015/08/25		100	%
1498706	AG5	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2015/08/25		106	%
1498706	AG5	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2015/08/25	<1		mg/L
1498710	AG5	QC Standard	Conductivity	2015/08/25		104	%
1498710	AG5	Method Blank	Conductivity	2015/08/25	<0.001		mS/cm
1498719	AG5	QC Standard	Fluoride (F)	2015/08/25		94	%
1498719	AG5	Method Blank	Fluoride (F)	2015/08/25	<0.1		mg/L
1499101	CA3	Spiked Blank	BOD5	2015/08/31		107	%
1499101	CA3	Spiked Blank DUP	BOD5	2015/08/31		113	%
1499101	CA3	Method Blank	BOD5	2015/08/31	<2		mg/L
1499101	CA3	Method Blank DUP	BOD5	2015/08/31	<2		mg/L
1499264	MR4	Spiked Blank	Dissolved organic carbon	2015/08/26		98	%
1499264	MR4	Method Blank	Dissolved organic carbon	2015/08/26	0.4, RDL=0.2		mg/L
1499390	JEM	Spiked Blank	Nitrates (N-NO3-)	2015/08/27		96	%
			Nitrites (N-NO2-)	2015/08/27		107	%
1499390	JEM	Method Blank	Nitrates (N-NO3-)	2015/08/27	<0.02		mg/L
			Nitrites (N-NO2-)	2015/08/27	<0.02		mg/L
1499393	JEM	Spiked Blank	Chloride (Cl)	2015/08/26		103	%
			Sulfates (SO4)	2015/08/26		112	%
1499393	JEM	Method Blank	Chloride (Cl)	2015/08/26	<0.05		mg/L
			Sulfates (SO4)	2015/08/26	<0.5		mg/L
1499576	MR4	QC Standard	Total Organic Carbon	2015/08/27		106	%
1499576	MR4	Spiked Blank	Total Organic Carbon	2015/08/27		106	%
1499576	MR4	Method Blank	Total Organic Carbon	2015/08/27	<0.2		mg/L
1499769	SC5	Matrix Spike	Aluminum (Al)	2015/08/28		NC	%
			Antimony (Sb)	2015/08/28		109	%
			Silver (Ag)	2015/08/28		105	%
			Arsenic (As)	2015/08/28		103	%
			Barium (Ba)	2015/08/28		102	%
			Boron (B)	2015/08/28		94	%
			Cadmium (Cd)	2015/08/28		106	%
			Calcium (Ca)	2015/08/28		NC	%
			Chromium (Cr)	2015/08/28		103	%
			Cobalt (Co)	2015/08/28		112	%
			Copper (Cu)	2015/08/28		106	%
			Tin (Sn)	2015/08/28		105	%
			Iron (Fe)	2015/08/28		101	%
			Magnesium (Mg)	2015/08/28		NC	%
			Manganese (Mn)	2015/08/28		NC	%
			Mercury (Hg)	2015/08/28		105	%
			Molybdenum (Mo)	2015/08/28		108	%
			Nickel (Ni)	2015/08/28		111	%
			Lead (Pb)	2015/08/28		109	%
			Potassium (K)	2015/08/28		110	%
			Selenium (Se)	2015/08/28		111	%

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Report Date: 2015/09/28

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Sodium (Na)	2015/08/28		NC	%
			Thallium (Tl)	2015/08/28		107	%
			Titanium (Ti)	2015/08/28		109	%
			Uranium (U)	2015/08/28		99	%
			Vanadium (V)	2015/08/28		97	%
			Zinc (Zn)	2015/08/28		97	%
1499769	SC5	Spiked Blank	Aluminum (Al)	2015/08/28		123 (1)	%
			Antimony (Sb)	2015/08/28		103	%
			Silver (Ag)	2015/08/28		101	%
			Arsenic (As)	2015/08/28		101	%
			Barium (Ba)	2015/08/28		103	%
			Boron (B)	2015/08/28		89	%
			Cadmium (Cd)	2015/08/28		98	%
			Calcium (Ca)	2015/08/28		100	%
			Chromium (Cr)	2015/08/28		102	%
			Cobalt (Co)	2015/08/28		108	%
			Copper (Cu)	2015/08/28		108	%
			Tin (Sn)	2015/08/28		103	%
			Iron (Fe)	2015/08/28		100	%
			Magnesium (Mg)	2015/08/28		111	%
			Manganese (Mn)	2015/08/28		120	%
			Mercury (Hg)	2015/08/28		98	%
			Molybdenum (Mo)	2015/08/28		103	%
			Nickel (Ni)	2015/08/28		101	%
			Lead (Pb)	2015/08/28		103	%
			Potassium (K)	2015/08/28		109	%
			Selenium (Se)	2015/08/28		99	%
			Sodium (Na)	2015/08/28		106	%
			Thallium (Tl)	2015/08/28		102	%
			Titanium (Ti)	2015/08/28		103	%
			Uranium (U)	2015/08/28		95	%
			Vanadium (V)	2015/08/28		105	%
			Zinc (Zn)	2015/08/28		101	%
1499769	SC5	Method Blank	Aluminum (Al)	2015/08/28	0.9, RDL=0.5		ug/L
			Antimony (Sb)	2015/08/28	<0.005		ug/L
			Silver (Ag)	2015/08/28	<0.003		ug/L
			Arsenic (As)	2015/08/28	<0.08		ug/L
			Barium (Ba)	2015/08/28	<0.03		ug/L
			Boron (B)	2015/08/28	<0.3		ug/L
			Cadmium (Cd)	2015/08/28	<0.006		ug/L
			Calcium (Ca)	2015/08/28	<20		ug/L
			Chromium (Cr)	2015/08/28	<0.04		ug/L
			Cobalt (Co)	2015/08/28	<0.008		ug/L
			Copper (Cu)	2015/08/28	<0.05		ug/L
			Tin (Sn)	2015/08/28	<0.05		ug/L
			Iron (Fe)	2015/08/28	<0.5		ug/L
			Magnesium (Mg)	2015/08/28	<10		ug/L
			Manganese (Mn)	2015/08/28	<0.03		ug/L
			Mercury (Hg)	2015/08/28	<0.002		ug/L

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Molybdenum (Mo)	2015/08/28	<0.01		ug/L
			Nickel (Ni)	2015/08/28	<0.03		ug/L
			Lead (Pb)	2015/08/28	<0.01		ug/L
			Potassium (K)	2015/08/28	<10		ug/L
			Selenium (Se)	2015/08/28	<0.05		ug/L
			Sodium (Na)	2015/08/28	<10		ug/L
			Thallium (Tl)	2015/08/28	<0.01		ug/L
			Titanium (Ti)	2015/08/28	<0.4		ug/L
			Uranium (U)	2015/08/28	<0.001		ug/L
			Vanadium (V)	2015/08/28	<0.05		ug/L
			Zinc (Zn)	2015/08/28	<0.5		ug/L
			Total Hardness (CaCO3)	2015/08/28	<40		ug/L
1499849	MCC	Spiked Blank	Total suspended solids (TSS)	2015/08/27		89	%
1499849	MCC	Method Blank	Total suspended solids (TSS)	2015/08/27	<2		mg/L
1499884	DKH	Spiked Blank	Nitrogen ammonia (N-NH3)	2015/08/27		101	%
1499884	DKH	Method Blank	Nitrogen ammonia (N-NH3)	2015/08/27	<0.02		mg/L
1500466	NS	QC Standard	Total phosphorous	2015/08/28		100	%
1500466	NS	Spiked Blank	Total phosphorous	2015/08/28		99	%
1500466	NS	Method Blank	Total phosphorous	2015/08/28	<0.002		mg/L
1500479	LD2	QC Standard	COD	2015/08/28		99	%
1500479	LD2	Spiked Blank	COD	2015/08/28		98	%
1500479	LD2	Method Blank	COD	2015/08/28	<10		mg/L
1500485	DKH	QC Standard	TKN Total Kjeldahl Nitrogen	2015/08/28		100	%
1500485	DKH	Spiked Blank	TKN Total Kjeldahl Nitrogen	2015/08/28		101	%
1500485	DKH	Method Blank	TKN Total Kjeldahl Nitrogen	2015/08/28	<0.40		mg/L
1500557	CB8	QC Standard	Total Cyanide (CN)	2015/08/28		89	%
1500557	CB8	Method Blank	Total Cyanide (CN)	2015/08/28	<0.01		mg/L
1500560	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2015/08/28		99	%
1500560	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2015/08/28		105	%
1500560	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2015/08/28	<0.008		mg/L
1501881	DP3	QC Standard	Reactive silica (SiO2)	2015/09/01		85	%
1501881	DP3	Method Blank	Reactive silica (SiO2)	2015/09/01	<0.1		mg/L

RDL = Reportable Detection Limit

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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).

(1) Recovery or relative percent difference (RPD) for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

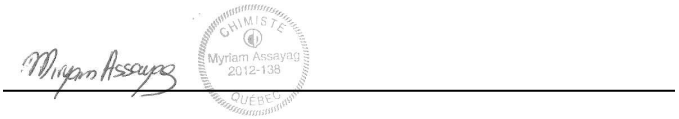
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Dochka Koleva Hristova, B.Sc., Chemist



David Provencher, B.Sc., Chemist



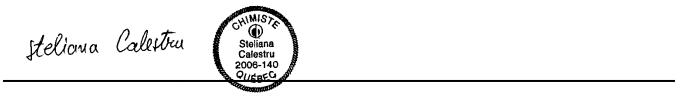
Miryam Assayag



Marilyn Blanc, B. Sc., Chemist



Madina Hamrouni, B.Sc., Chemist



Steliana Calestru, B.Sc. Chemist



Veronic Beausejour, B.Sc., Chemist, Supervisor

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 1A
Your P.O. #: 2200000596
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE(CONT'D)

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

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.

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Your Project #: B549383

Attention:Mathieu Letourneau

Maxxam Analytique Sainte Foy
2690, avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Report Date: 2015/09/10
Report #: R3657217
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5H4611
Received: 2015/08/26, 11:28

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Radium-226	1	N/A	2015/09/09	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry

Remarks:

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Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Simona Vatamanescu,
Email: SVatamanescu@maxxam.ca
Phone# (905)826-3080

==========

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Maxxam Job #: B5H4611
Report Date: 2015/09/10

Maxxam Analytique Sainte Foy
Client Project #: B549383

RESULTS OF ANALYSES OF WATER

Maxxam ID		AWZ246		
Sampling Date		2015/08/24 08:05		
	UNITS	**DSO4-ER-GW-2**	**RDL**	**QC Batch**
Radium-226	Bq/L	<0.0050	0.0050	4176920

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B5H4611
Report Date: 2015/09/10

Maxxam Analytique Sainte Foy
Client Project #: B549383

GENERAL COMMENTS

Radium-226 results have not been corrected for blanks.

Results relate only to the items tested.

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Maxxam Job #: B5H4611
Report Date: 2015/09/10

Maxxam Analytique Sainte Foy
Client Project #: B549383

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4176920	FA5	Spiked Blank	Radium-226	2015/09/08		101	%	85 - 115
4176920	FA5	Method Blank	Radium-226	2015/09/08	<0.0050		Bq/L	
4176920	FA5	RPD	Radium-226	2015/09/08	NC		%	N/A

N/A = Not Applicable

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

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 (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).

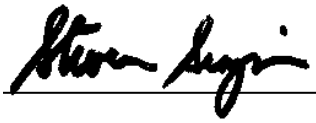
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Maxxam Job #: B5H4611
Report Date: 2015/09/10

Maxxam Analytique Sainte Foy
Client Project #: B549383

VALIDATION SIGNATURE PAGE

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Steven Simpson, Lab Director

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Your Project #: B549383

Attention:Mathieu Letourneau

Maxxam Analytique Sainte Foy
2690, avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Report Date: 2015/09/10
Report #: R3657217
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5H4611
Received: 2015/08/26, 11:28

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Radium-226	1	N/A	2015/09/09	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry

Remarks:

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Encryption Key

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Simona Vatamanescu,
Email: SVatamanescu@maxxam.ca
Phone# (905)826-3080

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Maxxam Job #: B5H4611
Report Date: 2015/09/10

Maxxam Analytique Sainte Foy
Client Project #: B549383

RESULTS OF ANALYSES OF WATER

Maxxam ID		AWZ246		
Sampling Date		2015/08/24 08:05		
	UNITS	**DSO4-ER-GW-2**	**RDL**	**QC Batch**
Radium-226	Bq/L	<0.0050	0.0050	4176920

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B5H4611
Report Date: 2015/09/10

Maxxam Analytique Sainte Foy
Client Project #: B549383

GENERAL COMMENTS

Radium-226 results have not been corrected for blanks.

Results relate only to the items tested.

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Maxxam Job #: B5H4611
Report Date: 2015/09/10

Maxxam Analytique Sainte Foy
Client Project #: B549383

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
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4176920	FA5	Method Blank	Radium-226	2015/09/08	<0.0050		Bq/L	
4176920	FA5	RPD	Radium-226	2015/09/08	NC		%	N/A

N/A = Not Applicable

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

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 (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).

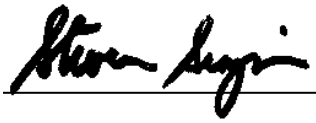
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Maxxam Job #: B5H4611
Report Date: 2015/09/10

Maxxam Analytique Sainte Foy
Client Project #: B549383

VALIDATION SIGNATURE PAGE

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Your P.O. #: 2200000596
Your Project #: GOODWOOD
Site#: TSMC
Site Location: DSO4 2A
Your C.O.C. #: 126426-02-02

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2015/11/04
Report #: R2069873
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B557239
Received: 2015/09/24, 10:30

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	2	N/A	2015/09/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Anions (1)*	2	N/A	2015/09/26	STL SOP-00014	MA300-Ions 1.3 R2 m
Biochemical Oxygen Demand (5 days)*	2	2015/09/25	2015/09/30	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	2	2015/09/25	2015/09/25	QUE SOP-00209	MA400–HYD 1.1 R1 m
Total Cyanide*	2	2015/09/24	2015/09/24	QUE SOP-00143	MA 300-CN 1.2 R2 m
Chemical Oxygen Demand (1)*	2	2015/09/29	2015/09/29	STL SOP-00009	MA315-DCO 1.1 R3 m
Conductivity*	2	N/A	2015/09/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	2	N/A	2015/09/28	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)***	2	2015/09/25	2015/09/25	STL SOP-00243	SM 21 5310-B m
Fluoride*	2	N/A	2015/09/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)***	2	2015/09/28	2015/09/29	STL SOP-00042	MA200-Hg 1.1 R1 m
Total Suspended Solids*	2	2015/09/24	2015/09/24	QUE SOP-00111	SM 22 2540D m
Total Extractable Metals (Low Level) (1)*	2	2015/09/29	2015/09/29	STL SOP-00006	MA200–Mét 1.2 R5 m
Ammonia Nitrogen (1)*	2	N/A	2015/09/28	STL SOP-00040	MA300–N 2.0 R2 m
Nitrate and/or Nitrite (1)*	2	N/A	2015/09/26	STL SOP-00014	MA300-Ions 1.3 R2 m
pH*	2	N/A	2015/09/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus Low Level by ICP-MS*	2	2015/09/29	2015/09/29	QUE SOP-00132	MA 200-Met 1.2 R5 m
Radium 226 LOW LEVEL (2)	2	N/A	N/A		
Reactive Silica (SiO2)***	2	N/A	2015/09/30	QUE SOP-00132	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN) (1)*	2	2015/09/28	2015/09/29	STL SOP-00043	MA300-NTPT 2.0 R1 m
Total Organic Carbon (1, 4)*	2	N/A	2015/09/29	STL SOP-00243	SM 21 5310-B m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Sub from Quebec to Becquerel
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

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Your P.O. #: 2200000596
Your Project #: GOODWOOD
Site#: TSMC
Site Location: DSO4 2A
Your C.O.C. #: 126426-02-02

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2015/11/04
Report #: R2069873
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B557239
Received: 2015/09/24, 10:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Mathieu Letourneau, B. Sc., Chemist,
Email: MLetourneau@maxxam.ca
Phone# (418) 658-5784 Ext:6432

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Maxxam Job #: B557239
Report Date: 2015/11/04

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2200000596
Sampler Initials: SJ

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		BK3858	BK3874		
Sampling Date		2015/09/23 09:30	2015/09/23 10:30		
COC Number		126426-02-02	126426-02-02		
	Units	DSO4-ER-GW-3	DSO4-EE-GW-1 (LAKE)	RDL	QC Batch
PETROLEUM HYDROCARBONS					
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	<100	100	1512874
Surrogate Recovery (%)					
1-Chlorooctadecane	%	94	108	N/A	1512874

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

2015/11/04 16:41

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Maxxam Job #: B557239
Report Date: 2015/11/04

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2200000596
Sampler Initials: SJ

METALS (SURFACE WATER)

Maxxam ID		BK3858	BK3874		
Sampling Date		2015/09/23 09:30	2015/09/23 10:30		
COC Number		126426-02-02	126426-02-02		
	Units	DSO4-ER-GW-3	DSO4-EE-GW-1 (LAKE)	RDL	QC Batch
METALS					
Mercury (Hg)	mg/L	<0.00001	<0.00001	0.00001	1513675

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2015/11/04 16:41

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Maxxam Job #: B557239
Report Date: 2015/11/04

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2200000596
Sampler Initials: SJ

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		BK3858	BK3874		
Sampling Date		2015/09/23 09:30	2015/09/23 10:30		
COC Number		126426-02-02	126426-02-02		
	Units	DSO4-ER-GW-3	DSO4-EE-GW-1 (LAKE)	RDL	QC Batch
METALS					
Total phosphorous	mg/L	0.004	0.005	0.002	1514280
METALS ICP-MS					
Aluminum (Al)	ug/L	25	<10	10	1514159
Antimony (Sb)	ug/L	<1.0	<1.0	1.0	1514159
Silver (Ag)	ug/L	<1.0	<1.0	1.0	1514159
Arsenic (As)	ug/L	<1.0	<1.0	1.0	1514159
Barium (Ba)	ug/L	<2.0	<2.0	2.0	1514159
Boron (B)	ug/L	<50	<50	50	1514159
Cadmium (Cd)	ug/L	<0.20	<0.20	0.20	1514159
Calcium (Ca)	ug/L	<500	<500	500	1514159
Chromium (Cr)	ug/L	<5.0	<5.0	5.0	1514159
Cobalt (Co)	ug/L	<1.0	<1.0	1.0	1514159
Copper (Cu)	ug/L	<1.0	<1.0	1.0	1514159
Total Hardness (CaCO3)	ug/L	<1000	<1000	1000	1514159
Tin (Sn)	ug/L	<2.0	<2.0	2.0	1514159
Iron (Fe)	ug/L	77	71	60	1514159
Magnesium (Mg)	ug/L	<100	110	100	1514159
Manganese (Mn)	ug/L	14	32	1.0	1514159
Molybdenum (Mo)	ug/L	<1.0	<1.0	1.0	1514159
Nickel (Ni)	ug/L	<2.0	<2.0	2.0	1514159
Lead (Pb)	ug/L	<0.50	<0.50	0.50	1514159
Potassium (K)	ug/L	<500	<500	500	1514159
Selenium (Se)	ug/L	<3.0	<3.0	3.0	1514159
Sodium (Na)	ug/L	<500	<500	500	1514159
Thallium (Tl)	ug/L	<2.0	<2.0	2.0	1514159
Titanium (Ti)	ug/L	<10	<10	10	1514159
Uranium (U)	ug/L	<1.0	<1.0	1.0	1514159
Vanadium (V)	ug/L	<2.0	<2.0	2.0	1514159
Zinc (Zn)	ug/L	<7.0	<7.0	7.0	1514159

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2015/11/04 16:41

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Maxxam Job #: B557239
Report Date: 2015/11/04

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2200000596
Sampler Initials: SJ

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		BK3858	BK3858		BK3874		
Sampling Date		2015/09/23 09:30	2015/09/23 09:30		2015/09/23 10:30		
COC Number		126426-02-02	126426-02-02		126426-02-02		
	Units	DSO4-ER-GW-3	DSO4-ER-GW-3 Lab-Dup	RDL	DSO4-EE-GW-1 (LAKE)	RDL	QC Batch
CONVENTIONALS							
BOD5	mg/L	<4	N/A	4	<4	4	1513130
COD	mg/L	12	22	10	14	10	1514148
Conductivity	mS/cm	0.003	N/A	0.001	0.003	0.001	1512690
Dissolved organic carbon	mg/L	2.5	N/A	0.2	1.7	0.2	1513270
Fluoride (F)	mg/L	<0.1	N/A	0.1	<0.1	0.1	1512156
Hexavalent Chromium (Cr 6+)	mg/L	<0.008	N/A	0.008	<0.008	0.008	1513819
Nitrates (N-NO3-)	mg/L	0.02	N/A	0.02	0.03	0.02	1513316
Nitrites (N-NO2-)	mg/L	<0.02	N/A	0.02	<0.02	0.02	1513316
Nitrogen ammonia (N-NH3)	mg/L	<0.02	N/A	0.02	<0.02	0.02	1513747
pH	pH	6.50	N/A	N/A	5.90	N/A	1512610
Reactive silica (SiO2)	mg/L	0.3	N/A	0.1	0.9	0.2	1514905
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	N/A	0.40	<0.40	0.40	1513652
Total Cyanide (CN)	mg/L	<0.01	N/A	0.01	<0.01	0.01	1512373
Total Organic Carbon	mg/L	2.5	2.5	0.2	1.6	0.2	1513717
Alkalinity Total (as CaCO3) pH 4.5	mg/L	2	N/A	1	1	1	1512613
Chloride (Cl)	mg/L	0.07	N/A	0.05	0.09	0.05	1513335
Sulfates (SO4)	mg/L	<0.5	N/A	0.5	<0.5	0.5	1513335
Total suspended solids (TSS)	mg/L	<2	<2	2	<2	2	1512637

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

2015/11/04 16:41

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

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Maxxam Job #: B557239
Report Date: 2015/11/04

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2200000596
Sampler Initials: SJ

GENERAL COMMENTS

Condition of sample(s) upon receipt: GOOD

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Reported detection limits are multiplied by dilution factors used for sample analysis.

Results relate only to the items tested.

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Maxxam Job #: B557239
Report Date: 2015/11/04

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2200000596
Sampler Initials: SJ

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1512156	CB8	QC Standard	Fluoride (F)	2015/09/24		93	%
1512156	CB8	Method Blank	Fluoride (F)	2015/09/24	<0.1		mg/L
1512373	CB8	QC Standard	Total Cyanide (CN)	2015/09/24		94	%
1512373	CB8	Method Blank	Total Cyanide (CN)	2015/09/24	<0.01		mg/L
1512610	CB8	QC Standard	pH	2015/09/24		100	%
1512613	CB8	Spiked Blank	Alkalinity Total (as CaCO3) pH 4.5	2015/09/24		85	%
1512613	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2015/09/24	<1		mg/L
1512637	AG5	Spiked Blank	Total suspended solids (TSS)	2015/09/24		88	%
1512637	AG5	Method Blank	Total suspended solids (TSS)	2015/09/24	<2		mg/L
1512690	CB8	QC Standard	Conductivity	2015/09/24		101	%
1512690	CB8	Method Blank	Conductivity	2015/09/24	<0.001		mS/cm
1512874	MH5	Spiked Blank	1-Chlorooctadecane	2015/09/25		100	%
			Petroleum Hydrocarbons (C10-C50)	2015/09/25		82	%
1512874	MH5	Method Blank	1-Chlorooctadecane	2015/09/25		106	%
			Petroleum Hydrocarbons (C10-C50)	2015/09/25	<100		ug/L
1513130	CA3	Spiked Blank	BOD5	2015/09/30		103	%
1513130	CA3	Spiked Blank DUP	BOD5	2015/09/30		92	%
1513130	CA3	Method Blank	BOD5	2015/09/30	<2		mg/L
1513130	CA3	Method Blank DUP	BOD5	2015/09/30	<2		mg/L
1513270	MR4	QC Standard	Dissolved organic carbon	2015/09/25		109	%
1513270	MR4	Spiked Blank	Dissolved organic carbon	2015/09/25		106	%
1513270	MR4	Method Blank	Dissolved organic carbon	2015/09/25	0.3, RDL=0.2		mg/L
1513316	JEM	Spiked Blank	Nitrates (N-NO3-)	2015/09/26		107	%
			Nitrites (N-NO2-)	2015/09/26		104	%
1513316	JEM	Method Blank	Nitrates (N-NO3-)	2015/09/26	<0.02		mg/L
			Nitrites (N-NO2-)	2015/09/26	<0.02		mg/L
1513335	JEM	Spiked Blank	Chloride (Cl)	2015/09/26		104	%
			Sulfates (SO4)	2015/09/26		103	%
1513335	JEM	Method Blank	Chloride (Cl)	2015/09/26	<0.05		mg/L
			Sulfates (SO4)	2015/09/26	<0.5		mg/L
1513652	DKH	QC Standard	TKN Total Kjeldahl Nitrogen	2015/09/29		103	%
1513652	DKH	Spiked Blank	TKN Total Kjeldahl Nitrogen	2015/09/29		108	%
1513652	DKH	Method Blank	TKN Total Kjeldahl Nitrogen	2015/09/29	<0.40		mg/L
1513675	SDA	Spiked Blank	Mercury (Hg)	2015/09/29		98	%
1513675	SDA	Method Blank	Mercury (Hg)	2015/09/29	<0.00001		mg/L
1513717	MR4	QC Standard	Total Organic Carbon	2015/09/29		98	%
1513717	MR4	Spiked Blank	Total Organic Carbon	2015/09/29		103	%
1513717	MR4	Method Blank	Total Organic Carbon	2015/09/29	<0.2		mg/L
1513747	DKH	Spiked Blank	Nitrogen ammonia (N-NH3)	2015/09/28		98	%
1513747	DKH	Method Blank	Nitrogen ammonia (N-NH3)	2015/09/28	<0.02		mg/L
1513819	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2015/09/28		95	%
1513819	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2015/09/28		101	%
1513819	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2015/09/28	<0.008		mg/L
1514148	LD2	QC Standard	COD	2015/09/29		103	%
1514148	LD2	Spiked Blank	COD	2015/09/29		99	%
1514148	LD2	Method Blank	COD	2015/09/29	<10		mg/L
1514159	JF1	QC Standard	Aluminum (Al)	2015/09/29		93	%
			Antimony (Sb)	2015/09/29		105	%
			Silver (Ag)	2015/09/29		102	%

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Maxxam Job #: B557239
Report Date: 2015/11/04

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2200000596
Sampler Initials: SJ

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Arsenic (As)	2015/09/29		100	%
			Barium (Ba)	2015/09/29		100	%
			Boron (B)	2015/09/29		117 (1)	%
			Cadmium (Cd)	2015/09/29		101	%
			Chromium (Cr)	2015/09/29		100	%
			Cobalt (Co)	2015/09/29		105	%
			Copper (Cu)	2015/09/29		98	%
			Iron (Fe)	2015/09/29		110	%
			Manganese (Mn)	2015/09/29		102	%
			Molybdenum (Mo)	2015/09/29		101	%
			Nickel (Ni)	2015/09/29		98	%
			Lead (Pb)	2015/09/29		102	%
			Selenium (Se)	2015/09/29		101	%
			Thallium (Tl)	2015/09/29		104	%
			Vanadium (V)	2015/09/29		101	%
			Zinc (Zn)	2015/09/29		101	%
1514159	JF1	Spiked Blank	Aluminum (Al)	2015/09/29		94	%
			Antimony (Sb)	2015/09/29		108	%
			Silver (Ag)	2015/09/29		100	%
			Arsenic (As)	2015/09/29		99	%
			Barium (Ba)	2015/09/29		100	%
			Boron (B)	2015/09/29		116	%
			Cadmium (Cd)	2015/09/29		101	%
			Calcium (Ca)	2015/09/29		95	%
			Chromium (Cr)	2015/09/29		95	%
			Cobalt (Co)	2015/09/29		93	%
			Copper (Cu)	2015/09/29		93	%
			Tin (Sn)	2015/09/29		105	%
			Iron (Fe)	2015/09/29		99	%
			Magnesium (Mg)	2015/09/29		101	%
			Manganese (Mn)	2015/09/29		101	%
			Molybdenum (Mo)	2015/09/29		102	%
			Nickel (Ni)	2015/09/29		94	%
			Lead (Pb)	2015/09/29		101	%
			Potassium (K)	2015/09/29		98	%
			Selenium (Se)	2015/09/29		100	%
			Sodium (Na)	2015/09/29		102	%
			Thallium (Tl)	2015/09/29		102	%
			Titanium (Ti)	2015/09/29		98	%
			Uranium (U)	2015/09/29		97	%
			Vanadium (V)	2015/09/29		97	%
			Zinc (Zn)	2015/09/29		95	%
1514159	JF1	Method Blank	Aluminum (Al)	2015/09/29	<10		ug/L
			Antimony (Sb)	2015/09/29	<1.0		ug/L
			Silver (Ag)	2015/09/29	<1.0		ug/L
			Arsenic (As)	2015/09/29	<1.0		ug/L
			Barium (Ba)	2015/09/29	<2.0		ug/L
			Boron (B)	2015/09/29	<50		ug/L
			Cadmium (Cd)	2015/09/29	<0.20		ug/L
			Calcium (Ca)	2015/09/29	<500		ug/L

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Maxxam Job #: B557239
Report Date: 2015/11/04

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2200000596
Sampler Initials: SJ

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Chromium (Cr)	2015/09/29	<5.0		ug/L
			Cobalt (Co)	2015/09/29	<1.0		ug/L
			Copper (Cu)	2015/09/29	<1.0		ug/L
			Total Hardness (CaCO3)	2015/09/29	<1000		ug/L
			Tin (Sn)	2015/09/29	<2.0		ug/L
			Iron (Fe)	2015/09/29	<60		ug/L
			Magnesium (Mg)	2015/09/29	<100		ug/L
			Manganese (Mn)	2015/09/29	<1.0		ug/L
			Molybdenum (Mo)	2015/09/29	<1.0		ug/L
			Nickel (Ni)	2015/09/29	<2.0		ug/L
			Lead (Pb)	2015/09/29	<0.50		ug/L
			Potassium (K)	2015/09/29	<500		ug/L
			Selenium (Se)	2015/09/29	<3.0		ug/L
			Sodium (Na)	2015/09/29	<500		ug/L
			Thallium (Tl)	2015/09/29	<2.0		ug/L
			Titanium (Ti)	2015/09/29	<10		ug/L
			Uranium (U)	2015/09/29	<1.0		ug/L
			Vanadium (V)	2015/09/29	<2.0		ug/L
			Zinc (Zn)	2015/09/29	<7.0		ug/L
1514280	NS	QC Standard	Total phosphorous	2015/09/29		107	%
1514280	NS	Spiked Blank	Total phosphorous	2015/09/29		105	%
1514280	NS	Method Blank	Total phosphorous	2015/09/29	<0.002		mg/L
1514905	DP3	QC Standard	Reactive silica (SiO2)	2015/09/30		102	%
1514905	DP3	Method Blank	Reactive silica (SiO2)	2015/09/30	0.2, RDL=0.1		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

(1) Recovery or relative percent difference (RPD) for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria

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Maxxam Job #: B557239
Report Date: 2015/11/04

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2200000596
Sampler Initials: SJ

VALIDATION SIGNATURE PAGE

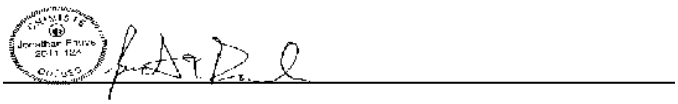
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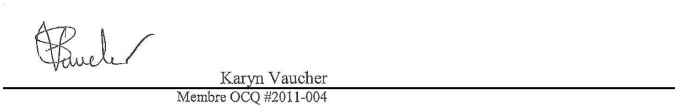
Dochka Koleva Hristova, B.Sc., Chemist



David Provencher, B.Sc., Chemist



Jonathan Fauvel, B.Sc, Chimiste, Analyste II



Karyn Vaucher



Marilyn Blanc, B. Sc., Chemist



Madina Hamrouni, B.Sc., Chemist



Steliana Calestru, B.Sc. Chemist

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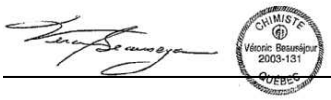
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Maxxam Job #: B557239
Report Date: 2015/11/04

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2200000596
Sampler Initials: SJ

VALIDATION SIGNATURE PAGE(CONT'D)

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Veronic Beausejour, B.Sc., Chemist, Supervisor

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Your Project #: B557239

Attention:Mathieu Letourneau

Maxxam Analytique Sainte Foy
2690, avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Report Date: 2015/10/07
Report #: R3713557
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5J4505
Received: 2015/09/25, 11:18

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Radium-226	2	N/A	2015/10/07	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry

Remarks:

Maxxam Analytics is an ISO 17025 accredited laboratory for certain tests listed within the scope of accreditation. This test report shall not be reproduced, except in full, without written approval of Maxxam Analytics.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Simona Vatamanescu,
Email: SVatamanescu@maxxam.ca
Phone# (905)826-3080

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Maxxam Job #: B5J4505
Report Date: 2015/10/07

Maxxam Analytique Sainte Foy
Client Project #: B557239

RESULTS OF ANALYSES OF WATER

Maxxam ID		BAW199	BAW201		
Sampling Date		2015/09/23 09:30	2015/09/23 10:30		
	UNITS	**DSO4-ER-GW-3**	**DSO4-EE-GW-1 (LAKE)**	**RDL**	**QC Batch**
Radium-226	Bq/L	<0.0050	<0.0050	0.0050	4211783

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B5J4505
Report Date: 2015/10/07

Maxxam Analytique Sainte Foy
Client Project #: B557239

GENERAL COMMENTS

Radium-226 results have not been corrected for blanks.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Maxxam Job #: B5J4505
Report Date: 2015/10/07

Maxxam Analytique Sainte Foy
Client Project #: B557239

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4211783	FA5	Spiked Blank	Radium-226	2015/10/07		103	%	85 - 115
4211783	FA5	Method Blank	Radium-226	2015/10/07	<0.0050		Bq/L	
4211783	FA5	RPD	Radium-226	2015/10/07	NC		%	N/A

N/A = Not Applicable

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

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 (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).

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Maxxam Job #: B5J4505
Report Date: 2015/10/07

Maxxam Analytique Sainte Foy
Client Project #: B557239

VALIDATION SIGNATURE PAGE

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



Steven Simpson, Lab Director

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B. Water Quality

2016

Your Project #: B638656

Attention:Mathieu Letourneau

Maxxam Analytique Sainte Foy
2690, avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Report Date: 2016/07/04
Report #: R4051339
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6C7958
Received: 2016/06/22, 09:30

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Radium-226 (1)	1	N/A	2016/06/28	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry

Remarks:

Maxxam Analytics is an ISO 17025 accredited laboratory for certain tests listed within the scope of accreditation. This test report shall not be reproduced, except in full, without written approval of Maxxam Analytics.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) Radium-226 results have not been corrected for blanks.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Simona Vatamanescu, Project Manager
Email: SVatamanescu@maxxam.ca
Phone# (905)826-3080

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Maxxam Job #: B6C7958
Report Date: 2016/07/04

Maxxam Analytique Sainte Foy
Client Project #: B638656

RESULTS OF ANALYSES OF WATER

Maxxam ID		COR284		
Sampling Date		2016/06/20 08:10		
	UNITS	**DSO4-ER-GW-4**	**RDL**	**QC Batch**
Radium-226	Bq/L	<0.0050	0.0050	4552352

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B6C7958
Report Date: 2016/07/04

Maxxam Analytique Sainte Foy
Client Project #: B638656

GENERAL COMMENTS

Radium-226: This analysis is accredited by the MDDELCC.

Results relate only to the items tested.

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Maxxam Job #: B6C7958
Report Date: 2016/07/04

Maxxam Analytique Sainte Foy
Client Project #: B638656

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4552352	FA5	Spiked Blank	Radium-226	2016/06/28		95	%	85 - 115
4552352	FA5	Method Blank	Radium-226	2016/06/28	<0.0050		Bq/L	
4552352	FA5	RPD	Radium-226	2016/06/28	NC		%	N/A

N/A = Not Applicable

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

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 (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).

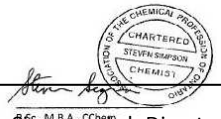
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Maxxam Job #: B6C7958
Report Date: 2016/07/04

Maxxam Analytique Sainte Foy
Client Project #: B638656

VALIDATION SIGNATURE PAGE

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



Steven Simpson, Lab Director

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Your P.O. #: 2100001513
Your Project #: GOODWOOD
Site#: TSMC
Your C.O.C. #: 136863-02-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2016/09/07
Report #: R2187449
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B638656
Received: 2016/06/21, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2016/06/21	QUE SOP-00142	MA.303-TitrAuto 2.1m
Anions*	1	N/A	2016/06/22	QUE SOP-00141	MA 300-Ions 1.3 R2 m
Anions*	1	N/A	2016/06/22	QUE SOP-00141	MA 300-Ions 1.3 R2 m
BOD5 (unfrozen)	1	2016/06/21	2016/06/26	QUE SOP-00100	MA315-DBO 1.1 R2 m
Petroleum Hydrocarbons (C10-C50)*	1	2016/06/22	2016/06/27	QUE SOP-00209	MA400–HYD 1.1 R1 m
Total Cyanide*	1	2016/06/27	2016/06/27	QUE SOP-00143	MA 300-CN 1.2 R3 m
Chemical Oxygen Demand (1)*	1	2016/06/27	2016/06/27	STL SOP-00009	MA315-DCO 1.1 R3 m
Conductivity*	1	N/A	2016/06/21	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2016/06/23	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (2, 4)	1	2016/09/07	2016/09/07		
Fluoride*	1	N/A	2016/06/22	QUE SOP-00142	MA.303-TitrAuto 2.1m
Radium 226 (MMER LOW LEVEL) (3)	1	N/A	N/A		
Total Suspended Solids*	1	2016/06/22	2016/06/23	QUE SOP-00111	MA104 - S.S. 2.0 m
Total Extractible Trace Metals by ICP-MS (1)	1	2016/06/30	2016/07/05	STL SOP-00006	MA203-Mét Tra1.1 m
Ammonia Nitrogen (1)*	1	N/A	2016/06/27	STL SOP-00040	MA300–N 2.0 R2 m
pH*	1	N/A	2016/06/21	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus Low Level by ICP-MS*	1	2016/06/23	2016/06/23	QUE SOP-00132	MA 200-Met 1.2 R5 m
Reactive Silica (SiO2)***	1	N/A	2016/06/29	QUE SOP-00132	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN) (1)*	1	2016/06/27	2016/06/28	STL SOP-00043	MA300-NTPT 2.0 R1 m
Total Organic Carbon (2, 5)	1	N/A	2016/07/22		

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Sub Quebec to Exova - PC
(3) This test was performed by Maxxam - Becquerel
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

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Your P.O. #: 2100001513
Your Project #: GOODWOOD
Site#: TSMC
Your C.O.C. #: 136863-02-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2016/09/07
Report #: R2187449
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B638656
Received: 2016/06/21, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Mathieu Letourneau, B. Sc., Chemist,
Email: MLetourneau@maxxam.ca
Phone# (418)658-5784 Ext:6432

==========

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Maxxam Job #: B638656
Report Date: 2016/09/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Your P.O. #: 2100001513
Sampler Initials: SJ

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		CN5188		
Sampling Date		2016/06/20 08:10		
COC Number		136863-02-01		
	Units	DSO4-ER-GW-4	RDL	QC Batch
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1625840
Surrogate Recovery (%)				
1-Chlorooctadecane	%	84	N/A	1625840

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

2016/09/07 19:02

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Report Date: 2016/09/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Your P.O. #: 2100001513
Sampler Initials: SJ

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		CN5188		
Sampling Date		2016/06/20 08:10		
COC Number		136863-02-01		
	Units	DSO4-ER-GW-4	RDL	QC Batch
METALS				
Total phosphorous	mg/L	0.008	0.002	1626531
Aluminum (Al)	ug/L	9.6	0.5	1629521
Antimony (Sb)	ug/L	0.017	0.005	1629521
Silver (Ag)	ug/L	0.003	0.003	1629521
Arsenic (As)	ug/L	<0.08	0.08	1629521
Barium (Ba)	ug/L	0.59	0.03	1629521
Boron (B)	ug/L	0.5	0.3	1629521
Cadmium (Cd)	ug/L	<0.006	0.006	1629521
Calcium (Ca)	ug/L	93	20	1629521
Chromium (Cr)	ug/L	<0.04	0.04	1629521
Cobalt (Co)	ug/L	0.019	0.008	1629521
Copper (Cu)	ug/L	0.17	0.05	1629521
Tin (Sn)	ug/L	<0.05	0.05	1629521
Iron (Fe)	ug/L	38	0.5	1629521
Magnesium (Mg)	ug/L	62	10	1629521
Manganese (Mn)	ug/L	27	0.03	1629521
Mercury (Hg)	ug/L	<0.002	0.002	1629521
Molybdenum (Mo)	ug/L	<0.01	0.01	1629521
Nickel (Ni)	ug/L	0.08	0.03	1629521
Lead (Pb)	ug/L	0.01	0.01	1629521
Potassium (K)	ug/L	60	10	1629521
Selenium (Se)	ug/L	<0.05	0.05	1629521
Sodium (Na)	ug/L	85	10	1629521
Thallium (Tl)	ug/L	<0.01	0.01	1629521
Titanium (Ti)	ug/L	<0.4	0.4	1629521
Uranium (U)	ug/L	0.002	0.001	1629521
Vanadium (V)	ug/L	<0.05	0.05	1629521
Zinc (Zn)	ug/L	0.6	0.5	1629521
Total Hardness (CaCO3)	ug/L	480	40	1629521

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2016/09/07 19:02

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Maxxam Job #: B638656
Report Date: 2016/09/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Your P.O. #: 2100001513
Sampler Initials: SJ

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		CN5188	CN5188		
Sampling Date		2016/06/20 08:10	2016/06/20 08:10		
COC Number		136863-02-01	136863-02-01		
	Units	DSO4-ER-GW-4	DSO4-ER-GW-4 Lab-Dup	RDL	QC Batch
CONVENTIONALS					
BOD5 Unfrozen	mg/L	<4	N/A	4	1625511
COD	mg/L	<10	N/A	10	1627399
Conductivity	mS/cm	0.003	N/A	0.001	1625674
Fluoride (F)	mg/L	<0.1	N/A	0.1	1626230
Hexavalent Chromium (Cr 6+)	mg/L	<0.008	N/A	0.008	1626562
Nitrogen ammonia (N-NH3)	mg/L	0.04	N/A	0.02	1627411
pH	pH	5.34	N/A	N/A	1625516
Reactive silica (SiO2)	mg/L	0.1	N/A	0.1	1628651
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	<0.40	0.40	1627407
Total Cyanide (CN)	mg/L	<0.01	N/A	0.01	1627586
Alkalinity Total (as CaCO3) pH 4.5	mg/L	<1	N/A	1	1625673
Chloride (Cl)	mg/L	0.08	N/A	0.05	1625867
Nitrites (N-NO2-)	mg/L	<0.01	N/A	0.01	1625914
Nitrates (N-NO3-)	mg/L	0.12	N/A	0.01	1625914
Sulfates (SO4)	mg/L	<0.5	N/A	0.5	1625867
Total suspended solids (TSS)	mg/L	<2	N/A	2	1625816

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

2016/09/07 19:02

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Maxxam Job #: B638656
Report Date: 2016/09/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Your P.O. #: 2100001513
Sampler Initials: SJ

GENERAL COMMENTS

Condition of sample(s) upon receipt: GOOD

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Reported detection limits are multiplied by dilution factors used for sample analysis.

Results relate only to the items tested.

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Report Date: 2016/09/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Your P.O. #: 2100001513
Sampler Initials: SJ

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1625511	SP7	Spiked Blank	BOD5 Unfrozen	2016/06/26		128	%
1625511	SP7	Spiked Blank DUP	BOD5 Unfrozen	2016/06/26		119	%
1625511	SP7	Method Blank	BOD5 Unfrozen	2016/06/26	<4		mg/L
1625511	SP7	Method Blank DUP	BOD5 Unfrozen	2016/06/26	<4		mg/L
1625516	CB8	QC Standard	pH	2016/06/21		101	%
1625673	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2016/06/21		98	%
1625673	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2016/06/21	<1		mg/L
1625674	CB8	QC Standard	Conductivity	2016/06/21		101	%
1625674	CB8	Method Blank	Conductivity	2016/06/21	<0.001		mS/cm
1625816	AG5	Spiked Blank	Total suspended solids (TSS)	2016/06/23		106	%
1625816	AG5	Method Blank	Total suspended solids (TSS)	2016/06/23	<2		mg/L
1625840	VBO	Spiked Blank	1-Chlorooctadecane	2016/06/27		91	%
			Petroleum Hydrocarbons (C10-C50)	2016/06/27		91	%
1625840	VBO	Method Blank	1-Chlorooctadecane	2016/06/27		89	%
			Petroleum Hydrocarbons (C10-C50)	2016/06/27	<100		ug/L
1625867	MCC	QC Standard	Chloride (Cl)	2016/06/22		107	%
			Sulfates (SO4)	2016/06/22		99	%
1625867	MCC	Method Blank	Chloride (Cl)	2016/06/22	<0.05		mg/L
			Sulfates (SO4)	2016/06/22	<0.5		mg/L
1625914	MCC	QC Standard	Nitrates (N-NO3-)	2016/06/22		96	%
1625914	MCC	Spiked Blank	Nitrites (N-NO2-)	2016/06/22		104	%
1625914	MCC	Method Blank	Nitrites (N-NO2-)	2016/06/22	<0.01		mg/L
			Nitrates (N-NO3-)	2016/06/22	<0.01		mg/L
1626230	CB8	QC Standard	Fluoride (F)	2016/06/22		101	%
1626230	CB8	Method Blank	Fluoride (F)	2016/06/22	<0.1		mg/L
1626531	NS	QC Standard	Total phosphorous	2016/06/23		101	%
1626531	NS	Method Blank	Total phosphorous	2016/06/23	<0.002		mg/L
1626562	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2016/06/23		102	%
1626562	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2016/06/23		106	%
1626562	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2016/06/23	<0.008		mg/L
1627399	JR8	Matrix Spike	COD	2016/06/27		94	%
1627399	JR8	QC Standard	COD	2016/06/27		98	%
1627399	JR8	Spiked Blank	COD	2016/06/27		97	%
1627399	JR8	Method Blank	COD	2016/06/27	<10		mg/L
1627407	DKH	QC Standard	TKN Total Kjeldahl Nitrogen	2016/06/28		103	%
1627407	DKH	Spiked Blank	TKN Total Kjeldahl Nitrogen	2016/06/28		105	%
1627407	DKH	Method Blank	TKN Total Kjeldahl Nitrogen	2016/06/28	<0.40		mg/L
1627411	DKH	Spiked Blank	Nitrogen ammonia (N-NH3)	2016/06/27		101	%
1627411	DKH	Method Blank	Nitrogen ammonia (N-NH3)	2016/06/27	<0.02		mg/L
1627586	CB8	QC Standard	Total Cyanide (CN)	2016/06/27		94	%
1627586	CB8	Method Blank	Total Cyanide (CN)	2016/06/27	<0.01		mg/L
1628651	DP3	QC Standard	Reactive silica (SiO2)	2016/06/29		95	%
1628651	DP3	Method Blank	Reactive silica (SiO2)	2016/06/29	<0.1		mg/L
1629521	MCA	Matrix Spike [CN5188-15]	Aluminum (Al)	2016/07/05		NC	%
			Antimony (Sb)	2016/07/05		114	%
			Silver (Ag)	2016/07/05		107	%
			Arsenic (As)	2016/07/05		110	%
			Barium (Ba)	2016/07/05		NC	%
			Boron (B)	2016/07/05		102	%
			Cadmium (Cd)	2016/07/05		107	%
			Calcium (Ca)	2016/07/05		97	%

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Maxxam Job #: B638656
Report Date: 2016/09/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Your P.O. #: 2100001513
Sampler Initials: SJ

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Chromium (Cr)	2016/07/05		104	%
			Cobalt (Co)	2016/07/05		105	%
			Copper (Cu)	2016/07/05		103	%
			Tin (Sn)	2016/07/05		110	%
			Iron (Fe)	2016/07/05		93	%
			Magnesium (Mg)	2016/07/05		108	%
			Manganese (Mn)	2016/07/05		NC	%
			Mercury (Hg)	2016/07/05		99	%
			Molybdenum (Mo)	2016/07/05		101	%
			Nickel (Ni)	2016/07/05		106	%
			Lead (Pb)	2016/07/05		106	%
			Potassium (K)	2016/07/05		104	%
			Selenium (Se)	2016/07/05		109	%
			Sodium (Na)	2016/07/05		NC	%
			Thallium (Tl)	2016/07/05		119	%
			Titanium (Ti)	2016/07/05		106	%
			Uranium (U)	2016/07/05		105	%
			Vanadium (V)	2016/07/05		106	%
			Zinc (Zn)	2016/07/05		102	%
1629521	MCA	Spiked Blank	Aluminum (Al)	2016/07/05		122 (1)	%
			Antimony (Sb)	2016/07/05		117	%
			Silver (Ag)	2016/07/05		106	%
			Arsenic (As)	2016/07/05		110	%
			Barium (Ba)	2016/07/05		105	%
			Boron (B)	2016/07/05		102	%
			Cadmium (Cd)	2016/07/05		102	%
			Calcium (Ca)	2016/07/05		98	%
			Chromium (Cr)	2016/07/05		107	%
			Cobalt (Co)	2016/07/05		107	%
			Copper (Cu)	2016/07/05		106	%
			Tin (Sn)	2016/07/05		111	%
			Iron (Fe)	2016/07/05		101	%
			Magnesium (Mg)	2016/07/05		108	%
			Manganese (Mn)	2016/07/05		112	%
			Mercury (Hg)	2016/07/05		110	%
			Molybdenum (Mo)	2016/07/05		100	%
			Nickel (Ni)	2016/07/05		137 (1)	%
			Lead (Pb)	2016/07/05		105	%
			Potassium (K)	2016/07/05		102	%
			Selenium (Se)	2016/07/05		108	%
			Sodium (Na)	2016/07/05		113	%
			Thallium (Tl)	2016/07/05		117	%
			Titanium (Ti)	2016/07/05		125 (1)	%
			Uranium (U)	2016/07/05		105	%
			Vanadium (V)	2016/07/05		110	%
			Zinc (Zn)	2016/07/05		102	%
1629521	MCA	Method Blank	Aluminum (Al)	2016/07/05	<0.5		ug/L
			Antimony (Sb)	2016/07/05	<0.005		ug/L
			Silver (Ag)	2016/07/05	<0.003		ug/L
			Arsenic (As)	2016/07/05	<0.08		ug/L
			Barium (Ba)	2016/07/05	<0.03		ug/L

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Maxxam Job #: B638656
Report Date: 2016/09/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Your P.O. #: 2100001513
Sampler Initials: SJ

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Boron (B)	2016/07/05	<0.3		ug/L
			Cadmium (Cd)	2016/07/05	<0.006		ug/L
			Calcium (Ca)	2016/07/05	<20		ug/L
			Chromium (Cr)	2016/07/05	<0.04		ug/L
			Cobalt (Co)	2016/07/05	<0.008		ug/L
			Copper (Cu)	2016/07/05	<0.05		ug/L
			Tin (Sn)	2016/07/05	<0.05		ug/L
			Iron (Fe)	2016/07/05	<0.5		ug/L
			Magnesium (Mg)	2016/07/05	<10		ug/L
			Manganese (Mn)	2016/07/05	<0.03		ug/L
			Mercury (Hg)	2016/07/05	<0.002		ug/L
			Molybdenum (Mo)	2016/07/05	<0.01		ug/L
			Nickel (Ni)	2016/07/05	<0.03		ug/L
			Lead (Pb)	2016/07/05	<0.01		ug/L
			Potassium (K)	2016/07/05	<10		ug/L
			Selenium (Se)	2016/07/05	<0.05		ug/L
			Sodium (Na)	2016/07/05	<10		ug/L
			Thallium (Tl)	2016/07/05	<0.01		ug/L
			Titanium (Ti)	2016/07/05	<0.4		ug/L
			Uranium (U)	2016/07/05	<0.001		ug/L
			Vanadium (V)	2016/07/05	<0.05		ug/L
			Zinc (Zn)	2016/07/05	<0.5		ug/L
			Total Hardness (CaCO3)	2016/07/05	<40		ug/L

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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).

(1) Recovery or relative percent difference (RPD) for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria

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Maxxam Job #: B638656
Report Date: 2016/09/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Your P.O. #: 2100001513
Sampler Initials: SJ

VALIDATION SIGNATURE PAGE

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



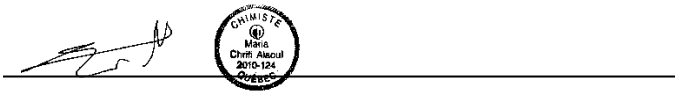
Dochka Koleva Hristova, B.Sc., Chemist



David Provencher, B.Sc., Chemist



Marilyn Blanc, B. Sc., Chemist



Maria Chrifi Alaoui, B.Sc., Chemist



Veronic Beausejour, B.Sc., Chemist, Supervisor

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Votre # du projet: B647971

Attention:Mathieu Letourneau

Maxxam Analytique Sainte Foy
2690, avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2016/08/09
Rapport: R4100607
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B6F5738
Reçu: 2016/07/26, 10:10

Matrice: Eau
Nombre d'échantillons reçus: 2

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	2	N/A	2016/08/04	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Maxxam Analytique est un laboratoire certifié ISO/CEI 17025 pour certaines analyses mentionnées dans la portée d'accréditation. Le présent rapport ne doit pas être reproduit, dans son intégralité, sans le consentement écrit de Maxxam Analytique. Les résultats pour le radium-226 n'ont pas été corrigés pour le blanc de méthode.

Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Simona Vatamanescu,
Courriel: SVatamanescu@maxxam.ca
Téléphone (905)826-3080

==========

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Dossier Maxxam: B6F5738
Date du rapport: 2016/08/09

Maxxam Analytique Sainte Foy
Votre # du projet: B647971

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		CTR077	CTR099		
Date d'échantillonnage		2016/07/21 09:05	2016/07/21 10:10		
	Unités	**DSO4-ER-GW-5**	**DSO4-EE-GW-1**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	<0.0050	0.0050	4598352

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

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Dossier Maxxam: B6F5738
Date du rapport: 2016/08/09

Maxxam Analytique Sainte Foy
Votre # du projet: B647971

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B6F5738
Date du rapport: 2016/08/09

Maxxam Analytique Sainte Foy
Votre # du projet: B647971

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
4598352	FA5	Blanc fortifié	Radium-226	2016/08/04		99	%	85 - 115
4598352	FA5	Blanc de méthode	Radium-226	2016/08/04	<0.0050		Bq/L	
4598352	FA5	RPD	Radium-226	2016/08/05	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD des duplicatas) : La RPD des duplicatas n'a pu être calculée. La concentration dans l'échantillon et/ou le duplicata était insuffisante pour permettre un calcul fiable (l'un des échantillons ou les deux < 5x LDR)

Réc = Récupération

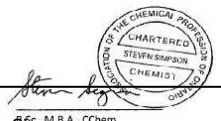
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Dossier Maxxam: B6F5738
Date du rapport: 2016/08/09

Maxxam Analytique Sainte Foy
Votre # du projet: B647971

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

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Your P.O. #: 2100001513
Your Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your C.O.C. #: 136861-02-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2016/08/17
Report #: R2178383
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B647971
Received: 2016/07/22, 09:00

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	2	N/A	2016/07/22	QUE SOP-00142	MA.303-TitrAuto 2.1m
Anions*	2	N/A	2016/07/22	QUE SOP-00141	MA 300-Ions 1.3 R2 m
Anions*	2	N/A	2016/07/22	QUE SOP-00141	MA 300-Ions 1.3 R2 m
Non-Typical Bacteria*	2	N/A	2016/07/22	QUE SOP-00304	MA 700-COL 1.0
Biochemical Oxygen Demand (5 days) (3)*	2	2016/07/22	2016/07/27	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	2	2016/07/25	2016/07/26	QUE SOP-00209	MA400–HYD 1.1 R1 m
Total Cyanide (1)*	2	2016/07/25	2016/07/26	STL SOP-00035	MA300-CN 1.2 R3 m
Chemical Oxygen Demand (1)*	2	2016/07/27	2016/07/27	STL SOP-00009	MA315-DCO 1.1 R3 m
Fecal coliforms*	2	N/A	2016/07/22	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms*	2	N/A	2016/07/22	QUE SOP-00304	MA.700-Col 1.0
Conductivity*	2	N/A	2016/07/22	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	2	N/A	2016/07/26	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)***	2	2016/07/26	2016/07/26	STL SOP-00243	SM 22 5310-B m
Fluoride*	2	N/A	2016/07/22	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)***	2	2016/08/02	2016/08/03	STL SOP-00042	MA200-Hg 1.1 R1 m
Radium 226 (MMER LOW LEVEL) (2)	2	N/A	N/A		
Total Suspended Solids*	1	2016/07/22	2016/07/22	QUE SOP-00111	MA104 - S.S. 2.0 m
Total Suspended Solids*	1	2016/07/25	2016/07/25	QUE SOP-00111	MA104 - S.S. 2.0 m
Total Extractable Metals (Low Level) (1)*	2	2016/07/26	2016/07/27	STL SOP-00006	MA200–Mét 1.2 R5 m
Ammonia Nitrogen (1)*	2	N/A	2016/07/26	STL SOP-00040	MA300–N 2.0 R2 m
Dissolved Oxygen***	2	N/A	2016/07/22	SM 421 F	MA315-DBO 1.1 R3 m
pH*	2	N/A	2016/07/22	QUE SOP-00142	MA.303-TitrAuto 2.1m
Reactive Silica (SiO2)***	2	N/A	2016/08/01	QUE SOP-00132	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN) (1)*	2	2016/07/27	2016/07/28	STL SOP-00043	MA300-NTPT 2.0 R1 m
Total Organic Carbon (1, 5)*	2	N/A	2016/07/26	STL SOP-00243	SM 22 5310-B m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: 2100001513
Your Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your C.O.C. #: 136861-02-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2016/08/17
Report #: R2178383
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B647971
Received: 2016/07/22, 09:00

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Sub from Quebec to Becquerel
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required, sample will be frozen to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Mathieu Letourneau, B. Sc., Chemist,
Email: MLetourneau@maxxam.ca
Phone# (418)658-5784 Ext:6432

==========

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Maxxam Job #: B647971
Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		CR7515	CR7597		
Sampling Date		2016/07/21 09:05	2016/07/21 10:10		
COC Number		136861-02-01	136861-02-01		
	Units	DSO4-ER-GW-5	DSO4-EE-GW-1	RDL	QC Batch
PETROLEUM HYDROCARBONS					
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	<100	100	1639880
Surrogate Recovery (%)					
1-Chlorooctadecane	%	92	80	N/A	1639880

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

2016/08/17 12:01

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Maxxam Job #: B647971
Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

METALS (SURFACE WATER)

Maxxam ID		CR7515	CR7597	CR7597		
Sampling Date		2016/07/21 09:05	2016/07/21 10:10	2016/07/21 10:10		
COC Number		136861-02-01	136861-02-01	136861-02-01		
	Units	DSO4-ER-GW-5	DSO4-EE-GW-1	DSO4-EE-GW-1 Lab-Dup	RDL	QC Batch
METALS						
Mercury (Hg)	mg/L	0.00003	0.00004	0.00003	0.00001	1643473

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B647971
Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		CR7515	CR7597		
Sampling Date		2016/07/21 09:05	2016/07/21 10:10		
COC Number		136861-02-01	136861-02-01		
	Units	DSO4-ER-GW-5	DSO4-EE-GW-1	RDL	QC Batch
METALS ICP-MS					
Aluminum (Al)	ug/L	13	13	10	1640632
Antimony (Sb)	ug/L	<1.0	<1.0	1.0	1640632
Silver (Ag)	ug/L	<1.0	<1.0	1.0	1640632
Arsenic (As)	ug/L	<1.0	<1.0	1.0	1640632
Barium (Ba)	ug/L	<2.0	<2.0	2.0	1640632
Beryllium (Be)	ug/L	<2.0	<2.0	2.0	1640632
Bismuth (Bi)	ug/L	<1.0	<1.0	1.0	1640632
Boron (B)	ug/L	<50	<50	50	1640632
Cadmium (Cd)	ug/L	<0.20	<0.20	0.20	1640632
Calcium (Ca)	ug/L	<500	<500	500	1640632
Chromium (Cr)	ug/L	<5.0	<5.0	5.0	1640632
Cobalt (Co)	ug/L	<1.0	<1.0	1.0	1640632
Copper (Cu)	ug/L	<1.0	<1.0	1.0	1640632
Total Hardness (CaCO3)	ug/L	<1000	<1000	1000	1640632
Tin (Sn)	ug/L	<2.0	<2.0	2.0	1640632
Iron (Fe)	ug/L	<60	<60	60	1640632
Magnesium (Mg)	ug/L	<100	<100	100	1640632
Manganese (Mn)	ug/L	13	19	1.0	1640632
Molybdenum (Mo)	ug/L	<1.0	<1.0	1.0	1640632
Nickel (Ni)	ug/L	<2.0	<2.0	2.0	1640632
Total phosphorous	ug/L	<10	<10	10	1640632
Lead (Pb)	ug/L	<0.50	<0.50	0.50	1640632
Potassium (K)	ug/L	<500	<500	500	1640632
Selenium (Se)	ug/L	<3.0	<3.0	3.0	1640632
Sodium (Na)	ug/L	<500	<500	500	1640632
Strontium (Sr)	ug/L	<2.0	<2.0	2.0	1640632
Thallium (Tl)	ug/L	<2.0	<2.0	2.0	1640632
Titanium (Ti)	ug/L	<10	<10	10	1640632
Uranium (U)	ug/L	<1.0	<1.0	1.0	1640632
Vanadium (V)	ug/L	<2.0	<2.0	2.0	1640632
Zinc (Zn)	ug/L	<7.0	<7.0	7.0	1640632

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2016/08/17 12:01

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Maxxam Job #: B647971
Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		CR7515		CR7597		
Sampling Date		2016/07/21 09:05		2016/07/21 10:10		
COC Number		136861-02-01		136861-02-01		
	Units	**DSO4-ER-GW-5**	**QC Batch**	**DSO4-EE-GW-1**	**RDL**	**QC Batch**
CONVENTIONALS						
BOD5	mg/L	<4	1639366	<4	4	1639366
COD	mg/L	<10	1641169	<10	10	1641169
Conductivity	mS/cm	0.003	1639386	0.003	0.001	1639386
Dissolved organic carbon	mg/L	1.2	1640416	1.5	0.2	1640416
Dissolved oxygen	mg/L	8.7	1639443	9.0	1.0	1639443
Fluoride (F)	mg/L	<0.1	1639395	<0.1	0.1	1639395
Hexavalent Chromium (Cr 6+)	mg/L	<0.008	1640409	<0.008	0.008	1640409
Nitrogen ammonia (N-NH3)	mg/L	<0.02	1640469	<0.02	0.02	1640469
pH	pH	6.32	1639385	5.56	N/A	1639385
Reactive silica (SiO2)	mg/L	<0.1	1643227	0.7	0.1	1643227
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	1641147	<0.40	0.40	1641147
Total Cyanide (CN)	mg/L	<0.003	1640273	<0.003	0.003	1640273
Total Organic Carbon	mg/L	1.3	1640468	1.6	0.2	1640468
Alkalinity Total (as CaCO3) pH 4.5	mg/L	2	1639387	<1	1	1639387
Chloride (Cl)	mg/L	0.07	1639264	0.06	0.05	1639264
Nitrites (N-NO2-)	mg/L	<0.01	1639263	<0.01	0.01	1639263
Nitrates (N-NO3-)	mg/L	0.05	1639263	0.18	0.01	1639263
Sulfates (SO4)	mg/L	<0.5	1639264	<0.5	0.5	1639264
Total suspended solids (TSS)	mg/L	<2	1639316	<2	2	1639828

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

2016/08/17 12:01

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Maxxam Job #: B647971
Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		CR7515		CR7597		
Sampling Date		2016/07/21 09:05		2016/07/21 10:10		
COC Number		136861-02-01		136861-02-01		
	Units	DSO4-ER-GW-5	RDL	DSO4-EE-GW-1	RDL	QC Batch
MICROBIOLGICAL TESTS						
Total coliforms	UFC/100ml	1000	1000	820	10	1639659
Non-typical bacteria	/membrane	172000	1000	410	10	1639632
Fecal coliforms	UFC/100ml	0	N/A	0	N/A	1639656

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

2016/08/17 12:01

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Maxxam Job #: B647971
Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

GENERAL COMMENTS

Condition of sample(s) upon receipt: GOOD

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Cr6+_WW:cr7597: Sample preserved upon receipt. The day analysis is performed, preserved sample pH is lower than 9.

Results relate only to the items tested.

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Maxxam Job #: B647971
Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1639263	MCC	QC Standard	Nitrates (N-NO3-)	2016/07/22		94	%
1639263	MCC	Spiked Blank	Nitrites (N-NO2-)	2016/07/22		100	%
1639263	MCC	Method Blank	Nitrites (N-NO2-)	2016/07/22	<0.01		mg/L
			Nitrates (N-NO3-)	2016/07/22	<0.01		mg/L
1639264	MCC	QC Standard	Chloride (Cl)	2016/07/22		104	%
			Sulfates (SO4)	2016/07/22		96	%
1639264	MCC	Method Blank	Chloride (Cl)	2016/07/22	<0.05		mg/L
			Sulfates (SO4)	2016/07/22	<0.5		mg/L
1639316	AG5	Spiked Blank	Total suspended solids (TSS)	2016/07/22		100	%
1639316	AG5	Method Blank	Total suspended solids (TSS)	2016/07/22	<2		mg/L
1639366	SP7	Spiked Blank	BOD5	2016/07/27		106	%
1639366	SP7	Spiked Blank DUP	BOD5	2016/07/27		106	%
1639366	SP7	Method Blank	BOD5	2016/07/27	<4		mg/L
1639366	SP7	Method Blank DUP	BOD5	2016/07/27	<4		mg/L
1639385	AG5	QC Standard	pH	2016/07/22		101	%
1639386	AG5	QC Standard	Conductivity	2016/07/22		101	%
1639386	AG5	Method Blank	Conductivity	2016/07/22	<0.001		mS/cm
1639387	AG5	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2016/07/22		91	%
1639387	AG5	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2016/07/22	<1		mg/L
1639395	AG5	QC Standard	Fluoride (F)	2016/07/22		103	%
1639395	AG5	Method Blank	Fluoride (F)	2016/07/22	<0.1		mg/L
1639828	MCC	Spiked Blank	Total suspended solids (TSS)	2016/07/25		96	%
1639828	MCC	Method Blank	Total suspended solids (TSS)	2016/07/25	<2		mg/L
1639880	MEP	Spiked Blank	1-Chlorooctadecane	2016/07/26		110	%
			Petroleum Hydrocarbons (C10-C50)	2016/07/26		108	%
1639880	MEP	Method Blank	1-Chlorooctadecane	2016/07/26		87	%
			Petroleum Hydrocarbons (C10-C50)	2016/07/26	<100		ug/L
1640273	MH1	QC Standard	Total Cyanide (CN)	2016/07/26		81	%
1640273	MH1	Spiked Blank	Total Cyanide (CN)	2016/07/26		94	%
1640273	MH1	Method Blank	Total Cyanide (CN)	2016/07/26	<0.003		mg/L
1640409	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2016/07/26		98	%
1640409	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2016/07/26		102	%
1640409	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2016/07/26	<0.008		mg/L
1640416	JL1	Spiked Blank	Dissolved organic carbon	2016/07/26		102	%
1640416	JL1	Method Blank	Dissolved organic carbon	2016/07/26	0.2, RDL=0.2		mg/L
1640468	JL1	Spiked Blank	Total Organic Carbon	2016/07/26		103	%
1640468	JL1	Method Blank	Total Organic Carbon	2016/07/26	<0.2		mg/L
1640469	DKH	Spiked Blank	Nitrogen ammonia (N-NH3)	2016/07/26		97	%
1640469	DKH	Method Blank	Nitrogen ammonia (N-NH3)	2016/07/26	<0.02		mg/L
1640632	EMA	QC Standard	Antimony (Sb)	2016/07/27		111	%
			Beryllium (Be)	2016/07/27		106	%
			Cobalt (Co)	2016/07/27		99	%
			Manganese (Mn)	2016/07/27		97	%
			Thallium (Tl)	2016/07/27		108	%
			Vanadium (V)	2016/07/27		96	%
1640632	EMA	Spiked Blank	Aluminum (Al)	2016/07/27		101	%
			Antimony (Sb)	2016/07/27		112	%
			Silver (Ag)	2016/07/27		105	%
			Arsenic (As)	2016/07/27		106	%

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Maxxam Job #: B647971
Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Barium (Ba)	2016/07/27		101	%
			Beryllium (Be)	2016/07/27		109	%
			Bismuth (Bi)	2016/07/27		105	%
			Boron (B)	2016/07/27		107	%
			Cadmium (Cd)	2016/07/27		105	%
			Calcium (Ca)	2016/07/27		101	%
			Chromium (Cr)	2016/07/27		98	%
			Cobalt (Co)	2016/07/27		100	%
			Copper (Cu)	2016/07/27		98	%
			Tin (Sn)	2016/07/27		114	%
			Iron (Fe)	2016/07/27		99	%
			Magnesium (Mg)	2016/07/27		99	%
			Manganese (Mn)	2016/07/27		102	%
			Molybdenum (Mo)	2016/07/27		105	%
			Nickel (Ni)	2016/07/27		100	%
			Total phosphorous	2016/07/27		92	%
			Lead (Pb)	2016/07/27		107	%
			Potassium (K)	2016/07/27		95	%
			Selenium (Se)	2016/07/27		96	%
			Sodium (Na)	2016/07/27		99	%
			Strontium (Sr)	2016/07/27		112	%
			Thallium (Tl)	2016/07/27		122 (1)	%
			Titanium (Ti)	2016/07/27		99	%
			Uranium (U)	2016/07/27		105	%
			Vanadium (V)	2016/07/27		102	%
			Zinc (Zn)	2016/07/27		99	%
1640632	EMA	Method Blank	Aluminum (Al)	2016/07/27	<10		ug/L
			Antimony (Sb)	2016/07/27	<1.0		ug/L
			Silver (Ag)	2016/07/27	<1.0		ug/L
			Arsenic (As)	2016/07/27	<1.0		ug/L
			Barium (Ba)	2016/07/27	<2.0		ug/L
			Beryllium (Be)	2016/07/27	<2.0		ug/L
			Bismuth (Bi)	2016/07/27	<1.0		ug/L
			Boron (B)	2016/07/27	<50		ug/L
			Cadmium (Cd)	2016/07/27	<0.20		ug/L
			Calcium (Ca)	2016/07/27	<500		ug/L
			Chromium (Cr)	2016/07/27	<5.0		ug/L
			Cobalt (Co)	2016/07/27	<1.0		ug/L
			Copper (Cu)	2016/07/27	<1.0		ug/L
			Total Hardness (CaCO3)	2016/07/27	<1000		ug/L
			Tin (Sn)	2016/07/27	<2.0		ug/L
			Iron (Fe)	2016/07/27	<60		ug/L
			Magnesium (Mg)	2016/07/27	<100		ug/L
			Manganese (Mn)	2016/07/27	<1.0		ug/L
			Molybdenum (Mo)	2016/07/27	<1.0		ug/L
			Nickel (Ni)	2016/07/27	<2.0		ug/L
			Total phosphorous	2016/07/27	<10		ug/L
			Lead (Pb)	2016/07/27	<0.50		ug/L
			Potassium (K)	2016/07/27	<500		ug/L
			Selenium (Se)	2016/07/27	<3.0		ug/L

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Maxxam Job #: B647971
Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Sodium (Na)	2016/07/27	<500		ug/L
			Strontium (Sr)	2016/07/27	<2.0		ug/L
			Thallium (Tl)	2016/07/27	<2.0		ug/L
			Titanium (Ti)	2016/07/27	<10		ug/L
			Uranium (U)	2016/07/27	<1.0		ug/L
			Vanadium (V)	2016/07/27	<2.0		ug/L
			Zinc (Zn)	2016/07/27	<7.0		ug/L
1641147	DKH	QC Standard	TKN Total Kjeldahl Nitrogen	2016/07/28		98	%
1641147	DKH	Spiked Blank	TKN Total Kjeldahl Nitrogen	2016/07/28		106	%
1641147	DKH	Method Blank	TKN Total Kjeldahl Nitrogen	2016/07/28	<0.40		mg/L
1641169	JR8	QC Standard	COD	2016/07/27		103	%
1641169	JR8	Spiked Blank	COD	2016/07/27		102	%
1641169	JR8	Method Blank	COD	2016/07/27	<10		mg/L
1643227	MTZ	QC Standard	Reactive silica (SiO2)	2016/08/01		99	%
1643227	MTZ	Method Blank	Reactive silica (SiO2)	2016/08/01	<0.1		mg/L
1643473	MCA	Spiked Blank	Mercury (Hg)	2016/08/03		93	%
1643473	MCA	Method Blank	Mercury (Hg)	2016/08/03	<0.00001		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

(1) Recovery or relative percent difference (RPD) for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria

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Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

David Provencher, B.Sc., Chemist

Frédéric Gagné, B. Sc., Microbiologist

Faouzi Sarsi, B.Sc. Chemist

Miryam Assayag

Marilyn Blanc, B. Sc., Chemist

Maria Chrifi Alaoui, B.Sc., Chemist

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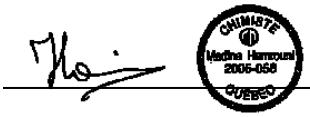
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Maxxam Job #: B647971
Report Date: 2016/08/17

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD/DSO4 1A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE(CONT'D)

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



Madina Hamrouni, B.Sc., Chemist



Olga Zlatov Polevoi, Analyst I

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A Bureau Veritas Group Company

Success Through Science®

Your P.O. #: 2100001513
Your Project #: GOODWOOD
Site#: TSMC
Site Location: DSO4 2A
Your C.O.C. #: 123185-01-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2016/09/15
Report #: R2190690
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B657657
Received: 2016/08/26, 10:00

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5) (1)***	2	N/A	2016/08/31	STL SOP-00038	SM 22 2320-B m
Anions*	2	N/A	2016/08/26	QUE SOP-00141	MA 300-Ions 1.3 R2 m
Anions*	2	N/A	2016/08/26	QUE SOP-00141	MA 300-Ions 1.3 R2 m
Non-Typical Bacteria*	2	N/A	2016/08/26	QUE SOP-00304	MA 700-COL 1.0
Biochemical Oxygen Demand (5 days) (3)*	2	2016/08/26	2016/08/31	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	2	2016/08/26	2016/08/26	QUE SOP-00209	MA400–HYD 1.1 R1 m
Total Cyanide (1)*	2	2016/08/29	2016/08/30	STL SOP-00035	MA300-CN 1.2 R3 m
Chemical Oxygen Demand (1)*	2	2016/08/31	2016/08/31	STL SOP-00009	MA315-DCO 1.1 R3 m
Fecal coliforms*	2	N/A	2016/08/26	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms*	2	N/A	2016/08/26	QUE SOP-00304	MA.700-Col 1.0
Conductivity*	2	N/A	2016/08/29	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	2	N/A	2016/08/30	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)***	2	2016/08/31	2016/08/31	STL SOP-00243	SM 22 5310-B m
Fluoride*	2	N/A	2016/08/29	QUE SOP-00142	MA.303-TitrAuto 2.1m
Radium 226 (MMER LOW LEVEL) (2)	2	N/A	N/A		
Total Suspended Solids*	2	2016/08/26	2016/08/26	QUE SOP-00111	MA104 - S.S. 2.0 m
Total Extractible Trace Metals by ICP-MS (1)	2	2016/09/13	2016/09/13	STL SOP-00006	MA203-Mét Tra1.1 m
Ammonia Nitrogen (1)*	2	N/A	2016/08/30	STL SOP-00040	MA300–N 2.0 R2 m
Dissolved Oxygen***	2	N/A	2016/08/26	SM 421 F	MA315-DBO 1.1 R3 m
pH*	2	N/A	2016/08/26	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus Low Level by ICP-MS*	2	2016/08/29	2016/08/29	QUE SOP-00132	MA 200-Met 1.2 R5 m
Reactive Silica (SiO2)***	2	N/A	2016/08/29	QUE SOP-00132	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN) (1)*	2	2016/08/29	2016/08/30	STL SOP-00043	MA300-NTPT 2.0 R1 m
Total Organic Carbon (1, 5)*	2	N/A	2016/08/31	STL SOP-00243	SM 22 5310-B m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: 2100001513
Your Project #: GOODWOOD
Site#: TSMC
Site Location: DSO4 2A
Your C.O.C. #: 123185-01-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2016/09/15
Report #: R2190690
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B657657
Received: 2016/08/26, 10:00

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam - Becquerel
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Mathieu Letourneau, B. Sc., Chemist,
Email: MLetourneau@maxxam.ca
Phone# (418)658-5784 Ext:6432

==========

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Maxxam Job #: B657657
Report Date: 2016/09/15

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2100001513
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		CW1393	CW1882		
Sampling Date		2016/08/25 09:05	2016/08/25 10:35		
COC Number		123185-01-01	123185-01-01		
	Units	DS04-ER-GW-6	DS04-EE-GW-2	RDL	QC Batch
PETROLEUM HYDROCARBONS					
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	<100	100	1655344
Surrogate Recovery (%)					
1-Chlorooctadecane	%	120	112	N/A	1655344

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

2016/09/15 14:29

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Maxxam Job #: B657657
Report Date: 2016/09/15

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2100001513
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		CW1393	CW1882		
Sampling Date		2016/08/25 09:05	2016/08/25 10:35		
COC Number		123185-01-01	123185-01-01		
	Units	DS04-ER-GW-6	DS04-EE-GW-2	RDL	QC Batch
METALS					
Total phosphorous	mg/L	0.005	0.007	0.002	1655696
Aluminum (Al)	ug/L	11	2.2	0.5	1662673
Antimony (Sb)	ug/L	0.005	0.005	0.005	1662673
Silver (Ag)	ug/L	<0.003	<0.003	0.003	1662673
Arsenic (As)	ug/L	<0.08	<0.08	0.08	1662673
Barium (Ba)	ug/L	0.61	1.1	0.03	1662673
Boron (B)	ug/L	0.4	0.4	0.3	1662673
Cadmium (Cd)	ug/L	<0.006	<0.006	0.006	1662673
Calcium (Ca)	ug/L	84	120	20	1662673
Chromium (Cr)	ug/L	<0.04	<0.04	0.04	1662673
Cobalt (Co)	ug/L	0.017	<0.008	0.008	1662673
Copper (Cu)	ug/L	0.16	0.18	0.05	1662673
Tin (Sn)	ug/L	<0.05	<0.05	0.05	1662673
Iron (Fe)	ug/L	36	9.6	0.5	1662673
Magnesium (Mg)	ug/L	59	80	10	1662673
Mercury (Hg)	ug/L	<0.002	<0.002	0.002	1662673
Molybdenum (Mo)	ug/L	<0.01	<0.01	0.01	1662673
Nickel (Ni)	ug/L	0.09	0.08	0.03	1662673
Lead (Pb)	ug/L	0.01	<0.01	0.01	1662673
Potassium (K)	ug/L	63	53	10	1662673
Selenium (Se)	ug/L	<0.05	<0.05	0.05	1662673
Sodium (Na)	ug/L	75	150	10	1662673
Thallium (Tl)	ug/L	<0.01	<0.01	0.01	1662673
Titanium (Ti)	ug/L	<0.4	<0.4	0.4	1662673
Uranium (U)	ug/L	0.003	0.002	0.001	1662673
Vanadium (V)	ug/L	<0.05	<0.05	0.05	1662673
Zinc (Zn)	ug/L	0.6	<0.5	0.5	1662673
Total Hardness (CaCO3)	ug/L	450	630	40	1662673

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B657657
Report Date: 2016/09/15

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2100001513
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		CW1393		CW1882		
Sampling Date		2016/08/25 09:05		2016/08/25 10:35		
COC Number		123185-01-01		123185-01-01		
	Units	**DS04-ER-GW-6**	**QC Batch**	**DS04-EE-GW-2**	**RDL**	**QC Batch**
CONVENTIONALS						
BOD5	mg/L	<4	1655169	<4	4	1655169
COD	mg/L	<10	1657019	<10	10	1657019
Conductivity	mS/cm	0.002	1656037	0.002	0.001	1656037
Dissolved organic carbon	mg/L	1.7	1656998	1.3	0.2	1656998
Dissolved oxygen	mg/L	8.5	1655410	9.1	1.0	1655410
Fluoride (F)	mg/L	<0.1	1656031	<0.1	0.1	1656031
Hexavalent Chromium (Cr 6+)	mg/L	<0.008	1656294	<0.008	0.008	1656294
Nitrogen ammonia (N-NH3)	mg/L	<0.02	1655960	<0.02	0.02	1656375
pH	pH	6.34	1655455	6.39	N/A	1655455
Reactive silica (SiO2)	mg/L	0.1	1655916	0.7	0.1	1655916
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	1655910	<0.40	0.40	1655910
Total Cyanide (CN)	mg/L	<0.003	1656030	<0.003	0.003	1656030
Total Organic Carbon	mg/L	1.9	1656995	1.5	0.2	1656995
Alkalinity Total (as CaCO3) pH 4.5	mg/L	1	1656934	1	1	1656934
Chloride (Cl)	mg/L	0.05	1655237	<0.05	0.05	1655237
Nitrites (N-NO2-)	mg/L	<0.01	1655236	<0.01	0.01	1655236
Nitrates (N-NO3-)	mg/L	<0.01	1655236	0.03	0.01	1655236
Sulfates (SO4)	mg/L	<0.5	1655237	<0.5	0.5	1655237
Total suspended solids (TSS)	mg/L	<2	1655239	<2	2	1655239

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

2016/09/15 14:29

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Maxxam Job #: B657657
Report Date: 2016/09/15

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2100001513
Sampler Initials: JFD

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		CW1393		CW1882		
Sampling Date		2016/08/25 09:05		2016/08/25 10:35		
COC Number		123185-01-01		123185-01-01		
	Units	**DS04-ER-GW-6**	**RDL**	**DS04-EE-GW-2**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS						
Total coliforms	UFC/100ml	9900	100	940	10	1655367
Non-typical bacteria	/membrane	6900	100	440	10	1655361
Fecal coliforms	UFC/100ml	0	N/A	14	1	1655368

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

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Maxxam Job #: B657657
Report Date: 2016/09/15

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2100001513
Sampler Initials: JFD

GENERAL COMMENTS

Condition of sample(s) upon receipt: GOOD except for the following:
Total Phosphorus Low Level by ICP-MS: Arrived unpreserved, preserved upon reception at the laboratory.: CW1393, CW1882

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

2016/09/15 14:29

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Maxxam Job #: B657657
Report Date: 2016/09/15

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2100001513
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1655169	SP7	Spiked Blank	BOD5	2016/08/31		114	%
1655169	SP7	Spiked Blank DUP	BOD5	2016/08/31		111	%
1655169	SP7	Method Blank	BOD5	2016/08/31	<4		mg/L
1655169	SP7	Method Blank DUP	BOD5	2016/08/31	<4		mg/L
1655236	MCC	QC Standard	Nitrates (N-NO3-)	2016/08/26		87	%
1655236	MCC	Spiked Blank	Nitrites (N-NO2-)	2016/08/26		96	%
1655236	MCC	Method Blank	Nitrites (N-NO2-)	2016/08/26	<0.01		mg/L
			Nitrates (N-NO3-)	2016/08/26	<0.01		mg/L
1655237	MCC	QC Standard	Chloride (Cl)	2016/08/26		94	%
			Sulfates (SO4)	2016/08/26		81	%
1655237	MCC	Method Blank	Chloride (Cl)	2016/08/26	<0.05		mg/L
			Sulfates (SO4)	2016/08/26	<0.5		mg/L
1655239	SP7	Spiked Blank	Total suspended solids (TSS)	2016/08/26		105	%
1655239	SP7	Method Blank	Total suspended solids (TSS)	2016/08/26	<2		mg/L
1655344	MH5	Spiked Blank	1-Chlorooctadecane	2016/08/26		114	%
			Petroleum Hydrocarbons (C10-C50)	2016/08/26		105	%
1655344	MH5	Method Blank	1-Chlorooctadecane	2016/08/26		124	%
			Petroleum Hydrocarbons (C10-C50)	2016/08/26	<100		ug/L
1655455	MTZ	QC Standard	pH	2016/08/26		101	%
1655696	NS	QC Standard	Total phosphorous	2016/08/29		107	%
1655696	NS	Method Blank	Total phosphorous	2016/08/29	<0.002		mg/L
1655910	DKH	QC Standard	TKN Total Kjeldahl Nitrogen	2016/08/30		96	%
1655910	DKH	Spiked Blank	TKN Total Kjeldahl Nitrogen	2016/08/30		102	%
1655910	DKH	Method Blank	TKN Total Kjeldahl Nitrogen	2016/08/30	<0.40		mg/L
1655916	MTZ	QC Standard	Reactive silica (SiO2)	2016/08/29		91	%
1655916	MTZ	Method Blank	Reactive silica (SiO2)	2016/08/29	<0.1		mg/L
1655960	DKH	QC Standard	Nitrogen ammonia (N-NH3)	2016/08/30		94	%
1655960	DKH	Spiked Blank	Nitrogen ammonia (N-NH3)	2016/08/30		106	%
1655960	DKH	Method Blank	Nitrogen ammonia (N-NH3)	2016/08/30	<0.02		mg/L
1656030	MH1	QC Standard	Total Cyanide (CN)	2016/08/30		88	%
1656030	MH1	Spiked Blank	Total Cyanide (CN)	2016/08/30		98	%
1656030	MH1	Method Blank	Total Cyanide (CN)	2016/08/30	<0.003		mg/L
1656031	MTZ	QC Standard	Fluoride (F)	2016/08/29		111	%
1656031	MTZ	Method Blank	Fluoride (F)	2016/08/29	<0.1		mg/L
1656037	MTZ	QC Standard	Conductivity	2016/08/29		98	%
1656037	MTZ	Method Blank	Conductivity	2016/08/29	<0.001		mS/cm
1656294	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2016/08/30		96	%
1656294	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2016/08/30		99	%
1656294	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2016/08/30	<0.008		mg/L
1656375	DKH	Spiked Blank	Nitrogen ammonia (N-NH3)	2016/08/30		99	%
1656375	DKH	Method Blank	Nitrogen ammonia (N-NH3)	2016/08/30	<0.02		mg/L
1656934	MR4	Spiked Blank	Alkalinity Total (as CaCO3) pH 4.5	2016/08/31		100	%
1656934	MR4	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2016/08/31	<1		mg/L
1656995	MR4	Spiked Blank	Total Organic Carbon	2016/08/31		101	%
1656995	MR4	Method Blank	Total Organic Carbon	2016/08/31	<0.2		mg/L
1656998	MR4	Spiked Blank	Dissolved organic carbon	2016/08/31		101	%
1656998	MR4	Method Blank	Dissolved organic carbon	2016/08/31	0.3, RDL=0.2		mg/L
1657019	KID	QC Standard	COD	2016/08/31		103	%
1657019	KID	Spiked Blank	COD	2016/08/31		102	%

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Maxxam Job #: B657657
Report Date: 2016/09/15

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2100001513
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1657019	KID	Method Blank	COD	2016/08/31	<10		mg/L
1662673	MCA	Spiked Blank	Aluminum (Al)	2016/09/13		105	%
			Antimony (Sb)	2016/09/13		97	%
			Silver (Ag)	2016/09/13		96	%
			Arsenic (As)	2016/09/13		95	%
			Barium (Ba)	2016/09/13		92	%
			Boron (B)	2016/09/13		86	%
			Cadmium (Cd)	2016/09/13		92	%
			Calcium (Ca)	2016/09/13		93	%
			Chromium (Cr)	2016/09/13		90	%
			Cobalt (Co)	2016/09/13		103	%
			Copper (Cu)	2016/09/13		105	%
			Tin (Sn)	2016/09/13		95	%
			Iron (Fe)	2016/09/13		83	%
			Magnesium (Mg)	2016/09/13		105	%
			Mercury (Hg)	2016/09/13		93	%
			Molybdenum (Mo)	2016/09/13		90	%
			Nickel (Ni)	2016/09/13		92	%
			Lead (Pb)	2016/09/13		95	%
			Potassium (K)	2016/09/13		101	%
			Selenium (Se)	2016/09/13		97	%
			Sodium (Na)	2016/09/13		109	%
			Thallium (Tl)	2016/09/13		107	%
			Titanium (Ti)	2016/09/13		107	%
			Uranium (U)	2016/09/13		95	%
			Vanadium (V)	2016/09/13		93	%
			Zinc (Zn)	2016/09/13		93	%
1662673	MCA	Method Blank	Aluminum (Al)	2016/09/13	<0.5		ug/L
			Antimony (Sb)	2016/09/13	<0.005		ug/L
			Silver (Ag)	2016/09/13	<0.003		ug/L
			Arsenic (As)	2016/09/13	<0.08		ug/L
			Barium (Ba)	2016/09/13	<0.03		ug/L
			Boron (B)	2016/09/13	<0.3		ug/L
			Cadmium (Cd)	2016/09/13	<0.006		ug/L
			Calcium (Ca)	2016/09/13	<20		ug/L
			Chromium (Cr)	2016/09/13	<0.04		ug/L
			Cobalt (Co)	2016/09/13	<0.008		ug/L
			Copper (Cu)	2016/09/13	<0.05		ug/L
			Tin (Sn)	2016/09/13	<0.05		ug/L
			Iron (Fe)	2016/09/13	<0.5		ug/L
			Magnesium (Mg)	2016/09/13	<10		ug/L
			Mercury (Hg)	2016/09/13	<0.002		ug/L
			Molybdenum (Mo)	2016/09/13	<0.01		ug/L
			Nickel (Ni)	2016/09/13	<0.03		ug/L
			Lead (Pb)	2016/09/13	<0.01		ug/L
			Potassium (K)	2016/09/13	<10		ug/L
			Selenium (Se)	2016/09/13	<0.05		ug/L
			Sodium (Na)	2016/09/13	<10		ug/L
			Thallium (Tl)	2016/09/13	<0.01		ug/L
			Titanium (Ti)	2016/09/13	<0.4		ug/L

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Maxxam Job #: B657657
Report Date: 2016/09/15

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2100001513
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Uranium (U)	2016/09/13	<0.001		ug/L
			Vanadium (V)	2016/09/13	<0.05		ug/L
			Zinc (Zn)	2016/09/13	<0.5		ug/L
			Total Hardness (CaCO3)	2016/09/13	<40		ug/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

2016/09/15 14:29

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Maxxam Job #: B657657
Report Date: 2016/09/15

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2100001513
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

David Provencher, B.Sc., Chemist

Kathie Quevillon, B.Sc., Chemist, Analyst II

Marilyn Blanc, B. Sc., Chemist

Madina Hamrouni, B.Sc., Chemist

Myriam Ouellet, M.Sc., Microbiologist, Analyste II

Olga Zlatov Polevoi, Analyst I

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD
Site Location: DSO4 2A
Your P.O. #: 2100001513
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE(CONT'D)

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

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Votre # du projet: B657657

Attention:Mathieu Letourneau

Maxxam Analytique Sainte Foy
2690, avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2016/09/13
Rapport: R4166219
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B6I4400
Reçu: 2016/08/30, 09:30

Matrice: Eau
Nombre d'échantillons reçus: 2

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	2	N/A	2016/09/11	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

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Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Simona Vatamanescu,
Courriel: SVatamanescu@maxxam.ca
Téléphone (905)826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B6I4400
Date du rapport: 2016/09/13

Maxxam Analytique Sainte Foy
Votre # du projet: B657657

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		CYZ546	CYZ547		
Date d'échantillonnage		2016/08/25 09:05	2016/08/25 10:35		
	Unités	**DS04-ER-GW-6**	**DS04-EE-GW-2**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	<0.0050	0.0050	4646427

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B6I4400
Date du rapport: 2016/09/13

Maxxam Analytique Sainte Foy
Votre # du projet: B657657

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B6I4400
Date du rapport: 2016/09/13

Maxxam Analytique Sainte Foy
Votre # du projet: B657657

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
4646427	FA5	Blanc fortifié	Radium-226	2016/09/11		96	%	85 - 115
4646427	FA5	Blanc de méthode	Radium-226	2016/09/11	<0.0050		Bq/L	
4646427	FA5	RPD [CYZ546-01]	Radium-226	2016/09/11	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD des duplicatas) : La RPD des duplicatas n'a pu être calculée. La concentration dans l'échantillon et/ou le duplicata était insuffisante pour permettre un calcul fiable (l'un des échantillons ou les deux < 5x LDR)

Réc = Récupération

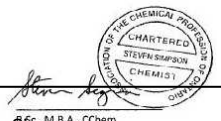
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Dossier Maxxam: B6I4400
Date du rapport: 2016/09/13

Maxxam Analytique Sainte Foy
Votre # du projet: B657657

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

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Votre # du projet: B666438

Attention:Mathieu Letourneau

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2016/10/12
Rapport: R4203057
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B6K9714
Reçu: 2016/09/28, 10:30

Matrice: Eau
Nombre d'échantillons reçus: 2

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	2	N/A	2016/10/09	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Maxxam Analytique est un laboratoire certifié ISO/CEI 17025 pour certaines analyses mentionnées dans la portée d'accréditation. Le présent rapport ne doit pas être reproduit, dans son intégralité, sans le consentement écrit de Maxxam Analytique. Les résultats pour le radium-226 n'ont pas été corrigés pour le blanc de méthode.

Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Simona Vatamanescu,
Courriel: SVatamanescu@maxxam.ca
Téléphone (905)826-3080

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Dossier Maxxam: B6K9714
Date du rapport: 2016/10/12

Maxxam Analytique
Votre # du projet: B666438

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		DDU966	DDU967		
Date d'échantillonnage		2016/09/26	2016/09/26		
	Unités	**DSO4-ER-GW-7**	**DSO4-EE-GW-3**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	<0.0050	0.0050	4684969

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

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Dossier Maxxam: B6K9714
Date du rapport: 2016/10/12

Maxxam Analytique
Votre # du projet: B666438

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B6K9714
Date du rapport: 2016/10/12

Maxxam Analytique
Votre # du projet: B666438

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
4684969	FA5	Blanc fortifié	Radium-226	2016/10/08		96	%	85 - 115
4684969	FA5	Blanc de méthode	Radium-226	2016/10/08	<0.0050		Bq/L	
4684969	FA5	RPD	Radium-226	2016/10/08	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

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Réc = Récupération

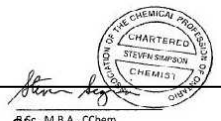
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Dossier Maxxam: B6K9714
Date du rapport: 2016/10/12

Maxxam Analytique
Votre # du projet: B666438

PAGE DES SIGNATURES DE VALIDATION

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B.Sc., M.B.A., CChem

Steven Simpson

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Your P.O. #: 2100001513
Your Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your C.O.C. #: 136862-03-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2016/10/12
Report #: R2202311
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B666438
Received: 2016/09/27, 11:00

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	2	N/A	2016/09/27	QUE SOP-00142	MA.303-TitrAuto 2.1m
Anions*	2	N/A	2016/09/28	QUE SOP-00141	MA 300-Ions 1.3 R2 m
Anions*	2	N/A	2016/09/28	QUE SOP-00141	MA 300-Ions 1.3 R2 m
Non-Typical Bacteria*	2	N/A	2016/09/27	QUE SOP-00304	MA 700-COL 1.0
Biochemical Oxygen Demand (5 days) (3)*	2	2016/09/28	2016/10/03	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	2	2016/09/29	2016/09/30	QUE SOP-00209	MA400–HYD 1.1 R1 m
Total Cyanide (1)*	2	2016/10/03	2016/10/06	STL SOP-00035	MA300-CN 1.2 R3 m
Chemical Oxygen Demand (1)*	2	2016/09/29	2016/09/29	STL SOP-00009	MA315-DCO 1.1 R3 m
Fecal coliforms*	2	N/A	2016/09/27	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms*	2	N/A	2016/09/27	QUE SOP-00304	MA.700-Col 1.0
Conductivity*	2	N/A	2016/09/27	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	2	N/A	2016/09/29	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)***	2	2016/09/29	2016/09/30	STL SOP-00243	SM 22 5310-B m
Fluoride*	2	N/A	2016/09/27	QUE SOP-00142	MA.303-TitrAuto 2.1m
Radium 226 (MMER LOW LEVEL) (2)	2	N/A	N/A		
Total Suspended Solids*	2	2016/09/28	2016/09/28	QUE SOP-00111	MA104 - S.S. 2.0 m
Total Extractable Metals (Low Level)*	2	2016/10/01	2016/10/02	QUE SOP-00132	MA 200-Met 1.2 R5 m
Ammonia Nitrogen (1)*	2	N/A	2016/09/29	STL SOP-00040	MA300–N 2.0 R2 m
Dissolved Oxygen***	2	N/A	2016/09/27	SM 421 F	MA315-DBO 1.1 R3 m
pH*	2	N/A	2016/09/27	QUE SOP-00142	MA.303-TitrAuto 2.1m
Reactive Silica (SiO2)***	2	N/A	2016/10/03	QUE SOP-00132	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN) (1)*	2	2016/09/28	2016/09/29	STL SOP-00043	MA300-NTPT 2.0 R1 m
Total Organic Carbon (1, 5)*	2	N/A	2016/09/30	STL SOP-00243	SM 22 5310-B m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

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Your P.O. #: 2100001513
Your Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your C.O.C. #: 136862-03-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2016/10/12
Report #: R2202311
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B666438
Received: 2016/09/27, 11:00

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam - Becquerel
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Mathieu Letourneau, B. Sc., Chemist,
Email: MLetourneau@maxxam.ca
Phone# (418)658-5784 Ext:6432

==========

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Maxxam Job #: B666438
Report Date: 2016/10/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		DA6155	DA6219		
Sampling Date		2016/09/26	2016/09/26		
COC Number		136862-03-01	136862-03-01		
	Units	DSO4-ER-GW-7	DSO4-EE-GW-3	RDL	QC Batch
PETROLEUM HYDROCARBONS					
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	<100	100	1670306
Surrogate Recovery (%)					
1-Chlorooctadecane	%	106	119	N/A	1670306

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

2016/10/12 10:52

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Maxxam Job #: B666438
Report Date: 2016/10/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		DA6155	DA6219		
Sampling Date		2016/09/26	2016/09/26		
COC Number		136862-03-01	136862-03-01		
	Units	DSO4-ER-GW-7	DSO4-EE-GW-3	RDL	QC Batch
METALS ICP-MS					
Aluminum (Al)	ug/L	28	14	10	1671676
Antimony (Sb)	ug/L	<1.0	<1.0	1.0	1671676
Silver (Ag)	ug/L	<1.0	<1.0	1.0	1671676
Arsenic (As)	ug/L	<1.0	<1.0	1.0	1671676
Barium (Ba)	ug/L	<2.0	<2.0	2.0	1671676
Beryllium (Be)	ug/L	<2.0	<2.0	2.0	1671676
Bismuth (Bi)	ug/L	<1.0	<1.0	1.0	1671676
Boron (B)	ug/L	<50	<50	50	1671676
Cadmium (Cd)	ug/L	<0.20	<0.20	0.20	1671676
Calcium (Ca)	ug/L	<500	<500	500	1671676
Chromium (Cr)	ug/L	<5.0	<5.0	5.0	1671676
Cobalt (Co)	ug/L	<1.0	<1.0	1.0	1671676
Copper (Cu)	ug/L	<1.0	<1.0	1.0	1671676
Total Hardness (CaCO3)	ug/L	<1000	<1000	1000	1671676
Tin (Sn)	ug/L	<2.0	<2.0	2.0	1671676
Iron (Fe)	ug/L	81	74	60	1671676
Magnesium (Mg)	ug/L	<100	<100	100	1671676
Manganese (Mn)	ug/L	16	11	1.0	1671676
Molybdenum (Mo)	ug/L	<1.0	<1.0	1.0	1671676
Mercury (Hg)	ug/L	<0.10	<0.10	0.10	1671676
Nickel (Ni)	ug/L	<2.0	<2.0	2.0	1671676
Total phosphorous	ug/L	<10	<10	10	1671676
Lead (Pb)	ug/L	<0.50	<0.50	0.50	1671676
Potassium (K)	ug/L	<500	<500	500	1671676
Selenium (Se)	ug/L	<3.0	<3.0	3.0	1671676
Sodium (Na)	ug/L	<500	<500	500	1671676
Strontium (Sr)	ug/L	<2.0	<2.0	2.0	1671676
Thallium (Tl)	ug/L	<2.0	<2.0	2.0	1671676
Titanium (Ti)	ug/L	<10	<10	10	1671676
Uranium (U)	ug/L	<1.0	<1.0	1.0	1671676
Vanadium (V)	ug/L	<2.0	<2.0	2.0	1671676
Zinc (Zn)	ug/L	<7.0	<7.0	7.0	1671676

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2016/10/12 10:52

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Maxxam Job #: B666438
Report Date: 2016/10/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		DA6155	DA6219		
Sampling Date		2016/09/26	2016/09/26		
COC Number		136862-03-01	136862-03-01		
	Units	DSO4-ER-GW-7	DSO4-EE-GW-3	RDL	QC Batch
CONVENTIONALS					
BOD5	mg/L	<4	<4	4	1669954
COD	mg/L	11	14	10	1670443
Conductivity	mS/cm	0.003	0.003	0.001	1669420
Dissolved organic carbon	mg/L	1.6	1.3	0.2	1670786
Dissolved oxygen	mg/L	10	11	1.0	1669516
Fluoride (F)	mg/L	<0.1	<0.1	0.1	1669421
Hexavalent Chromium (Cr 6+)	mg/L	<0.008	<0.008	0.008	1670332
Nitrogen ammonia (N-NH3)	mg/L	<0.02	<0.02	0.02	1670359
pH	pH	6.36	6.21	N/A	1669409
Reactive silica (SiO2)	mg/L	0.3	0.8	0.1	1672109
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	<0.40	0.40	1670080
Total Cyanide (CN)	mg/L	<0.003	<0.003	0.003	1672177
Total Organic Carbon	mg/L	1.8	1.4	0.2	1670928
Alkalinity Total (as CaCO3) pH 4.5	mg/L	2	1	1	1669412
Chloride (Cl)	mg/L	0.07	0.31	0.05	1669680
Nitrites (N-NO2-)	mg/L	<0.01	<0.01	0.01	1669677
Nitrates (N-NO3-)	mg/L	0.01	0.15	0.01	1669677
Sulfates (SO4)	mg/L	<0.5	<0.5	0.5	1669680
Total suspended solids (TSS)	mg/L	<2	<2	2	1669631

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

2016/10/12 10:52

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Maxxam Job #: B666438
Report Date: 2016/10/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		DA6155	DA6219		
Sampling Date		2016/09/26	2016/09/26		
COC Number		136862-03-01	136862-03-01		
	Units	DSO4-ER-GW-7	DSO4-EE-GW-3	RDL	QC Batch
MICROBIOLGICAL TESTS					
Total coliforms	UFC/100ml	1100	940	10	1669399
Non-typical bacteria	/membrane	200	280	10	1669394
Fecal coliforms	UFC/100ml	0	0	N/A	1669403

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

2016/10/12 10:52

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Maxxam Job #: B666438
Report Date: 2016/10/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

GENERAL COMMENTS

Condition of sample(s) upon receipt: GOOD

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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Maxxam Job #: B666438
Report Date: 2016/10/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1669409	CB8	QC Standard	pH	2016/09/27		101	%
1669412	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2016/09/27		95	%
1669412	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2016/09/27	<1		mg/L
1669420	CB8	QC Standard	Conductivity	2016/09/27		101	%
1669420	CB8	Method Blank	Conductivity	2016/09/27	<0.001		mS/cm
1669421	CB8	QC Standard	Fluoride (F)	2016/09/27		100	%
1669421	CB8	Method Blank	Fluoride (F)	2016/09/27	<0.1		mg/L
1669631	MCC	Spiked Blank	Total suspended solids (TSS)	2016/09/28		100	%
1669631	MCC	Method Blank	Total suspended solids (TSS)	2016/09/28	<2		mg/L
1669677	MCC	QC Standard	Nitrates (N-NO3-)	2016/09/28		93	%
1669677	MCC	Spiked Blank	Nitrites (N-NO2-)	2016/09/28		96	%
1669677	MCC	Method Blank	Nitrites (N-NO2-)	2016/09/28	<0.01		mg/L
			Nitrates (N-NO3-)	2016/09/28	<0.01		mg/L
1669680	MCC	QC Standard	Chloride (Cl)	2016/09/28		103	%
			Sulfates (SO4)	2016/09/28		91	%
1669680	MCC	Method Blank	Chloride (Cl)	2016/09/28	<0.05		mg/L
			Sulfates (SO4)	2016/09/28	<0.5		mg/L
1669954	SP7	Spiked Blank	BOD5	2016/10/03		106	%
1669954	SP7	Spiked Blank DUP	BOD5	2016/10/03		108	%
1669954	SP7	Method Blank	BOD5	2016/10/03	<4		mg/L
1669954	SP7	Method Blank DUP	BOD5	2016/10/03	<4		mg/L
1670080	DKH	QC Standard	TKN Total Kjeldahl Nitrogen	2016/09/29		108	%
1670080	DKH	Spiked Blank	TKN Total Kjeldahl Nitrogen	2016/09/29		109	%
1670080	DKH	Method Blank	TKN Total Kjeldahl Nitrogen	2016/09/29	<0.40		mg/L
1670306	MH5	Spiked Blank	1-Chlorooctadecane	2016/09/30		109	%
			Petroleum Hydrocarbons (C10-C50)	2016/09/30		97	%
1670306	MH5	Method Blank	1-Chlorooctadecane	2016/09/30		62	%
			Petroleum Hydrocarbons (C10-C50)	2016/09/30	<100		ug/L
1670332	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2016/09/29		93	%
1670332	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2016/09/29		91	%
1670332	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2016/09/29	<0.008		mg/L
1670359	DKH	Spiked Blank	Nitrogen ammonia (N-NH3)	2016/09/29		103	%
1670359	DKH	Method Blank	Nitrogen ammonia (N-NH3)	2016/09/29	<0.02		mg/L
1670443	KID	QC Standard	COD	2016/09/29		107	%
1670443	KID	Spiked Blank	COD	2016/09/29		102	%
1670443	KID	Method Blank	COD	2016/09/29	<10		mg/L
1670786	MR4	Spiked Blank	Dissolved organic carbon	2016/09/30		101	%
1670786	MR4	Method Blank	Dissolved organic carbon	2016/09/30	<0.2		mg/L
1670928	MR4	Spiked Blank	Total Organic Carbon	2016/09/30		102	%
1670928	MR4	Method Blank	Total Organic Carbon	2016/09/30	<0.2		mg/L
1671676	NS	QC Standard	Aluminum (Al)	2016/10/02		111	%
			Antimony (Sb)	2016/10/02		127 (1)	%
			Arsenic (As)	2016/10/02		112	%
			Barium (Ba)	2016/10/02		110	%
			Beryllium (Be)	2016/10/02		105	%
			Boron (B)	2016/10/02		99	%
			Cadmium (Cd)	2016/10/02		108	%
			Calcium (Ca)	2016/10/02		107	%
			Chromium (Cr)	2016/10/02		113	%
			Cobalt (Co)	2016/10/02		111	%

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Maxxam Job #: B666438
Report Date: 2016/10/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Copper (Cu)	2016/10/02		111	%
			Iron (Fe)	2016/10/02		120	%
			Magnesium (Mg)	2016/10/02		109	%
			Manganese (Mn)	2016/10/02		111	%
			Molybdenum (Mo)	2016/10/02		107	%
			Mercury (Hg)	2016/10/02		106	%
			Nickel (Ni)	2016/10/02		109	%
			Total phosphorous	2016/10/02		106	%
			Lead (Pb)	2016/10/02		115	%
			Potassium (K)	2016/10/02		107	%
			Selenium (Se)	2016/10/02		108	%
			Sodium (Na)	2016/10/02		104	%
			Strontium (Sr)	2016/10/02		105	%
			Thallium (Tl)	2016/10/02		127 (1)	%
			Uranium (U)	2016/10/02		101	%
			Vanadium (V)	2016/10/02		108	%
			Zinc (Zn)	2016/10/02		111	%
1671676	NS	Spiked Blank	Aluminum (Al)	2016/10/02		109	%
			Antimony (Sb)	2016/10/02		108	%
			Silver (Ag)	2016/10/02		105	%
			Arsenic (As)	2016/10/02		109	%
			Barium (Ba)	2016/10/02		99	%
			Beryllium (Be)	2016/10/02		106	%
			Bismuth (Bi)	2016/10/02		100	%
			Boron (B)	2016/10/02		101	%
			Cadmium (Cd)	2016/10/02		109	%
			Calcium (Ca)	2016/10/02		102	%
			Chromium (Cr)	2016/10/02		108	%
			Cobalt (Co)	2016/10/02		106	%
			Copper (Cu)	2016/10/02		108	%
			Tin (Sn)	2016/10/02		107	%
			Iron (Fe)	2016/10/02		107	%
			Magnesium (Mg)	2016/10/02		109	%
			Manganese (Mn)	2016/10/02		109	%
			Molybdenum (Mo)	2016/10/02		105	%
			Mercury (Hg)	2016/10/02		108	%
			Nickel (Ni)	2016/10/02		104	%
			Total phosphorous	2016/10/02		107	%
			Lead (Pb)	2016/10/02		109	%
			Potassium (K)	2016/10/02		110	%
			Selenium (Se)	2016/10/02		101	%
			Sodium (Na)	2016/10/02		102	%
			Strontium (Sr)	2016/10/02		103	%
			Thallium (Tl)	2016/10/02		112	%
			Titanium (Ti)	2016/10/02		105	%
			Uranium (U)	2016/10/02		101	%
			Vanadium (V)	2016/10/02		108	%
			Zinc (Zn)	2016/10/02		110	%
1671676	NS	Method Blank	Aluminum (Al)	2016/10/02	<10		ug/L
			Antimony (Sb)	2016/10/02	<1.0		ug/L

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Maxxam Job #: B666438
Report Date: 2016/10/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Silver (Ag)	2016/10/02	<1.0		ug/L
			Arsenic (As)	2016/10/02	<1.0		ug/L
			Barium (Ba)	2016/10/02	<2.0		ug/L
			Beryllium (Be)	2016/10/02	<2.0		ug/L
			Bismuth (Bi)	2016/10/02	<1.0		ug/L
			Boron (B)	2016/10/02	<50		ug/L
			Cadmium (Cd)	2016/10/02	<0.20		ug/L
			Calcium (Ca)	2016/10/02	<500		ug/L
			Chromium (Cr)	2016/10/02	<5.0		ug/L
			Cobalt (Co)	2016/10/02	<1.0		ug/L
			Copper (Cu)	2016/10/02	<1.0		ug/L
			Total Hardness (CaCO3)	2016/10/02	<1000		ug/L
			Tin (Sn)	2016/10/02	<2.0		ug/L
			Iron (Fe)	2016/10/02	<60		ug/L
			Magnesium (Mg)	2016/10/02	<100		ug/L
			Manganese (Mn)	2016/10/02	<1.0		ug/L
			Molybdenum (Mo)	2016/10/02	<1.0		ug/L
			Mercury (Hg)	2016/10/02	<0.10		ug/L
			Nickel (Ni)	2016/10/02	<2.0		ug/L
			Total phosphorous	2016/10/02	<10		ug/L
			Lead (Pb)	2016/10/02	<0.50		ug/L
			Potassium (K)	2016/10/02	<500		ug/L
			Selenium (Se)	2016/10/02	<3.0		ug/L
			Sodium (Na)	2016/10/02	<500		ug/L
			Strontium (Sr)	2016/10/02	<2.0		ug/L
			Thallium (Tl)	2016/10/02	<2.0		ug/L
			Titanium (Ti)	2016/10/02	<10		ug/L
			Uranium (U)	2016/10/02	<1.0		ug/L
			Vanadium (V)	2016/10/02	<2.0		ug/L
			Zinc (Zn)	2016/10/02	<7.0		ug/L
1672109	MTZ	QC Standard	Reactive silica (SiO2)	2016/10/03		100	%
1672109	MTZ	Method Blank	Reactive silica (SiO2)	2016/10/03	<0.1		mg/L
1672177	MH1	QC Standard	Total Cyanide (CN)	2016/10/06		92	%
1672177	MH1	Spiked Blank	Total Cyanide (CN)	2016/10/06		105	%
1672177	MH1	Method Blank	Total Cyanide (CN)	2016/10/06	<0.003		mg/L

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

(1) Recovery or relative percent difference (RPD) for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria

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Maxxam Job #: B666438
Report Date: 2016/10/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD / DSO4-2A
Site Location: TSMC
Your P.O. #: 2100001513
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Dochka Koleva Hristova, B.Sc., Chemist



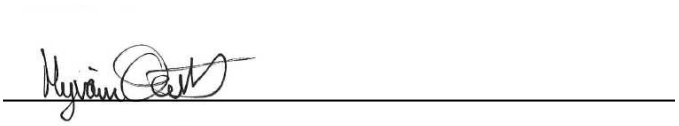
David Provencher, B.Sc., Chemist



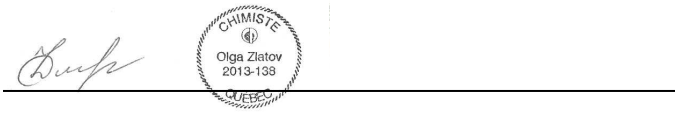
Marilyn Blanc, B. Sc., Chemist



Madina Hamrouni, B.Sc., Chemist



Myriam Ouellet, M.Sc., Microbiologist, Analyste II



Olga Zlatov Polevoi, Analyst I

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B. Water Quality

2017

Votre # du projet: B732266

Attention:Mathieu Letourneau

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/06/20
Rapport: R4551649
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7C1655
Reçu: 2017/06/13, 09:44

Matrice: EAU DE SURFACE
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2017/06/19	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B732266

Attention:Mathieu Letourneau

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/06/20
Rapport: R4551649
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7C1655
Reçu: 2017/06/13, 09:44

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Simona Vatamanescu,
Courriel: SVatamanescu@maxxam.ca
Téléphone (905)826-3080

==========

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Dossier Maxxam: B7C1655
Date du rapport: 2017/06/20

Maxxam Analytique
Votre # du projet: B732266

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU DE SURFACE

Identification Maxxam		ENW945		
Date d'échantillonnage		2017/06/08 08:40		
	Unités	**EB8856-DSO4-ER-GW-Q1-2016**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5026076

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B7C1655
Date du rapport: 2017/06/20

Maxxam Analytique
Votre # du projet: B732266

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B7C1655
Date du rapport: 2017/06/20

Maxxam Analytique
Votre # du projet: B732266

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5026076	FA5	Blanc fortifié	Radium-226	2017/06/19		104	%	85 - 115
5026076	FA5	Blanc de méthode	Radium-226	2017/06/19	<0.0050		Bq/L	
5026076	FA5	RPD [ENW945-01]	Radium-226	2017/06/19	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

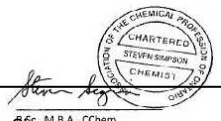
Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B7C1655
Date du rapport: 2017/06/20

Maxxam Analytique
Votre # du projet: B732266

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

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Your P.O. #: 2200001372
Your Project #: DSO4 SURFACE WATER
Site#: TSMC
Site Location: DSO4
Your C.O.C. #: 157352-03-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/06/21
Report #: R2292134
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B732266
Received: 2017/06/09, 10:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2017/06/09	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions*	1	N/A	2017/06/09	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Non-Typical Bacteria*	1	N/A	2017/06/09	QUE SOP-00304	MA 700-COL 1.0
Biochemical Oxygen Demand (5 days) (3)*	1	2017/06/09	2017/06/14	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	1	2017/06/13	2017/06/13	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide (1)*	1	2017/06/13	2017/06/14	STL SOP-00035	MA300-CN 1.2 R3 m
Chemical Oxygen Demand*	1	2017/06/12	2017/06/12	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms*	1	N/A	2017/06/09	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms*	1	N/A	2017/06/09	QUE SOP-00304	MA.700-Col 1.0
Conductivity*	1	N/A	2017/06/09	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2017/06/16	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)***	1	2017/06/14	2017/06/14	STL SOP-00243	MA.300-C1.0 R6m
Fluoride*	1	N/A	2017/06/13	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)***	1	2017/06/19	2017/06/20	STL SOP-00042	MA.200–Hg 1.1 R1 m
Radium 226 (MMER LOW LEVEL) (2)	1	N/A	N/A		
Total Suspended Solids*	1	2017/06/09	2017/06/09	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)*	1	2017/06/13	2017/06/14	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen*	1	N/A	2017/06/12	QUE SOP-00126	MA.300–N 2.0 R2 m
Dissolved Oxygen***	1	N/A	2017/06/09	SM 421 F	MA315-DBO 1.1 R3 m
pH*	1	N/A	2017/06/09	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus*	1	2017/06/09	2017/06/09	QUE SOP-00132	MA.200-Mét. 1.2 R5m
Reactive Silica (SiO2)***	1	N/A	2017/06/12	QUE SOP-00150	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN)*	1	2017/06/12	2017/06/12	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 5)*	1	N/A	2017/06/12	STL SOP-00243	MA.300-C1.0 R6m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200001372
Your Project #: DSO4 SURFACE WATER
Site#: TSMC
Site Location: DSO4
Your C.O.C. #: 157352-03-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/06/21
Report #: R2292134
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B732266
Received: 2017/06/09, 10:00

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam-Radiological Lab
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

==========

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 #: B732266
Report Date: 2017/06/21

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		EB8856		
Sampling Date		2017/06/08 08:40		
COC Number		157352-03-01		
	Units	**DSO4-ER-GW-Q1-2016**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1789552
Surrogate Recovery (%)				
1-Chlorooctadecane	%	118	N/A	1789552

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

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Maxxam Job #: B732266
Report Date: 2017/06/21

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		EB8856	EB8856		
Sampling Date		2017/06/08 08:40	2017/06/08 08:40		
COC Number		157352-03-01	157352-03-01		
	Units	DSO4-ER-GW-Q1-2016	DSO4-ER-GW-Q1-2016 Lab-Dup	RDL	QC Batch
METALS					
Mercury (Hg)	mg/L	<0.000010	<0.000010	0.000010	1792115
METALS ICP-MS					
Aluminum (Al)	ug/L	21	N/A	10	1789404
Antimony (Sb)	ug/L	<1.0	N/A	1.0	1789404
Silver (Ag)	ug/L	<1.0	N/A	1.0	1789404
Arsenic (As)	ug/L	<1.0	N/A	1.0	1789404
Barium (Ba)	ug/L	<2.0	N/A	2.0	1789404
Beryllium (Be)	ug/L	<2.0	N/A	2.0	1789404
Bismuth (Bi)	ug/L	<1.0	N/A	1.0	1789404
Boron (B)	ug/L	<50	N/A	50	1789404
Cadmium (Cd)	ug/L	<0.20	N/A	0.20	1789404
Calcium (Ca)	ug/L	<500	N/A	500	1789404
Chromium (Cr)	ug/L	<5.0	N/A	5.0	1789404
Cobalt (Co)	ug/L	<1.0	N/A	1.0	1789404
Copper (Cu)	ug/L	<1.0	N/A	1.0	1789404
Total Hardness (CaCO3)	ug/L	<1000	N/A	1000	1789404
Tin (Sn)	ug/L	<2.0	N/A	2.0	1789404
Iron (Fe)	ug/L	<60	N/A	60	1789404
Magnesium (Mg)	ug/L	<100	N/A	100	1789404
Manganese (Mn)	ug/L	24	N/A	1.0	1789404
Molybdenum (Mo)	ug/L	<1.0	N/A	1.0	1789404
Nickel (Ni)	ug/L	<2.0	N/A	2.0	1789404
Total phosphorous	ug/L	<10	N/A	10	1789404
Lead (Pb)	ug/L	<0.50	N/A	0.50	1789404
Potassium (K)	ug/L	<500	N/A	500	1789404
Selenium (Se)	ug/L	<3.0	N/A	3.0	1789404
Sodium (Na)	ug/L	<500	N/A	500	1789404
Strontium (Sr)	ug/L	<2.0	N/A	2.0	1789404
Thallium (Tl)	ug/L	<2.0	N/A	2.0	1789404
Titanium (Ti)	ug/L	<10	N/A	10	1789404
Uranium (U)	ug/L	<1.0	N/A	1.0	1789404

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

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Maxxam Job #: B732266
Report Date: 2017/06/21

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		EB8856	EB8856		
Sampling Date		2017/06/08 08:40	2017/06/08 08:40		
COC Number		157352-03-01	157352-03-01		
	Units	**DSO4-ER-GW-Q1-2016**	**DSO4-ER-GW-Q1-2016 Lab-Dup**	**RDL**	**QC Batch**
Vanadium (V)	ug/L	<2.0	N/A	2.0	1789404
Zinc (Zn)	ug/L	<7.0	N/A	7.0	1789404

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

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Maxxam Job #: B732266
Report Date: 2017/06/21

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		EB8856	EB8856		
Sampling Date		2017/06/08 08:40	2017/06/08 08:40		
COC Number		157352-03-01	157352-03-01		
	Units	**DSO4-ER-GW-Q1-2016**	**DSO4-ER-GW-Q1-2016 Lab-Dup**	**RDL**	**QC Batch**
CONVENTIONALS					
BOD5	mg/L	<4.0	N/A	4.0	1788268
COD	mg/L	<10	N/A	10	1788862
Conductivity	mS/cm	0.0016	N/A	0.0010	1788251
Dissolved organic carbon	mg/L	1.3	N/A	0.20	1790487
Dissolved oxygen	mg/L	8.3	N/A	1.0	1788393
Fluoride (F)	mg/L	<0.10	N/A	0.10	1789469
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	N/A	0.0080	1791500
Nitrogen ammonia (N-NH3)	mg/L	<0.020	N/A	0.020	1788881
pH	pH	6.18	N/A	N/A	1788249
Reactive silica (SiO2)	mg/L	0.23	N/A	0.10	1789037
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	N/A	0.40	1788808
Total Cyanide (CN)	mg/L	<0.0030	N/A	0.0030	1789850
Total Organic Carbon	mg/L	1.5	N/A	0.20	1789218
Alkalinity Total (as CaCO3) pH 4.5	mg/L	1.8	N/A	1.0	1788255
Chloride (Cl)	mg/L	0.060	0.060	0.050	1788419
Nitrate (N) and Nitrite(N)	mg/L	<0.020	<0.020	0.020	1788419
Sulfates (SO4)	mg/L	<0.50	<0.50	0.50	1788419
Total suspended solids (TSS)	mg/L	3.2	N/A	2.0	1788363

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

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TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		EB8856		
Sampling Date		2017/06/08 08:40		
COC Number		157352-03-01		
	Units	**DSO4-ER-GW-Q1-2016**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	1450	10	1788277
Non-typical bacteria	/membrane	420	10	1788276
Fecal coliforms	UFC/100ml	0	N/A	1788279

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

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Maxxam Job #: B732266
Report Date: 2017/06/21

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

GENERAL COMMENTS

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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Maxxam Job #: B732266
Report Date: 2017/06/21

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1788249	AG5	QC Standard	pH	2017/06/09		100	%
1788251	AG5	QC Standard	Conductivity	2017/06/09		100	%
1788251	AG5	Method Blank	Conductivity	2017/06/09	<0.0010		mS/cm
1788255	AG5	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2017/06/09		91	%
1788255	AG5	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2017/06/09	<1.0		mg/L
1788268	GG1	Spiked Blank	BOD5	2017/06/14		104	%
1788268	GG1	Spiked Blank DUP	BOD5	2017/06/14		106	%
1788268	GG1	Method Blank	BOD5	2017/06/14	<4.0		mg/L
1788268	GG1	Method Blank DUP	BOD5	2017/06/14	<4.0		mg/L
1788363	AG5	Spiked Blank	Total suspended solids (TSS)	2017/06/09		99	%
1788363	AG5	Method Blank	Total suspended solids (TSS)	2017/06/09	<2.0		mg/L
1788419	MCC	QC Standard	Chloride (Cl)	2017/06/09		98	%
			Nitrate (N) and Nitrite(N)	2017/06/09		101	%
			Sulfates (SO4)	2017/06/09		103	%
1788419	MCC	Spiked Blank	Nitrate (N) and Nitrite(N)	2017/06/09		101	%
1788419	MCC	Method Blank	Chloride (Cl)	2017/06/09	<0.050		mg/L
			Nitrate (N) and Nitrite(N)	2017/06/09	<0.020		mg/L
			Sulfates (SO4)	2017/06/09	<0.50		mg/L
1788808	AG5	QC Standard	TKN Total Kjeldahl Nitrogen	2017/06/12		95	%
1788808	AG5	Method Blank	TKN Total Kjeldahl Nitrogen	2017/06/12	<0.40		mg/L
1788862	DP3	QC Standard	COD	2017/06/12		107	%
1788862	DP3	QC Standard DUP	COD	2017/06/12		100	%
1788862	DP3	Method Blank	COD	2017/06/12	<10		mg/L
1788862	DP3	Method Blank DUP	COD	2017/06/12	<10		mg/L
1788881	AG5	QC Standard	Nitrogen ammonia (N-NH3)	2017/06/12		104	%
1788881	AG5	Method Blank	Nitrogen ammonia (N-NH3)	2017/06/12	<0.020		mg/L
1789037	GG1	QC Standard	Reactive silica (SiO2)	2017/06/12		85	%
1789037	GG1	Method Blank	Reactive silica (SiO2)	2017/06/12	<0.10		mg/L
1789218	MR4	Spiked Blank	Total Organic Carbon	2017/06/12		104	%
1789218	MR4	Method Blank	Total Organic Carbon	2017/06/12	<0.20		mg/L
1789404	MDR	QC Standard	Aluminum (Al)	2017/06/14		99	%
			Antimony (Sb)	2017/06/14		104	%
			Arsenic (As)	2017/06/14		101	%
			Barium (Ba)	2017/06/14		98	%
			Beryllium (Be)	2017/06/14		104	%
			Boron (B)	2017/06/14		111	%
			Cadmium (Cd)	2017/06/14		101	%
			Calcium (Ca)	2017/06/14		99	%
			Chromium (Cr)	2017/06/14		99	%
			Cobalt (Co)	2017/06/14		101	%
			Copper (Cu)	2017/06/14		100	%
			Iron (Fe)	2017/06/14		109	%
			Magnesium (Mg)	2017/06/14		99	%
			Manganese (Mn)	2017/06/14		100	%
			Molybdenum (Mo)	2017/06/14		98	%
			Nickel (Ni)	2017/06/14		99	%
			Total phosphorous	2017/06/14		100	%
			Lead (Pb)	2017/06/14		104	%
			Potassium (K)	2017/06/14		98	%
			Selenium (Se)	2017/06/14		98	%

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Maxxam Job #: B732266
Report Date: 2017/06/21

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Sodium (Na)	2017/06/14		96	%
			Strontium (Sr)	2017/06/14		100	%
			Thallium (Tl)	2017/06/14		117	%
			Uranium (U)	2017/06/14		105	%
			Vanadium (V)	2017/06/14		97	%
			Zinc (Zn)	2017/06/14		101	%
1789404	MDR	Spiked Blank	Aluminum (Al)	2017/06/14		104	%
			Antimony (Sb)	2017/06/14		103	%
			Silver (Ag)	2017/06/14		100	%
			Arsenic (As)	2017/06/14		100	%
			Barium (Ba)	2017/06/14		99	%
			Beryllium (Be)	2017/06/14		101	%
			Bismuth (Bi)	2017/06/14		98	%
			Boron (B)	2017/06/14		118	%
			Cadmium (Cd)	2017/06/14		100	%
			Calcium (Ca)	2017/06/14		97	%
			Chromium (Cr)	2017/06/14		95	%
			Cobalt (Co)	2017/06/14		96	%
			Copper (Cu)	2017/06/14		95	%
			Tin (Sn)	2017/06/14		101	%
			Iron (Fe)	2017/06/14		97	%
			Magnesium (Mg)	2017/06/14		98	%
			Manganese (Mn)	2017/06/14		99	%
			Molybdenum (Mo)	2017/06/14		98	%
			Nickel (Ni)	2017/06/14		96	%
			Total phosphorous	2017/06/14		99	%
			Lead (Pb)	2017/06/14		104	%
			Potassium (K)	2017/06/14		96	%
			Selenium (Se)	2017/06/14		101	%
			Sodium (Na)	2017/06/14		91	%
			Strontium (Sr)	2017/06/14		99	%
			Thallium (Tl)	2017/06/14		114	%
			Titanium (Ti)	2017/06/14		96	%
			Uranium (U)	2017/06/14		101	%
			Vanadium (V)	2017/06/14		98	%
			Zinc (Zn)	2017/06/14		100	%
1789404	MDR	Method Blank	Aluminum (Al)	2017/06/14	<10		ug/L
			Antimony (Sb)	2017/06/14	<1.0		ug/L
			Silver (Ag)	2017/06/14	<1.0		ug/L
			Arsenic (As)	2017/06/14	<1.0		ug/L
			Barium (Ba)	2017/06/14	<2.0		ug/L
			Beryllium (Be)	2017/06/14	<2.0		ug/L
			Bismuth (Bi)	2017/06/14	<1.0		ug/L
			Boron (B)	2017/06/14	<50		ug/L
			Cadmium (Cd)	2017/06/14	<0.20		ug/L
			Calcium (Ca)	2017/06/14	<500		ug/L
			Chromium (Cr)	2017/06/14	<5.0		ug/L
			Cobalt (Co)	2017/06/14	<1.0		ug/L
			Copper (Cu)	2017/06/14	<1.0		ug/L
			Total Hardness (CaCO3)	2017/06/14	<1000		ug/L

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Maxxam Job #: B732266
Report Date: 2017/06/21

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Tin (Sn)	2017/06/14	<2.0		ug/L
			Iron (Fe)	2017/06/14	<60		ug/L
			Magnesium (Mg)	2017/06/14	<100		ug/L
			Manganese (Mn)	2017/06/14	<1.0		ug/L
			Molybdenum (Mo)	2017/06/14	<1.0		ug/L
			Nickel (Ni)	2017/06/14	<2.0		ug/L
			Total phosphorous	2017/06/14	<10		ug/L
			Lead (Pb)	2017/06/14	<0.50		ug/L
			Potassium (K)	2017/06/14	<500		ug/L
			Selenium (Se)	2017/06/14	<3.0		ug/L
			Sodium (Na)	2017/06/14	<500		ug/L
			Strontium (Sr)	2017/06/14	2.5, RDL=2.0		ug/L
			Thallium (Tl)	2017/06/14	<2.0		ug/L
			Titanium (Ti)	2017/06/14	<10		ug/L
			Uranium (U)	2017/06/14	<1.0		ug/L
			Vanadium (V)	2017/06/14	<2.0		ug/L
			Zinc (Zn)	2017/06/14	<7.0		ug/L
1789469	CB8	QC Standard	Fluoride (F)	2017/06/13		104	%
1789469	CB8	Method Blank	Fluoride (F)	2017/06/13	<0.10		mg/L
1789552	GTE	Spiked Blank	1-Chlorooctadecane	2017/06/13		90	%
			Petroleum Hydrocarbons (C10-C50)	2017/06/13		75	%
1789552	GTE	Method Blank	1-Chlorooctadecane	2017/06/13		94	%
			Petroleum Hydrocarbons (C10-C50)	2017/06/13	<100		ug/L
1789850	DKH	Spiked Blank	Total Cyanide (CN)	2017/06/14		101	%
1789850	DKH	Method Blank	Total Cyanide (CN)	2017/06/14	<0.0030		mg/L
1790487	MR4	Spiked Blank	Dissolved organic carbon	2017/06/14		102	%
1790487	MR4	Method Blank	Dissolved organic carbon	2017/06/14	<0.20		mg/L
1791500	FS	QC Standard	Hexavalent Chromium (Cr 6+)	2017/06/16		91	%
1791500	FS	Spiked Blank	Hexavalent Chromium (Cr 6+)	2017/06/16		94	%
1791500	FS	Method Blank	Hexavalent Chromium (Cr 6+)	2017/06/16	<0.0080		mg/L
1792115	SD2	QC Standard	Mercury (Hg)	2017/06/20		100	%
1792115	SD2	Spiked Blank	Mercury (Hg)	2017/06/20		91	%
1792115	SD2	Method Blank	Mercury (Hg)	2017/06/20	<0.000010		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Maxxam Job #: B732266
Report Date: 2017/06/21

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

David Provencher, B.Sc., Chemist, Senior Analyst

Faouzi Sarsi, B.Sc. Chemist

Kassy Blais, B. Sc., Microbiologist

Madina Hamrouni, B.Sc., Chemist

Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

Myriam Ouellet, M.Sc., Microbiologist, Analyste II

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Maxxam Job #: B732266
Report Date: 2017/06/21

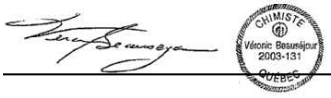
TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001372
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE(CONT'D)

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



Olga Zlatov Polevoi, Analyst I



Veronic Beausejour, B.Sc., Chemist, Supervisor

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Votre # du projet: B737365

Attention:Mathieu Letourneau

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/07/17
Rapport: R4601734
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7E1981
Reçu: 2017/07/06, 09:30

Matrice: EAU DE SURFACE
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2017/07/15	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B737365

Attention:Mathieu Letourneau

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/07/17
Rapport: R4601734
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7E1981
Reçu: 2017/07/06, 09:30

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Simona Vatamanescu,
Courriel: SVatamanescu@maxxam.ca
Téléphone (905)826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B7E1981
Date du rapport: 2017/07/17

Maxxam Analytique
Votre # du projet: B737365

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU DE SURFACE

Identification Maxxam		ERS376		
Date d'échantillonnage		2017/06/29 09:44		
	Unités	**EE7715-DSO4-EE-GW-Q1-2017**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5067845

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B7E1981
Date du rapport: 2017/07/17

Maxxam Analytique
Votre # du projet: B737365

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B7E1981
Date du rapport: 2017/07/17

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Votre # du projet: B737365

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5067845	DS2	Blanc fortifié	Radium-226	2017/07/15		98	%	85 - 115
5067845	DS2	Blanc de méthode	Radium-226	2017/07/15	<0.0050		Bq/L	
5067845	DS2	RPD [ERS376-01]	Radium-226	2017/07/15	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

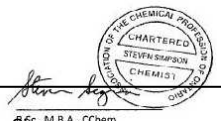
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Dossier Maxxam: B7E1981
Date du rapport: 2017/07/17

Maxxam Analytique
Votre # du projet: B737365

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

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Your P.O. #: 2200001778
Your Project #: DSO4 SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 157352-02-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/07/17
Report #: R2300318
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B737365
Received: 2017/06/29, 18:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2017/06/30	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions*	1	N/A	2017/06/30	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Non-Typical Bacteria*	1	N/A	2017/06/30	QUE SOP-00304	MA 700-COL 1.0
Biochemical Oxygen Demand (5 days) (3)*	1	2017/06/30	2017/07/05	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	1	2017/07/07	2017/07/08	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide (1)*	1	2017/07/05	2017/07/06	STL SOP-00035	MA300-CN 1.2 R3 m
Chemical Oxygen Demand*	1	2017/07/04	2017/07/04	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms*	1	N/A	2017/06/30	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms*	1	N/A	2017/06/30	QUE SOP-00304	MA.700-Col 1.0
Conductivity*	1	N/A	2017/06/30	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2017/07/06	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)***	1	2017/07/06	2017/07/06	STL SOP-00243	MA.300-C1.0 R6m
Fluoride*	1	N/A	2017/06/30	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)***	1	2017/07/04	2017/07/05	STL SOP-00042	MA.200–Hg 1.1 R1 m
Radium 226 (MMER LOW LEVEL) (2)	1	N/A	N/A		
Total Suspended Solids*	1	2017/07/03	2017/07/03	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)*	1	2017/06/30	2017/07/02	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen*	1	N/A	2017/07/04	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite*	1	N/A	2017/06/30	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen***	1	N/A	2017/06/30	SM 421 F	MA315-DBO 1.1 R3 m
pH*	1	N/A	2017/06/30	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus*	1	2017/06/30	2017/06/29	QUE SOP-00132	MA.200-Mét. 1.2 R5m
Reactive Silica (SiO2)***	1	N/A	2017/07/04	QUE SOP-00150	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN)*	1	2017/07/04	2017/07/05	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 5)*	1	N/A	2017/07/06	STL SOP-00243	MA.300-C1.0 R6m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

Your P.O. #: 2200001778
Your Project #: DSO4 SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 157352-02-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/07/17
Report #: R2300318
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B737365
Received: 2017/06/29, 18:00

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam - Radiological Lab
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201
==========
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Maxxam Job #: B737365
Report Date: 2017/07/17

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200001778
Sampler Initials: YE

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		EE7715		
Sampling Date		2017/06/29 09:44		
COC Number		157352-02-01		
	Units	**DSO4-EE-GW-Q1-2017**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1799931
Surrogate Recovery (%)				
1-Chlorooctadecane	%	75	N/A	1799931

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

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Maxxam Job #: B737365
Report Date: 2017/07/17

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200001778
Sampler Initials: YE

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		EE7715		
Sampling Date		2017/06/29 09:44		
COC Number		157352-02-01		
	Units	**DSO4-EE-GW-Q1-2017**	**RDL**	**QC Batch**
METALS				
Mercury (Hg)	mg/L	<0.000010	0.000010	1798169
METALS ICP-MS				
Aluminum (Al)	ug/L	32	10	1797401
Antimony (Sb)	ug/L	<1.0	1.0	1797401
Silver (Ag)	ug/L	<1.0	1.0	1797401
Arsenic (As)	ug/L	<1.0	1.0	1797401
Barium (Ba)	ug/L	<2.0	2.0	1797401
Beryllium (Be)	ug/L	<2.0	2.0	1797401
Bismuth (Bi)	ug/L	<1.0	1.0	1797401
Boron (B)	ug/L	<50	50	1797401
Cadmium (Cd)	ug/L	<0.20	0.20	1797401
Calcium (Ca)	ug/L	<500	500	1797401
Chromium (Cr)	ug/L	<5.0	5.0	1797401
Cobalt (Co)	ug/L	<1.0	1.0	1797401
Copper (Cu)	ug/L	<1.0	1.0	1797401
Total Hardness (CaCO3)	ug/L	<1000	1000	1797401
Tin (Sn)	ug/L	<2.0	2.0	1797401
Iron (Fe)	ug/L	<60	60	1797401
Magnesium (Mg)	ug/L	<100	100	1797401
Manganese (Mn)	ug/L	28	1.0	1797401
Molybdenum (Mo)	ug/L	<1.0	1.0	1797401
Nickel (Ni)	ug/L	<2.0	2.0	1797401
Total phosphorous	ug/L	16	10	1797401
Lead (Pb)	ug/L	<0.50	0.50	1797401
Potassium (K)	ug/L	<500	500	1797401
Selenium (Se)	ug/L	<3.0	3.0	1797401
Sodium (Na)	ug/L	<500	500	1797401
Strontium (Sr)	ug/L	<2.0	2.0	1797401
Thallium (Tl)	ug/L	<2.0	2.0	1797401
Titanium (Ti)	ug/L	<10	10	1797401
Uranium (U)	ug/L	<1.0	1.0	1797401
Vanadium (V)	ug/L	<2.0	2.0	1797401
Zinc (Zn)	ug/L	<7.0	7.0	1797401

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B737365
Report Date: 2017/07/17

TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200001778
Sampler Initials: YE

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		EE7715	EE7715		
Sampling Date		2017/06/29 09:44	2017/06/29 09:44		
COC Number		157352-02-01	157352-02-01		
	Units	**DSO4-EE-GW-Q1-2017**	**DSO4-EE-GW-Q1-2017 Lab-Dup**	**RDL**	**QC Batch**
CONVENTIONALS					
BOD5	mg/L	<4.0	N/A	4.0	1797760
COD	mg/L	<10	N/A	10	1798180
Conductivity	mS/cm	0.0026	N/A	0.0010	1797732
Dissolved organic carbon	mg/L	1.9	N/A	0.20	1799575
Dissolved oxygen	mg/L	9.6	N/A	1.0	1797716
Fluoride (F)	mg/L	<0.10	N/A	0.10	1797733
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	N/A	0.0080	1799348
Nitrates (N-NO3-)	mg/L	<0.020	N/A	0.020	1797638
Nitrites (N-NO2-)	mg/L	<0.020	N/A	0.020	1797638
Nitrogen ammonia (N-NH3)	mg/L	0.025	N/A	0.020	1798010
pH	pH	6.41	N/A	N/A	1797725
Reactive silica (SiO2)	mg/L	1.3	N/A	0.20	1798241
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	<0.40	0.40	1798065
Total Cyanide (CN)	mg/L	0.0043	N/A	0.0030	1799025
Total Organic Carbon	mg/L	2.0	N/A	0.20	1799580
Alkalinity Total (as CaCO3) pH 4.5	mg/L	<1.0	N/A	1.0	1797727
Chloride (Cl)	mg/L	0.050	0.050	0.050	1797632
Sulfates (SO4)	mg/L	<0.50	<0.50	0.50	1797632
Total suspended solids (TSS)	mg/L	<2.0	N/A	2.0	1797957

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

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TATA STEEL MINERALS CANADA
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MICROBIOLOGY (SURFACE WATER)

Maxxam ID		EE7715		
Sampling Date		2017/06/29 09:44		
COC Number		157352-02-01		
	Units	**DSO4-EE-GW-Q1-2017**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	1240	10	1797657
Non-typical bacteria	/membrane	380	10	1797658
Fecal coliforms	UFC/100ml	0	N/A	1797656

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

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TATA STEEL MINERALS CANADA
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GENERAL COMMENTS

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Reported detection limits are multiplied by dilution factors used for sample analysis.

Results relate only to the items tested.

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TATA STEEL MINERALS CANADA
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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1797401	CRO	QC Standard	Aluminum (Al)	2017/07/02		93	%
			Antimony (Sb)	2017/07/02		104	%
			Arsenic (As)	2017/07/02		104	%
			Barium (Ba)	2017/07/02		99	%
			Beryllium (Be)	2017/07/02		107	%
			Boron (B)	2017/07/02		107	%
			Cadmium (Cd)	2017/07/02		104	%
			Calcium (Ca)	2017/07/02		102	%
			Chromium (Cr)	2017/07/02		105	%
			Cobalt (Co)	2017/07/02		105	%
			Copper (Cu)	2017/07/02		104	%
			Iron (Fe)	2017/07/02		110	%
			Magnesium (Mg)	2017/07/02		101	%
			Manganese (Mn)	2017/07/02		107	%
			Molybdenum (Mo)	2017/07/02		97	%
			Nickel (Ni)	2017/07/02		103	%
			Total phosphorous	2017/07/02		102	%
			Lead (Pb)	2017/07/02		106	%
			Potassium (K)	2017/07/02		100	%
			Selenium (Se)	2017/07/02		102	%
			Sodium (Na)	2017/07/02		108	%
			Strontium (Sr)	2017/07/02		102	%
			Thallium (Tl)	2017/07/02		119	%
			Uranium (U)	2017/07/02		101	%
			Vanadium (V)	2017/07/02		103	%
			Zinc (Zn)	2017/07/02		107	%
1797401	CRO	QC Standard DUP	Aluminum (Al)	2017/07/02		110	%
			Antimony (Sb)	2017/07/02		103	%
			Arsenic (As)	2017/07/02		102	%
			Barium (Ba)	2017/07/02		98	%
			Beryllium (Be)	2017/07/02		106	%
			Boron (B)	2017/07/02		108	%
			Cadmium (Cd)	2017/07/02		103	%
			Calcium (Ca)	2017/07/02		101	%
			Chromium (Cr)	2017/07/02		103	%
			Cobalt (Co)	2017/07/02		104	%
			Copper (Cu)	2017/07/02		104	%
			Iron (Fe)	2017/07/02		122	%
			Magnesium (Mg)	2017/07/02		98	%
			Manganese (Mn)	2017/07/02		105	%
			Molybdenum (Mo)	2017/07/02		97	%
			Nickel (Ni)	2017/07/02		102	%
			Total phosphorous	2017/07/02		100	%
			Lead (Pb)	2017/07/02		105	%
			Potassium (K)	2017/07/02		98	%
			Selenium (Se)	2017/07/02		101	%
			Sodium (Na)	2017/07/02		106	%
			Strontium (Sr)	2017/07/02		102	%
			Thallium (Tl)	2017/07/02		119	%
			Uranium (U)	2017/07/02		99	%

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TATA STEEL MINERALS CANADA
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Vanadium (V)	2017/07/02		101	%
			Zinc (Zn)	2017/07/02		105	%
1797401	CRO	Spiked Blank	Aluminum (Al)	2017/07/02		105	%
			Antimony (Sb)	2017/07/02		103	%
			Silver (Ag)	2017/07/02		104	%
			Arsenic (As)	2017/07/02		105	%
			Barium (Ba)	2017/07/02		95	%
			Beryllium (Be)	2017/07/02		107	%
			Bismuth (Bi)	2017/07/02		93	%
			Boron (B)	2017/07/02		104	%
			Cadmium (Cd)	2017/07/02		105	%
			Calcium (Ca)	2017/07/02		100	%
			Chromium (Cr)	2017/07/02		104	%
			Cobalt (Co)	2017/07/02		102	%
			Copper (Cu)	2017/07/02		104	%
			Tin (Sn)	2017/07/02		104	%
			Iron (Fe)	2017/07/02		105	%
			Magnesium (Mg)	2017/07/02		101	%
			Manganese (Mn)	2017/07/02		107	%
			Molybdenum (Mo)	2017/07/02		97	%
			Nickel (Ni)	2017/07/02		100	%
			Total phosphorous	2017/07/02		106	%
			Lead (Pb)	2017/07/02		102	%
			Potassium (K)	2017/07/02		101	%
			Selenium (Se)	2017/07/02		104	%
			Sodium (Na)	2017/07/02		100	%
			Strontium (Sr)	2017/07/02		97	%
			Thallium (Tl)	2017/07/02		112	%
			Titanium (Ti)	2017/07/02		107	%
			Uranium (U)	2017/07/02		92	%
			Vanadium (V)	2017/07/02		111	%
			Zinc (Zn)	2017/07/02		107	%
1797401	CRO	Spiked Blank DUP	Aluminum (Al)	2017/07/02		104	%
			Antimony (Sb)	2017/07/02		104	%
			Silver (Ag)	2017/07/02		103	%
			Arsenic (As)	2017/07/02		104	%
			Barium (Ba)	2017/07/02		100	%
			Beryllium (Be)	2017/07/02		102	%
			Bismuth (Bi)	2017/07/02		92	%
			Boron (B)	2017/07/02		101	%
			Cadmium (Cd)	2017/07/02		104	%
			Calcium (Ca)	2017/07/02		101	%
			Chromium (Cr)	2017/07/02		106	%
			Cobalt (Co)	2017/07/02		104	%
			Copper (Cu)	2017/07/02		102	%
			Tin (Sn)	2017/07/02		104	%
			Iron (Fe)	2017/07/02		106	%
			Magnesium (Mg)	2017/07/02		102	%
			Manganese (Mn)	2017/07/02		109	%
			Molybdenum (Mo)	2017/07/02		96	%

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TATA STEEL MINERALS CANADA
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Nickel (Ni)	2017/07/02		102	%
			Total phosphorous	2017/07/02		105	%
			Lead (Pb)	2017/07/02		102	%
			Potassium (K)	2017/07/02		102	%
			Selenium (Se)	2017/07/02		106	%
			Sodium (Na)	2017/07/02		99	%
			Strontium (Sr)	2017/07/02		99	%
			Thallium (Tl)	2017/07/02		111	%
			Titanium (Ti)	2017/07/02		109	%
			Uranium (U)	2017/07/02		92	%
			Vanadium (V)	2017/07/02		112	%
			Zinc (Zn)	2017/07/02		106	%
1797401	CRO	Method Blank	Aluminum (Al)	2017/07/02	<10		ug/L
			Antimony (Sb)	2017/07/02	<1.0		ug/L
			Silver (Ag)	2017/07/02	<1.0		ug/L
			Arsenic (As)	2017/07/02	<1.0		ug/L
			Barium (Ba)	2017/07/02	<2.0		ug/L
			Beryllium (Be)	2017/07/02	<2.0		ug/L
			Bismuth (Bi)	2017/07/02	<1.0		ug/L
			Boron (B)	2017/07/02	<50		ug/L
			Cadmium (Cd)	2017/07/02	<0.20		ug/L
			Calcium (Ca)	2017/07/02	<500		ug/L
			Chromium (Cr)	2017/07/02	<5.0		ug/L
			Cobalt (Co)	2017/07/02	<1.0		ug/L
			Copper (Cu)	2017/07/02	<1.0		ug/L
			Total Hardness (CaCO3)	2017/07/02	<1000		ug/L
			Tin (Sn)	2017/07/02	<2.0		ug/L
			Iron (Fe)	2017/07/02	<60		ug/L
			Magnesium (Mg)	2017/07/02	<100		ug/L
			Manganese (Mn)	2017/07/02	<1.0		ug/L
			Molybdenum (Mo)	2017/07/02	<1.0		ug/L
			Nickel (Ni)	2017/07/02	<2.0		ug/L
			Total phosphorous	2017/07/02	<10		ug/L
			Lead (Pb)	2017/07/02	<0.50		ug/L
			Potassium (K)	2017/07/02	<500		ug/L
			Selenium (Se)	2017/07/02	<3.0		ug/L
			Sodium (Na)	2017/07/02	<500		ug/L
			Strontium (Sr)	2017/07/02	<2.0		ug/L
			Thallium (Tl)	2017/07/02	<2.0		ug/L
			Titanium (Ti)	2017/07/02	<10		ug/L
			Uranium (U)	2017/07/02	<1.0		ug/L
			Vanadium (V)	2017/07/02	2.5, RDL=2.0		ug/L
			Zinc (Zn)	2017/07/02	<7.0		ug/L
1797401	CRO	Method Blank DUP	Aluminum (Al)	2017/07/02	<10		ug/L
			Antimony (Sb)	2017/07/02	<1.0		ug/L
			Silver (Ag)	2017/07/02	<1.0		ug/L
			Arsenic (As)	2017/07/02	<1.0		ug/L
			Barium (Ba)	2017/07/02	<2.0		ug/L
			Beryllium (Be)	2017/07/02	<2.0		ug/L

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TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
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Your P.O. #: 2200001778
Sampler Initials: YE

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Bismuth (Bi)	2017/07/02	<1.0		ug/L
			Boron (B)	2017/07/02	<50		ug/L
			Cadmium (Cd)	2017/07/02	<0.20		ug/L
			Calcium (Ca)	2017/07/02	<500		ug/L
			Chromium (Cr)	2017/07/02	<5.0		ug/L
			Cobalt (Co)	2017/07/02	<1.0		ug/L
			Copper (Cu)	2017/07/02	<1.0		ug/L
			Total Hardness (CaCO3)	2017/07/02	<1000		ug/L
			Tin (Sn)	2017/07/02	<2.0		ug/L
			Iron (Fe)	2017/07/02	<60		ug/L
			Magnesium (Mg)	2017/07/02	<100		ug/L
			Manganese (Mn)	2017/07/02	<1.0		ug/L
			Molybdenum (Mo)	2017/07/02	<1.0		ug/L
			Nickel (Ni)	2017/07/02	<2.0		ug/L
			Total phosphorous	2017/07/02	<10		ug/L
			Lead (Pb)	2017/07/02	<0.50		ug/L
			Potassium (K)	2017/07/02	<500		ug/L
			Selenium (Se)	2017/07/02	<3.0		ug/L
			Sodium (Na)	2017/07/02	<500		ug/L
			Strontium (Sr)	2017/07/02	<2.0		ug/L
			Thallium (Tl)	2017/07/02	<2.0		ug/L
			Titanium (Ti)	2017/07/02	<10		ug/L
			Uranium (U)	2017/07/02	<1.0		ug/L
			Vanadium (V)	2017/07/02	2.3, RDL=2.0		ug/L
			Zinc (Zn)	2017/07/02	<7.0		ug/L
1797632	MCC	QC Standard	Chloride (Cl)	2017/06/30		97	%
			Sulfates (SO4)	2017/06/30		101	%
1797632	MCC	QC Standard DUP	Chloride (Cl)	2017/06/30		97	%
			Sulfates (SO4)	2017/06/30		101	%
1797632	MCC	Method Blank	Chloride (Cl)	2017/06/30	<0.050		mg/L
			Sulfates (SO4)	2017/06/30	<0.50		mg/L
1797632	MCC	Method Blank DUP	Chloride (Cl)	2017/06/30	<0.050		mg/L
			Sulfates (SO4)	2017/06/30	<0.50		mg/L
1797638	MCC	QC Standard	Nitrates (N-NO3-)	2017/06/30		101	%
1797638	MCC	Spiked Blank	Nitrites (N-NO2-)	2017/06/30		103	%
1797638	MCC	Method Blank	Nitrates (N-NO3-)	2017/06/30	<0.020		mg/L
			Nitrites (N-NO2-)	2017/06/30	<0.020		mg/L
1797725	CB8	QC Standard	pH	2017/06/30		100	%
1797727	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2017/06/30		94	%
1797727	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2017/06/30	<1.0		mg/L
1797732	CB8	QC Standard	Conductivity	2017/06/30		99	%
1797732	CB8	Method Blank	Conductivity	2017/06/30	<0.0010		mS/cm
1797733	CB8	QC Standard	Fluoride (F)	2017/06/30		98	%
1797733	CB8	Method Blank	Fluoride (F)	2017/06/30	<0.10		mg/L
1797760	GG1	Spiked Blank	BOD5	2017/07/05		102	%
1797760	GG1	Spiked Blank DUP	BOD5	2017/07/05		112	%
1797760	GG1	Method Blank	BOD5	2017/07/05	<4.0		mg/L
1797760	GG1	Method Blank DUP	BOD5	2017/07/05	<4.0		mg/L
1797957	MCC	Spiked Blank	Total suspended solids (TSS)	2017/07/03		98	%

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1797957	MCC	Method Blank	Total suspended solids (TSS)	2017/07/03	<2.0		mg/L
1798010	MCC	QC Standard	Nitrogen ammonia (N-NH3)	2017/07/04		106	%
1798010	MCC	Method Blank	Nitrogen ammonia (N-NH3)	2017/07/04	<0.020		mg/L
1798065	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2017/07/05		98	%
1798065	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2017/07/05	<0.40		mg/L
1798169	SD2	Spiked Blank	Mercury (Hg)	2017/07/05		103	%
1798169	SD2	Method Blank	Mercury (Hg)	2017/07/05	<0.000010		mg/L
1798180	MDR	QC Standard	COD	2017/07/04		92	%
1798180	MDR	QC Standard DUP	COD	2017/07/04		103	%
1798180	MDR	Method Blank	COD	2017/07/04	<10		mg/L
1798180	MDR	Method Blank DUP	COD	2017/07/04	<10		mg/L
1798241	GG1	QC Standard	Reactive silica (SiO2)	2017/07/04		96	%
1798241	GG1	Method Blank	Reactive silica (SiO2)	2017/07/04	<0.10		mg/L
1799025	DKH	Spiked Blank	Total Cyanide (CN)	2017/07/06		100	%
1799025	DKH	Method Blank	Total Cyanide (CN)	2017/07/06	<0.0030		mg/L
1799348	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2017/07/06		99	%
1799348	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2017/07/06		109	%
1799348	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2017/07/06	<0.0080		mg/L
1799575	MR4	Spiked Blank	Dissolved organic carbon	2017/07/06		103	%
1799575	MR4	Method Blank	Dissolved organic carbon	2017/07/06	1.3, RDL=0.20		mg/L
1799580	MR4	Spiked Blank	Total Organic Carbon	2017/07/06		100	%
1799580	MR4	Method Blank	Total Organic Carbon	2017/07/06	<0.20		mg/L
1799931	MEP	Spiked Blank	1-Chlorooctadecane	2017/07/08		103	%
			Petroleum Hydrocarbons (C10-C50)	2017/07/08		90	%
1799931	MEP	Method Blank	1-Chlorooctadecane	2017/07/08		90	%
			Petroleum Hydrocarbons (C10-C50)	2017/07/08	<100		ug/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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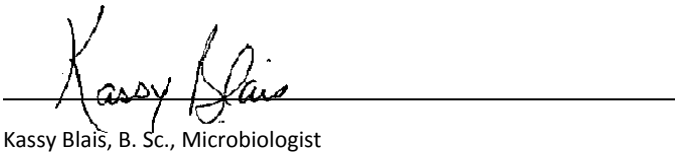
TATA STEEL MINERALS CANADA
Client Project #: DSO4 SURFACE WATER
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VALIDATION SIGNATURE PAGE

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



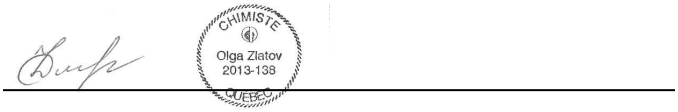
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Kassy Blais, B. Sc., Microbiologist



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist



Olga Zlatov Polevoi, Analyst I



Veronic Beausejour, B.Sc., Chemist, Supervisor

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Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Votre # du projet: B739727

Attention:Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/07/24
Rapport: R4610769
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7E6456
Reçu: 2017/07/12, 12:35

Matrice: EAU DE SURFACE
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2017/07/22	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B739727

Attention:Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/07/24
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CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7E6456
Reçu: 2017/07/12, 12:35

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Simona Vatamanescu,
Courriel: SVatamanescu@maxxam.ca
Téléphone (905)826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B7E6456
Date du rapport: 2017/07/24

Maxxam Analytique
Votre # du projet: B739727

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU DE SURFACE

Identification Maxxam		ESO880		
Date d'échantillonnage		2017/07/10 09:35		
	Unités	**EF9693-DSO4-ER-GW-Q2-2017**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5076419

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B7E6456
Date du rapport: 2017/07/24

Maxxam Analytique
Votre # du projet: B739727

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B7E6456
Date du rapport: 2017/07/24

Maxxam Analytique
Votre # du projet: B739727

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5076419	FA5	Blanc fortifié	Radium-226	2017/07/20		97	%	85 - 115
5076419	FA5	Blanc de méthode	Radium-226	2017/07/20	<0.0050		Bq/L	
5076419	FA5	RPD	Radium-226	2017/07/20	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

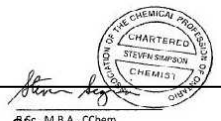
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Dossier Maxxam: B7E6456
Date du rapport: 2017/07/24

Maxxam Analytique
Votre # du projet: B739727

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

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Your P.O. #: 2200001778
Your Project #: GOODWOOD SURFACE WATER
Site#: TSMC
Site Location: DSO4 2A
Your C.O.C. #: 161195-02-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/07/24
Report #: R2302826
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B739727
Received: 2017/07/11, 09:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2017/07/11	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions*	1	N/A	2017/07/11	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Non-Typical Bacteria*	1	N/A	2017/07/11	QUE SOP-00304	MA 700-COL 1.0
Biochemical Oxygen Demand (5 days) (3)*	1	2017/07/12	2017/07/17	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	1	2017/07/13	2017/07/17	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide (1)*	1	2017/07/13	2017/07/13	STL SOP-00035	MA300-CN 1.2 R3 m
Chemical Oxygen Demand*	1	2017/07/11	2017/07/11	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms*	1	N/A	2017/07/11	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms*	1	N/A	2017/07/11	QUE SOP-00304	MA.700-Col 1.0
Conductivity*	1	N/A	2017/07/11	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2017/07/13	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)***	1	2017/07/12	2017/07/13	STL SOP-00243	MA.300-C1.0 R6m
Fluoride*	1	N/A	2017/07/12	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)***	1	2017/07/17	2017/07/18	STL SOP-00042	MA.200–Hg 1.1 R1 m
Radium 226 (MMER LOW LEVEL) (2)	1	N/A	N/A		
Total Suspended Solids*	1	2017/07/11	2017/07/11	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)*	1	2017/07/12	2017/07/12	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen*	1	N/A	2017/07/13	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite*	1	N/A	2017/07/11	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen***	1	N/A	2017/07/11	SM 421 F	MA315-DBO 1.1 R3 m
pH*	1	N/A	2017/07/11	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus*	1	2017/07/11	2017/07/11	QUE SOP-00132	MA.200-Mét. 1.2 R5m
Reactive Silica (SiO2)***	1	N/A	2017/07/11	QUE SOP-00150	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN)*	1	2017/07/14	2017/07/17	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 5)*	1	N/A	2017/07/13	STL SOP-00243	MA.300-C1.0 R6m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

Your P.O. #: 2200001778
Your Project #: GOODWOOD SURFACE WATER
Site#: TSMC
Site Location: DSO4 2A
Your C.O.C. #: 161195-02-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/07/24
Report #: R2302826
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B739727
Received: 2017/07/11, 09:00

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam-Radiological Lab
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201
==========
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Maxxam Job #: B739727
Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		EF9693		
Sampling Date		2017/07/10 09:35		
COC Number		161195-02-01		
	Units	**DSO4-ER-GW-Q2-2017**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1803219
Surrogate Recovery (%)				
1-Chlorooctadecane	%	105	N/A	1803219

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

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Maxxam Job #: B739727
Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		EF9693		
Sampling Date		2017/07/10 09:35		
COC Number		161195-02-01		
	Units	DSO4-ER-GW-Q2-2017	RDL	QC Batch
METALS				
Mercury (Hg)	mg/L	<0.000010	0.000010	1804077
METALS ICP-MS				
Aluminum (Al)	ug/L	19	10	1802108
Antimony (Sb)	ug/L	<1.0	1.0	1802108
Silver (Ag)	ug/L	<1.0	1.0	1802108
Arsenic (As)	ug/L	<1.0	1.0	1802108
Barium (Ba)	ug/L	<2.0	2.0	1802108
Beryllium (Be)	ug/L	<2.0	2.0	1802108
Bismuth (Bi)	ug/L	<1.0	1.0	1802108
Boron (B)	ug/L	<50	50	1802108
Cadmium (Cd)	ug/L	<0.20	0.20	1802108
Calcium (Ca)	ug/L	<500	500	1802108
Chromium (Cr)	ug/L	<5.0	5.0	1802108
Cobalt (Co)	ug/L	<1.0	1.0	1802108
Copper (Cu)	ug/L	<1.0	1.0	1802108
Total Hardness (CaCO3)	ug/L	<1000	1000	1802108
Tin (Sn)	ug/L	<2.0	2.0	1802108
Iron (Fe)	ug/L	<60	60	1802108
Magnesium (Mg)	ug/L	<100	100	1802108
Manganese (Mn)	ug/L	13	1.0	1802108
Molybdenum (Mo)	ug/L	<1.0	1.0	1802108
Nickel (Ni)	ug/L	<2.0	2.0	1802108
Total phosphorous	ug/L	<10	10	1802108
Lead (Pb)	ug/L	<0.50	0.50	1802108
Potassium (K)	ug/L	<500	500	1802108
Selenium (Se)	ug/L	<3.0	3.0	1802108
Sodium (Na)	ug/L	<500	500	1802108
Strontium (Sr)	ug/L	<2.0	2.0	1802108
Thallium (Tl)	ug/L	<2.0	2.0	1802108
Titanium (Ti)	ug/L	<10	10	1802108
Uranium (U)	ug/L	<1.0	1.0	1802108
Vanadium (V)	ug/L	2.3	2.0	1802108
Zinc (Zn)	ug/L	<7.0	7.0	1802108

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B739727
Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		EF9693	EF9693		
Sampling Date		2017/07/10 09:35	2017/07/10 09:35		
COC Number		161195-02-01	161195-02-01		
	Units	**DSO4-ER-GW-Q2-2017**	**DSO4-ER-GW-Q2-2017 Lab-Dup**	**RDL**	**QC Batch**
CONVENTIONALS					
BOD5	mg/L	<4.0	N/A	4.0	1801882
COD	mg/L	26	N/A	10	1801372
Conductivity	mS/cm	0.0018	N/A	0.0010	1801746
Dissolved organic carbon	mg/L	1.4	N/A	0.20	1802501
Dissolved oxygen	mg/L	8.7	N/A	1.0	1801572
Fluoride (F)	mg/L	<0.10	<0.10	0.10	1802303
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	N/A	0.0080	1802698
Nitrates (N-NO3-)	mg/L	<0.020	N/A	0.020	1801612
Nitrites (N-NO2-)	mg/L	<0.020	N/A	0.020	1801612
Nitrogen ammonia (N-NH3)	mg/L	0.020	0.030	0.020	1802530
pH	pH	6.25	N/A	N/A	1801744
Reactive silica (SiO2)	mg/L	0.14	N/A	0.10	1801517
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	N/A	0.40	1803245
Total Cyanide (CN)	mg/L	<0.0030	N/A	0.0030	1802947
Total Organic Carbon	mg/L	1.8	N/A	0.20	1802968
Alkalinity Total (as CaCO3) pH 4.5	mg/L	2.1	N/A	1.0	1801745
Chloride (Cl)	mg/L	0.080	N/A	0.050	1801355
Sulfates (SO4)	mg/L	<0.50	N/A	0.50	1801355
Total suspended solids (TSS)	mg/L	<2.0	N/A	2.0	1801273

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

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Maxxam Job #: B739727
Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		EF9693		
Sampling Date		2017/07/10 09:35		
COC Number		161195-02-01		
	Units	**DSO4-ER-GW-Q2-2017**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	1230	10	1801474
Non-typical bacteria	/membrane	890	10	1801475
Fecal coliforms	UFC/100ml	0	N/A	1801473

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

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Maxxam Job #: B739727
Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

GENERAL COMMENTS

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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Maxxam Job #: B739727
Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1801273	LAR	Spiked Blank	Total suspended solids (TSS)	2017/07/11		96	%
1801273	LAR	Method Blank	Total suspended solids (TSS)	2017/07/11	<2.0		mg/L
1801355	MCC	QC Standard	Chloride (Cl)	2017/07/11		97	%
			Sulfates (SO4)	2017/07/11		101	%
1801355	MCC	Method Blank	Chloride (Cl)	2017/07/11	<0.050		mg/L
			Sulfates (SO4)	2017/07/11	<0.50		mg/L
1801372	MDR	QC Standard	COD	2017/07/11		99	%
1801372	MDR	QC Standard DUP	COD	2017/07/11		87	%
1801372	MDR	Method Blank	COD	2017/07/11	<10		mg/L
1801372	MDR	Method Blank DUP	COD	2017/07/11	<10		mg/L
1801517	AG5	QC Standard	Reactive silica (SiO2)	2017/07/11		98	%
1801517	AG5	Method Blank	Reactive silica (SiO2)	2017/07/11	<0.10		mg/L
1801612	MCC	QC Standard	Nitrates (N-NO3-)	2017/07/11		100	%
1801612	MCC	Spiked Blank	Nitrites (N-NO2-)	2017/07/11		101	%
1801612	MCC	Method Blank	Nitrates (N-NO3-)	2017/07/11	<0.020		mg/L
			Nitrites (N-NO2-)	2017/07/11	<0.020		mg/L
1801744	CB8	QC Standard	pH	2017/07/11		100	%
1801745	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2017/07/11		101	%
1801745	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2017/07/11	<1.0		mg/L
1801746	CB8	QC Standard	Conductivity	2017/07/11		98	%
1801746	CB8	Method Blank	Conductivity	2017/07/11	<0.0010		mS/cm
1801882	AG5	Spiked Blank	BOD5	2017/07/17		98	%
1801882	AG5	Spiked Blank DUP	BOD5	2017/07/17		110	%
1801882	AG5	Method Blank	BOD5	2017/07/17	<4.0		mg/L
1801882	AG5	Method Blank DUP	BOD5	2017/07/17	<4.0		mg/L
1802108	MDR	QC Standard	Aluminum (Al)	2017/07/12		89	%
			Antimony (Sb)	2017/07/12		102	%
			Arsenic (As)	2017/07/12		101	%
			Barium (Ba)	2017/07/12		95	%
			Beryllium (Be)	2017/07/12		104	%
			Boron (B)	2017/07/12		100	%
			Cadmium (Cd)	2017/07/12		100	%
			Calcium (Ca)	2017/07/12		99	%
			Chromium (Cr)	2017/07/12		100	%
			Cobalt (Co)	2017/07/12		102	%
			Copper (Cu)	2017/07/12		101	%
			Iron (Fe)	2017/07/12		107	%
			Magnesium (Mg)	2017/07/12		94	%
			Manganese (Mn)	2017/07/12		101	%
			Molybdenum (Mo)	2017/07/12		95	%
			Nickel (Ni)	2017/07/12		100	%
			Total phosphorous	2017/07/12		93	%
			Lead (Pb)	2017/07/12		105	%
			Potassium (K)	2017/07/12		95	%
			Selenium (Se)	2017/07/12		100	%
			Sodium (Na)	2017/07/12		99	%
			Strontium (Sr)	2017/07/12		99	%
			Thallium (Tl)	2017/07/12		115	%
			Uranium (U)	2017/07/12		105	%
			Vanadium (V)	2017/07/12		97	%

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Maxxam Job #: B739727
Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Zinc (Zn)	2017/07/12		102	%
1802108	MDR	QC Standard DUP	Aluminum (Al)	2017/07/12		89	%
			Antimony (Sb)	2017/07/12		99	%
			Arsenic (As)	2017/07/12		97	%
			Barium (Ba)	2017/07/12		94	%
			Beryllium (Be)	2017/07/12		100	%
			Boron (B)	2017/07/12		98	%
			Cadmium (Cd)	2017/07/12		99	%
			Calcium (Ca)	2017/07/12		98	%
			Chromium (Cr)	2017/07/12		97	%
			Cobalt (Co)	2017/07/12		99	%
			Copper (Cu)	2017/07/12		98	%
			Iron (Fe)	2017/07/12		103	%
			Magnesium (Mg)	2017/07/12		91	%
			Manganese (Mn)	2017/07/12		97	%
			Molybdenum (Mo)	2017/07/12		93	%
			Nickel (Ni)	2017/07/12		96	%
			Total phosphorous	2017/07/12		92	%
			Lead (Pb)	2017/07/12		103	%
			Potassium (K)	2017/07/12		92	%
			Selenium (Se)	2017/07/12		97	%
			Sodium (Na)	2017/07/12		97	%
			Strontium (Sr)	2017/07/12		97	%
			Thallium (Tl)	2017/07/12		111	%
			Uranium (U)	2017/07/12		101	%
			Vanadium (V)	2017/07/12		93	%
			Zinc (Zn)	2017/07/12		99	%
1802108	MDR	Spiked Blank	Aluminum (Al)	2017/07/12		101	%
			Antimony (Sb)	2017/07/12		102	%
			Silver (Ag)	2017/07/12		99	%
			Arsenic (As)	2017/07/12		100	%
			Barium (Ba)	2017/07/12		89	%
			Beryllium (Be)	2017/07/12		102	%
			Bismuth (Bi)	2017/07/12		88	%
			Boron (B)	2017/07/12		97	%
			Cadmium (Cd)	2017/07/12		102	%
			Calcium (Ca)	2017/07/12		100	%
			Chromium (Cr)	2017/07/12		102	%
			Cobalt (Co)	2017/07/12		98	%
			Copper (Cu)	2017/07/12		100	%
			Tin (Sn)	2017/07/12		103	%
			Iron (Fe)	2017/07/12		99	%
			Magnesium (Mg)	2017/07/12		94	%
			Manganese (Mn)	2017/07/12		97	%
			Molybdenum (Mo)	2017/07/12		96	%
			Nickel (Ni)	2017/07/12		98	%
			Total phosphorous	2017/07/12		93	%
			Lead (Pb)	2017/07/12		102	%
			Potassium (K)	2017/07/12		94	%
			Selenium (Se)	2017/07/12		103	%

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Maxxam Job #: B739727
Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Sodium (Na)	2017/07/12		92	%
			Strontium (Sr)	2017/07/12		91	%
			Thallium (Tl)	2017/07/12		103	%
			Titanium (Ti)	2017/07/12		92	%
			Uranium (U)	2017/07/12		93	%
			Vanadium (V)	2017/07/12		101	%
			Zinc (Zn)	2017/07/12		99	%
1802108	MDR	Spiked Blank DUP	Aluminum (Al)	2017/07/12		104	%
			Antimony (Sb)	2017/07/12		103	%
			Silver (Ag)	2017/07/12		100	%
			Arsenic (As)	2017/07/12		99	%
			Barium (Ba)	2017/07/12		91	%
			Beryllium (Be)	2017/07/12		101	%
			Bismuth (Bi)	2017/07/12		89	%
			Boron (B)	2017/07/12		99	%
			Cadmium (Cd)	2017/07/12		103	%
			Calcium (Ca)	2017/07/12		97	%
			Chromium (Cr)	2017/07/12		102	%
			Cobalt (Co)	2017/07/12		98	%
			Copper (Cu)	2017/07/12		97	%
			Tin (Sn)	2017/07/12		102	%
			Iron (Fe)	2017/07/12		100	%
			Magnesium (Mg)	2017/07/12		95	%
			Manganese (Mn)	2017/07/12		97	%
			Molybdenum (Mo)	2017/07/12		96	%
			Nickel (Ni)	2017/07/12		92	%
			Total phosphorous	2017/07/12		102	%
			Lead (Pb)	2017/07/12		104	%
			Potassium (K)	2017/07/12		95	%
			Selenium (Se)	2017/07/12		105	%
			Sodium (Na)	2017/07/12		93	%
			Strontium (Sr)	2017/07/12		93	%
			Thallium (Tl)	2017/07/12		106	%
			Titanium (Ti)	2017/07/12		96	%
			Uranium (U)	2017/07/12		94	%
			Vanadium (V)	2017/07/12		103	%
			Zinc (Zn)	2017/07/12		101	%
1802108	MDR	Method Blank	Aluminum (Al)	2017/07/12	<10		ug/L
			Antimony (Sb)	2017/07/12	<1.0		ug/L
			Silver (Ag)	2017/07/12	<1.0		ug/L
			Arsenic (As)	2017/07/12	<1.0		ug/L
			Barium (Ba)	2017/07/12	<2.0		ug/L
			Beryllium (Be)	2017/07/12	<2.0		ug/L
			Bismuth (Bi)	2017/07/12	<1.0		ug/L
			Boron (B)	2017/07/12	<50		ug/L
			Cadmium (Cd)	2017/07/12	<0.20		ug/L
			Calcium (Ca)	2017/07/12	<500		ug/L
			Chromium (Cr)	2017/07/12	<5.0		ug/L
			Cobalt (Co)	2017/07/12	<1.0		ug/L
			Copper (Cu)	2017/07/12	<1.0		ug/L

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Maxxam Job #: B739727
Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Total Hardness (CaCO3)	2017/07/12	<1000		ug/L
			Tin (Sn)	2017/07/12	<2.0		ug/L
			Iron (Fe)	2017/07/12	<60		ug/L
			Magnesium (Mg)	2017/07/12	<100		ug/L
			Manganese (Mn)	2017/07/12	<1.0		ug/L
			Molybdenum (Mo)	2017/07/12	<1.0		ug/L
			Nickel (Ni)	2017/07/12	<2.0		ug/L
			Total phosphorous	2017/07/12	<10		ug/L
			Lead (Pb)	2017/07/12	<0.50		ug/L
			Potassium (K)	2017/07/12	<500		ug/L
			Selenium (Se)	2017/07/12	<3.0		ug/L
			Sodium (Na)	2017/07/12	<500		ug/L
			Strontium (Sr)	2017/07/12	<2.0		ug/L
			Thallium (Tl)	2017/07/12	<2.0		ug/L
			Titanium (Ti)	2017/07/12	<10		ug/L
			Uranium (U)	2017/07/12	<1.0		ug/L
			Vanadium (V)	2017/07/12	<2.0		ug/L
			Zinc (Zn)	2017/07/12	<7.0		ug/L
1802108	MDR	Method Blank DUP	Aluminum (Al)	2017/07/12	<10		ug/L
			Antimony (Sb)	2017/07/12	<1.0		ug/L
			Silver (Ag)	2017/07/12	<1.0		ug/L
			Arsenic (As)	2017/07/12	<1.0		ug/L
			Barium (Ba)	2017/07/12	<2.0		ug/L
			Beryllium (Be)	2017/07/12	<2.0		ug/L
			Bismuth (Bi)	2017/07/12	<1.0		ug/L
			Boron (B)	2017/07/12	<50		ug/L
			Cadmium (Cd)	2017/07/12	<0.20		ug/L
			Calcium (Ca)	2017/07/12	<500		ug/L
			Chromium (Cr)	2017/07/12	<5.0		ug/L
			Cobalt (Co)	2017/07/12	<1.0		ug/L
			Copper (Cu)	2017/07/12	<1.0		ug/L
			Total Hardness (CaCO3)	2017/07/12	<1000		ug/L
			Tin (Sn)	2017/07/12	<2.0		ug/L
			Iron (Fe)	2017/07/12	<60		ug/L
			Magnesium (Mg)	2017/07/12	<100		ug/L
			Manganese (Mn)	2017/07/12	<1.0		ug/L
			Molybdenum (Mo)	2017/07/12	<1.0		ug/L
			Nickel (Ni)	2017/07/12	<2.0		ug/L
			Total phosphorous	2017/07/12	<10		ug/L
			Lead (Pb)	2017/07/12	<0.50		ug/L
			Potassium (K)	2017/07/12	<500		ug/L
			Selenium (Se)	2017/07/12	<3.0		ug/L
			Sodium (Na)	2017/07/12	<500		ug/L
			Strontium (Sr)	2017/07/12	<2.0		ug/L
			Thallium (Tl)	2017/07/12	<2.0		ug/L
			Titanium (Ti)	2017/07/12	<10		ug/L
			Uranium (U)	2017/07/12	<1.0		ug/L
			Vanadium (V)	2017/07/12	<2.0		ug/L
			Zinc (Zn)	2017/07/12	<7.0		ug/L
1802303	CB8	QC Standard	Fluoride (F)	2017/07/12		109	%

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Maxxam Job #: B739727
Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1802303	CB8	Method Blank	Fluoride (F)	2017/07/12	<0.10		mg/L
1802501	MR4	Spiked Blank	Dissolved organic carbon	2017/07/13		102	%
1802501	MR4	Method Blank	Dissolved organic carbon	2017/07/13	1.4, RDL=0.20		mg/L
1802530	MCC	QC Standard	Nitrogen ammonia (N-NH3)	2017/07/13		106	%
1802530	MCC	Method Blank	Nitrogen ammonia (N-NH3)	2017/07/13	<0.020		mg/L
1802698	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2017/07/13		96	%
1802698	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2017/07/13		105	%
1802698	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2017/07/13	<0.0080		mg/L
1802947	MH1	Spiked Blank	Total Cyanide (CN)	2017/07/13		102	%
1802947	MH1	Method Blank	Total Cyanide (CN)	2017/07/13	<0.0030		mg/L
1802968	MR4	Spiked Blank	Total Organic Carbon	2017/07/13		104	%
1802968	MR4	Method Blank	Total Organic Carbon	2017/07/13	<0.20		mg/L
1803219	VBO	Spiked Blank	1-Chlorooctadecane	2017/07/16		108	%
			Petroleum Hydrocarbons (C10-C50)	2017/07/16		85	%
1803219	VBO	Method Blank	1-Chlorooctadecane	2017/07/16		107	%
			Petroleum Hydrocarbons (C10-C50)	2017/07/16	<100		ug/L
1803245	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2017/07/17		95	%
1803245	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2017/07/17	<0.40		mg/L
1804077	RNP	QC Standard	Mercury (Hg)	2017/07/18		95	%
1804077	RNP	Spiked Blank	Mercury (Hg)	2017/07/18		104	%
1804077	RNP	Method Blank	Mercury (Hg)	2017/07/18	<0.000010		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Report Date: 2017/07/24

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 2A
Your P.O. #: 2200001778
Sampler Initials: LM

VALIDATION SIGNATURE PAGE

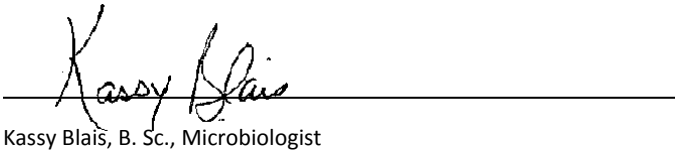
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Dochka Koleva Hristova, B.Sc., Chemist



Jonathan Fauvel, B.Sc, Chimiste, Analyste II



Kassy Blais, B. Sc., Microbiologist



Madina Hamrouni, B.Sc., Chemist



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Votre # du projet: B745430

Attention:Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/08/10
Rapport: R4642624
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7G4531
Reçu: 2017/08/02, 10:04

Matrice: EAU DE SURFACE
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2017/08/09	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B745430

Attention:Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/08/10
Rapport: R4642624
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7G4531
Reçu: 2017/08/02, 10:04

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Simona Vatamanescu,
Courriel: SVatamanescu@maxxam.ca
Téléphone (905)826-3080

==========

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Dossier Maxxam: B7G4531
Date du rapport: 2017/08/10

Maxxam Analytique
Votre # du projet: B745430

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU DE SURFACE

Identification Maxxam		EWC422		
Date d'échantillonnage		2017/07/31 08:45		
	Unités	**EI9213-DSO4-EE-GW-Q2-2017**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5101933

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

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Dossier Maxxam: B7G4531
Date du rapport: 2017/08/10

Maxxam Analytique
Votre # du projet: B745430

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B7G4531
Date du rapport: 2017/08/10

Maxxam Analytique
Votre # du projet: B745430

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5101933	FA5	Blanc fortifié	Radium-226	2017/08/09		97	%	85 - 115
5101933	FA5	Blanc de méthode	Radium-226	2017/08/09	<0.0050		Bq/L	
5101933	FA5	RPD	Radium-226	2017/08/09	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

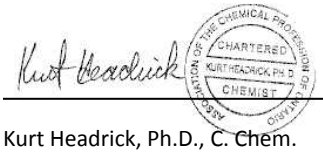
Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B7G4531
Date du rapport: 2017/08/10

Maxxam Analytique
Votre # du projet: B745430

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Your P.O. #: 2200001778
Your Project #: GOODWOOD SURFACE WATER
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 161196-01-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/08/11
Report #: R2308976
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B745430
Received: 2017/08/01, 10:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2017/08/01	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions*	1	N/A	2017/08/01	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Non-Typical Bacteria*	1	N/A	2017/08/02	QUE SOP-00304	MA 700-COL 1.0
Biochemical Oxygen Demand (5 days) (3)*	1	2017/08/02	2017/08/07	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	1	2017/08/04	2017/08/04	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide (1)*	1	2017/08/03	2017/08/03	STL SOP-00035	MA300-CN 1.2 R3 m
Chemical Oxygen Demand*	1	2017/08/03	2017/08/03	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms*	1	N/A	2017/08/02	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms*	1	N/A	2017/08/02	QUE SOP-00304	MA.700-Col 1.0
Conductivity*	1	N/A	2017/08/03	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2017/08/03	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)***	1	2017/08/04	2017/08/04	STL SOP-00243	MA.300-C1.0 R6m
Fluoride*	1	N/A	2017/08/05	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)***	1	2017/08/07	2017/08/08	STL SOP-00042	MA.200–Hg 1.1 R1 m
Radium 226 (MMER LOW LEVEL) (2)	1	N/A	N/A		
Total Suspended Solids*	1	2017/08/01	2017/08/01	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)*	1	2017/08/07	2017/08/09	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen*	1	N/A	2017/08/03	QUE SOP-00126	MA.300–N 2.0 R2 m
Dissolved Oxygen***	1	N/A	2017/08/01	SM 421 F	MA315-DBO 1.1 R3 m
pH*	1	N/A	2017/08/01	QUE SOP-00142	MA.303-TitrAuto 2.1m
Reactive Silica (SiO2)***	1	N/A	2017/08/08	QUE SOP-00150	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN)*	1	2017/08/07	2017/08/08	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 5)*	1	N/A	2017/08/03	STL SOP-00243	MA.300-C1.0 R6m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using

Your P.O. #: 2200001778
Your Project #: GOODWOOD SURFACE WATER
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 161196-01-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/08/11
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CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B745430
Received: 2017/08/01, 10:00

accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam-Radiological Lab
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

==========

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 #: B745430
Report Date: 2017/08/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		EI9213		
Sampling Date		2017/07/31 08:45		
COC Number		161196-01-01		
	Units	DSO4-EE-GW-Q2-2017	RDL	QC Batch
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1820976
Surrogate Recovery (%)				
1-Chlorooctadecane	%	86	N/A	1820976

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

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B745430
Report Date: 2017/08/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		EI9213		
Sampling Date		2017/07/31 08:45		
COC Number		161196-01-01		
	Units	DSO4-EE-GW-Q2-2017	RDL	QC Batch
METALS				
Mercury (Hg)	mg/L	<0.000010	0.000010	1821518
METALS ICP-MS				
Aluminum (Al)	ug/L	22	10	1821715
Antimony (Sb)	ug/L	<1.0	1.0	1821715
Silver (Ag)	ug/L	<1.0	1.0	1821715
Arsenic (As)	ug/L	<1.0	1.0	1821715
Barium (Ba)	ug/L	2.1	2.0	1821715
Beryllium (Be)	ug/L	<2.0	2.0	1821715
Bismuth (Bi)	ug/L	<1.0	1.0	1821715
Boron (B)	ug/L	<50	50	1821715
Cadmium (Cd)	ug/L	<0.20	0.20	1821715
Calcium (Ca)	ug/L	<500	500	1821715
Chromium (Cr)	ug/L	<5.0	5.0	1821715
Cobalt (Co)	ug/L	<1.0	1.0	1821715
Copper (Cu)	ug/L	<1.0	1.0	1821715
Total Hardness (CaCO3)	ug/L	<1000	1000	1821715
Tin (Sn)	ug/L	<2.0	2.0	1821715
Iron (Fe)	ug/L	<60	60	1821715
Magnesium (Mg)	ug/L	<100	100	1821715
Manganese (Mn)	ug/L	15	1.0	1821715
Molybdenum (Mo)	ug/L	<1.0	1.0	1821715
Nickel (Ni)	ug/L	<2.0	2.0	1821715
Total phosphorous	ug/L	<10	10	1821715
Lead (Pb)	ug/L	<0.50	0.50	1821715
Potassium (K)	ug/L	<500	500	1821715
Selenium (Se)	ug/L	<3.0	3.0	1821715
Sodium (Na)	ug/L	<500	500	1821715
Strontium (Sr)	ug/L	<2.0	2.0	1821715
Thallium (Tl)	ug/L	<2.0	2.0	1821715
Titanium (Ti)	ug/L	<10	10	1821715
Uranium (U)	ug/L	<1.0	1.0	1821715
Vanadium (V)	ug/L	<2.0	2.0	1821715
Zinc (Zn)	ug/L	<7.0	7.0	1821715

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B745430
Report Date: 2017/08/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		EI9213	EI9213		
Sampling Date		2017/07/31 08:45	2017/07/31 08:45		
COC Number		161196-01-01	161196-01-01		
	Units	**DSO4-EE-GW-Q2-2017**	**DSO4-EE-GW-Q2-2017 Lab-Dup**	**RDL**	**QC Batch**
CONVENTIONALS					
BOD5	mg/L	<4.0	N/A	4.0	1819967
COD	mg/L	<10	N/A	10	1820448
Conductivity	mS/cm	0.0020	N/A	0.0010	1819623
Dissolved organic carbon	mg/L	1.5	N/A	0.20	1821135
Dissolved oxygen	mg/L	9.0	N/A	1.0	1819558
Fluoride (F)	mg/L	<0.10	N/A	0.10	1820577
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	N/A	0.0080	1820342
Nitrogen ammonia (N-NH3)	mg/L	0.10	0.080	0.020	1820272
pH	pH	5.49	N/A	N/A	1819622
Reactive silica (SiO2)	mg/L	0.67	N/A	0.10	1821789
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	N/A	0.40	1821531
Total Cyanide (CN)	mg/L	<0.0030	N/A	0.0030	1820628
Total Organic Carbon	mg/L	1.7	N/A	0.20	1820416
Alkalinity Total (as CaCO3) pH 4.5	mg/L	<1.0	N/A	1.0	1819624
Chloride (Cl)	mg/L	0.070	N/A	0.050	1819447
Nitrate (N) and Nitrite(N)	mg/L	<0.020	N/A	0.020	1819447
Sulfates (SO4)	mg/L	<0.50	N/A	0.50	1819447
Total suspended solids (TSS)	mg/L	3.0	N/A	2.0	1819476

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

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Report Date: 2017/08/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		EI9213		
Sampling Date		2017/07/31 08:45		
COC Number		161196-01-01		
	Units	**DSO4-EE-GW-Q2-2017**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	3000	100	1819893
Non-typical bacteria	/membrane	400	100	1819894
Fecal coliforms	UFC/100ml	5	1	1819884

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

GENERAL COMMENTS

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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Maxxam Job #: B745430
Report Date: 2017/08/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1819447	MCC	QC Standard	Chloride (Cl)	2017/08/01		100	%
			Nitrate (N) and Nitrite(N)	2017/08/01		101	%
			Sulfates (SO4)	2017/08/01		104	%
1819447	MCC	Spiked Blank	Nitrate (N) and Nitrite(N)	2017/08/01		100	%
1819447	MCC	Method Blank	Chloride (Cl)	2017/08/01	<0.050		mg/L
			Nitrate (N) and Nitrite(N)	2017/08/01	<0.020		mg/L
			Sulfates (SO4)	2017/08/01	<0.50		mg/L
1819476	LAR	Spiked Blank	Total suspended solids (TSS)	2017/08/01		97	%
1819476	LAR	Method Blank	Total suspended solids (TSS)	2017/08/01	<2.0		mg/L
1819622	GG1	QC Standard	pH	2017/08/01		101	%
1819623	GG1	QC Standard	Conductivity	2017/08/01		100	%
1819623	GG1	Method Blank	Conductivity	2017/08/01	<0.0010		mS/cm
1819624	GG1	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2017/08/01		100	%
1819624	GG1	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2017/08/01	<1.0		mg/L
1819967	GG1	Spiked Blank	BOD5	2017/08/07		99	%
1819967	GG1	Spiked Blank DUP	BOD5	2017/08/07		94	%
1819967	GG1	Method Blank	BOD5	2017/08/07	<4.0		mg/L
1819967	GG1	Method Blank DUP	BOD5	2017/08/07	<4.0		mg/L
1820272	AG5	QC Standard	Nitrogen ammonia (N-NH3)	2017/08/03		104	%
1820272	AG5	QC Standard DUP	Nitrogen ammonia (N-NH3)	2017/08/03		101	%
1820272	AG5	Method Blank	Nitrogen ammonia (N-NH3)	2017/08/03	<0.020		mg/L
1820272	AG5	Method Blank DUP	Nitrogen ammonia (N-NH3)	2017/08/03	<0.020		mg/L
1820342	MR4	QC Standard	Hexavalent Chromium (Cr 6+)	2017/08/03		98	%
1820342	MR4	Spiked Blank	Hexavalent Chromium (Cr 6+)	2017/08/03		103	%
1820342	MR4	Method Blank	Hexavalent Chromium (Cr 6+)	2017/08/03	<0.0080		mg/L
1820416	JL1	Spiked Blank	Total Organic Carbon	2017/08/03		101	%
1820416	JL1	Method Blank	Total Organic Carbon	2017/08/03	<0.20		mg/L
1820448	LAR	QC Standard	COD	2017/08/03		100	%
1820448	LAR	QC Standard DUP	COD	2017/08/03		90	%
1820448	LAR	Method Blank	COD	2017/08/03	<10		mg/L
1820448	LAR	Method Blank DUP	COD	2017/08/03	<10		mg/L
1820577	AG5	QC Standard	Fluoride (F)	2017/08/03		97	%
1820577	AG5	Method Blank	Fluoride (F)	2017/08/03	<0.10		mg/L
1820628	MH1	Spiked Blank	Total Cyanide (CN)	2017/08/03		87	%
1820628	MH1	Method Blank	Total Cyanide (CN)	2017/08/03	<0.0030		mg/L
1820976	GTE	Spiked Blank	1-Chlorooctadecane	2017/08/04		106	%
			Petroleum Hydrocarbons (C10-C50)	2017/08/04		100	%
1820976	GTE	Method Blank	1-Chlorooctadecane	2017/08/04		98	%
			Petroleum Hydrocarbons (C10-C50)	2017/08/04	<100		ug/L
1821135	JL1	Spiked Blank	Dissolved organic carbon	2017/08/04		100	%
1821135	JL1	Method Blank	Dissolved organic carbon	2017/08/04	1.5, RDL=0.20		mg/L
1821518	RNP	Spiked Blank	Mercury (Hg)	2017/08/08		91	%
1821518	RNP	Method Blank	Mercury (Hg)	2017/08/08	<0.000010		mg/L
1821531	AG5	QC Standard	TKN Total Kjeldahl Nitrogen	2017/08/08		98	%
1821531	AG5	Method Blank	TKN Total Kjeldahl Nitrogen	2017/08/08	<0.40		mg/L
1821715	NS	QC Standard	Aluminum (Al)	2017/08/09		88	%
			Antimony (Sb)	2017/08/09		106	%
			Arsenic (As)	2017/08/09		100	%
			Barium (Ba)	2017/08/09		95	%

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Maxxam Job #: B745430
Report Date: 2017/08/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Beryllium (Be)	2017/08/09		102	%
			Boron (B)	2017/08/09		98	%
			Cadmium (Cd)	2017/08/09		99	%
			Calcium (Ca)	2017/08/09		94	%
			Chromium (Cr)	2017/08/09		101	%
			Cobalt (Co)	2017/08/09		101	%
			Copper (Cu)	2017/08/09		102	%
			Iron (Fe)	2017/08/09		111	%
			Magnesium (Mg)	2017/08/09		100	%
			Manganese (Mn)	2017/08/09		101	%
			Molybdenum (Mo)	2017/08/09		97	%
			Nickel (Ni)	2017/08/09		101	%
			Total phosphorous	2017/08/09		94	%
			Lead (Pb)	2017/08/09		100	%
			Potassium (K)	2017/08/09		94	%
			Selenium (Se)	2017/08/09		96	%
			Sodium (Na)	2017/08/09		97	%
			Strontium (Sr)	2017/08/09		95	%
			Thallium (Tl)	2017/08/09		114	%
			Uranium (U)	2017/08/09		104	%
			Vanadium (V)	2017/08/09		99	%
			Zinc (Zn)	2017/08/09		105	%
1821715	NS	Spiked Blank	Aluminum (Al)	2017/08/09		107	%
			Antimony (Sb)	2017/08/09		104	%
			Silver (Ag)	2017/08/09		98	%
			Arsenic (As)	2017/08/09		100	%
			Barium (Ba)	2017/08/09		104	%
			Beryllium (Be)	2017/08/09		106	%
			Bismuth (Bi)	2017/08/09		100	%
			Boron (B)	2017/08/09		103	%
			Cadmium (Cd)	2017/08/09		100	%
			Calcium (Ca)	2017/08/09		96	%
			Chromium (Cr)	2017/08/09		99	%
			Cobalt (Co)	2017/08/09		100	%
			Copper (Cu)	2017/08/09		102	%
			Tin (Sn)	2017/08/09		102	%
			Iron (Fe)	2017/08/09		98	%
			Magnesium (Mg)	2017/08/09		99	%
			Manganese (Mn)	2017/08/09		99	%
			Molybdenum (Mo)	2017/08/09		98	%
			Nickel (Ni)	2017/08/09		101	%
			Total phosphorous	2017/08/09		96	%
			Lead (Pb)	2017/08/09		105	%
			Potassium (K)	2017/08/09		98	%
			Selenium (Se)	2017/08/09		93	%
			Sodium (Na)	2017/08/09		97	%
			Strontium (Sr)	2017/08/09		98	%
			Thallium (Tl)	2017/08/09		117	%
			Titanium (Ti)	2017/08/09		101	%
			Uranium (U)	2017/08/09		102	%

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B745430
Report Date: 2017/08/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Vanadium (V)	2017/08/09		89	%
			Zinc (Zn)	2017/08/09		102	%
1821715	NS	Method Blank	Aluminum (Al)	2017/08/09	<10		ug/L
			Antimony (Sb)	2017/08/09	<1.0		ug/L
			Silver (Ag)	2017/08/09	<1.0		ug/L
			Arsenic (As)	2017/08/09	<1.0		ug/L
			Barium (Ba)	2017/08/09	<2.0		ug/L
			Beryllium (Be)	2017/08/09	<2.0		ug/L
			Bismuth (Bi)	2017/08/09	<1.0		ug/L
			Boron (B)	2017/08/09	<50		ug/L
			Cadmium (Cd)	2017/08/09	<0.20		ug/L
			Calcium (Ca)	2017/08/09	<500		ug/L
			Chromium (Cr)	2017/08/09	<5.0		ug/L
			Cobalt (Co)	2017/08/09	<1.0		ug/L
			Copper (Cu)	2017/08/09	<1.0		ug/L
			Total Hardness (CaCO3)	2017/08/09	<1000		ug/L
			Tin (Sn)	2017/08/09	<2.0		ug/L
			Iron (Fe)	2017/08/09	<60		ug/L
			Magnesium (Mg)	2017/08/09	<100		ug/L
			Manganese (Mn)	2017/08/09	<1.0		ug/L
			Molybdenum (Mo)	2017/08/09	<1.0		ug/L
			Nickel (Ni)	2017/08/09	<2.0		ug/L
			Total phosphorous	2017/08/09	<10		ug/L
			Lead (Pb)	2017/08/09	<0.50		ug/L
			Potassium (K)	2017/08/09	<500		ug/L
			Selenium (Se)	2017/08/09	<3.0		ug/L
			Sodium (Na)	2017/08/09	<500		ug/L
			Strontium (Sr)	2017/08/09	<2.0		ug/L
			Thallium (Tl)	2017/08/09	<2.0		ug/L
			Titanium (Ti)	2017/08/09	<10		ug/L
			Uranium (U)	2017/08/09	<1.0		ug/L
			Vanadium (V)	2017/08/09	<2.0		ug/L
			Zinc (Zn)	2017/08/09	<7.0		ug/L
1821789	GG1	QC Standard	Reactive silica (SiO2)	2017/08/08		0.94	%
1821789	GG1	Method Blank	Reactive silica (SiO2)	2017/08/08	0.14, RDL=0.10		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Maxxam Job #: B745430
Report Date: 2017/08/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

David Provencher, B.Sc., Chemist, Senior Analyst

Kassy Blais, B. Sc., Microbiologist

Madina Hamrouni, B.Sc., Chemist

Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

Olga Zlatov Polevoi, Analyst I

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Votre # du projet: B751280

Attention:Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/09/07
Rapport: R4690180
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7I4434
Reçu: 2017/08/25, 10:00

Matrice: Eau de Surface
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2017/09/06	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B751280

Attention:Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/09/07
Rapport: R4690180
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7I4434
Reçu: 2017/08/25, 10:00

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Simona Vatamanescu,
Courriel: SVatamanescu@maxxam.ca
Téléphone (905)826-3080

==========

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Dossier Maxxam: B7I4434
Date du rapport: 2017/09/07

Maxxam Analytique
Votre # du projet: B751280

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU DE SURFACE

Identification Maxxam		EZW135		
Date d'échantillonnage		2017/08/23 09:40		
	Unités	**EL6679-DSO4-ERGW-Q3-2017**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5142498

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B7I4434
Date du rapport: 2017/09/07

Maxxam Analytique
Votre # du projet: B751280

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B7I4434
Date du rapport: 2017/09/07

Maxxam Analytique
Votre # du projet: B751280

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5142498	FA5	Blanc fortifié	Radium-226	2017/09/06		91	%	85 - 115
5142498	FA5	Blanc de méthode	Radium-226	2017/09/06	<0.0050		Bq/L	
5142498	FA5	RPD [EZW135-01]	Radium-226	2017/09/06	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

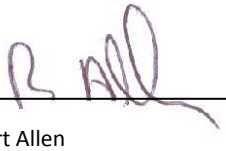
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Dossier Maxxam: B7I4434
Date du rapport: 2017/09/07

Maxxam Analytique
Votre # du projet: B751280

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Robert Allen

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Maxxam
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Your P.O. #: 2200001778
Your Project #: GOODWOOD SURFACE WATER
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 161195-01-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/09/12
Report #: R2318198
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B751280
Received: 2017/08/24, 09:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2017/08/24	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions*	1	N/A	2017/08/24	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Non-Typical Bacteria*	1	N/A	2017/08/25	QUE SOP-00304	MA 700-COL 1.0
Biochemical Oxygen Demand (5 days) (3)*	1	2017/08/25	2017/08/30	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	1	2017/08/25	2017/08/25	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide*	1	2017/08/31	2017/08/31	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand*	1	2017/08/28	2017/08/28	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms*	1	N/A	2017/08/24	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms*	1	N/A	2017/08/25	QUE SOP-00304	MA.700-Col 1.0
Conductivity*	1	N/A	2017/08/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2017/08/29	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)***	1	2017/08/28	2017/08/28	STL SOP-00243	MA.300-C1.0 R6m
Fluoride*	1	N/A	2017/08/28	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)***	1	2017/08/28	2017/08/29	STL SOP-00042	MA.200–Hg 1.1 R1 m
Radium 226 (MMER LOW LEVEL) (2)	1	N/A	N/A		
Total Suspended Solids*	1	2017/08/25	2017/08/25	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)*	1	2017/08/25	2017/08/26	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen*	1	N/A	2017/08/29	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite*	1	N/A	2017/08/24	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen***	1	N/A	2017/08/24	SM 421 F	MA315-DBO 1.1 R3 m
pH*	1	N/A	2017/08/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus Low Level by ICP-MS*	1	2017/08/28	2017/08/28	QUE SOP-00132	MA.200-Mét. 1.2 R5 m
Reactive Silica (SiO2)***	1	N/A	2017/08/28	QUE SOP-00150	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN)*	1	2017/08/25	2017/08/28	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 5)*	1	N/A	2017/08/30	STL SOP-00243	MA.300-C1.0 R6m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200001778
Your Project #: GOODWOOD SURFACE WATER
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 161195-01-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/09/12
Report #: R2318198
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B751280
Received: 2017/08/24, 09:00

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam-Radiological Lab
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

==========

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Maxxam Job #: B751280
Report Date: 2017/09/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		EL6679		
Sampling Date		2017/08/23 09:40		
COC Number		161195-01-01		
	Units	DSO4-ERGW-Q3-2017	RDL	QC Batch
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1829951
Surrogate Recovery (%)				
1-Chlorooctadecane	%	81	N/A	1829951

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

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Maxxam Job #: B751280
Report Date: 2017/09/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		EL6679		
Sampling Date		2017/08/23 09:40		
COC Number		161195-01-01		
	Units	**DSO4-ERGW-Q3-2017**	**RDL**	**QC Batch**
METALS				
Mercury (Hg)	mg/L	0.000014	0.000010	1830542
Total phosphorous	ug/L	8.5	2.0	1830572
METALS ICP-MS				
Aluminum (Al)	ug/L	10	10	1829841
Antimony (Sb)	ug/L	<1.0	1.0	1829841
Silver (Ag)	ug/L	<1.0	1.0	1829841
Arsenic (As)	ug/L	<1.0	1.0	1829841
Barium (Ba)	ug/L	<2.0	2.0	1829841
Beryllium (Be)	ug/L	<2.0	2.0	1829841
Bismuth (Bi)	ug/L	<1.0	1.0	1829841
Boron (B)	ug/L	<50	50	1829841
Cadmium (Cd)	ug/L	<0.20	0.20	1829841
Calcium (Ca)	ug/L	<500	500	1829841
Chromium (Cr)	ug/L	<5.0	5.0	1829841
Cobalt (Co)	ug/L	<1.0	1.0	1829841
Copper (Cu)	ug/L	<1.0	1.0	1829841
Total Hardness (CaCO3)	ug/L	<1000	1000	1829841
Tin (Sn)	ug/L	<2.0	2.0	1829841
Iron (Fe)	ug/L	<60	60	1829841
Magnesium (Mg)	ug/L	<100	100	1829841
Manganese (Mn)	ug/L	6.9	1.0	1829841
Molybdenum (Mo)	ug/L	<1.0	1.0	1829841
Nickel (Ni)	ug/L	<2.0	2.0	1829841
Lead (Pb)	ug/L	<0.50	0.50	1829841
Potassium (K)	ug/L	<500	500	1829841
Selenium (Se)	ug/L	<3.0	3.0	1829841
Sodium (Na)	ug/L	<500	500	1829841
Strontium (Sr)	ug/L	<2.0	2.0	1829841
Thallium (Tl)	ug/L	<2.0	2.0	1829841
Titanium (Ti)	ug/L	<10	10	1829841
Uranium (U)	ug/L	<1.0	1.0	1829841
Vanadium (V)	ug/L	<2.0	2.0	1829841
Zinc (Zn)	ug/L	<7.0	7.0	1829841

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B751280
Report Date: 2017/09/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		EL6679		
Sampling Date		2017/08/23 09:40		
COC Number		161195-01-01		
	Units	**DSO4-ERGW-Q3-2017**	**RDL**	**QC Batch**
CONVENTIONALS				
BOD5	mg/L	<4.0	4.0	1829963
COD	mg/L	<10	10	1830523
Conductivity	mS/cm	0.0016	0.0010	1829714
Dissolved organic carbon	mg/L	0.98	0.20	1830635
Dissolved oxygen	mg/L	8.4	1.0	1829754
Fluoride (F)	mg/L	<0.10	0.10	1830714
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	0.0080	1831119
Nitrates (N-NO3-)	mg/L	0.020	0.020	1829505
Nitrites (N-NO2-)	mg/L	<0.020	0.020	1829505
Nitrogen ammonia (N-NH3)	mg/L	0.14	0.020	1831057
pH	pH	6.18	N/A	1829698
Reactive silica (SiO2)	mg/L	0.21	0.10	1830757
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	0.40	1829914
Total Cyanide (CN)	mg/L	<0.010	0.010	1832453
Total Organic Carbon	mg/L	1.1	0.20	1831890
Alkalinity Total (as CaCO3) pH 4.5	mg/L	<1.0	1.0	1829712
Chloride (Cl)	mg/L	0.080	0.050	1829503
Sulfates (SO4)	mg/L	<0.50	0.50	1829503
Total suspended solids (TSS)	mg/L	<2.0	2.0	1829786

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

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		EL6679		
Sampling Date		2017/08/23 09:40		
COC Number		161195-01-01		
	Units	**DSO4-ERGW-Q3-2017**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	1000	1000	1830275
Non-typical bacteria	/membrane	98000	1000	1830279
Fecal coliforms	UFC/100ml	0	N/A	1829613

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

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

GENERAL COMMENTS

Total Phosphorus Low Level by ICP-MS: Arrived unpreserved, preserved upon reception at the laboratory.: EL6679

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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Maxxam Job #: B751280
Report Date: 2017/09/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1829503	MCC	QC Standard	Chloride (Cl)	2017/08/24		98	%
			Sulfates (SO4)	2017/08/24		103	%
1829503	MCC	Method Blank	Chloride (Cl)	2017/08/24	<0.050		mg/L
			Sulfates (SO4)	2017/08/24	<0.50		mg/L
1829505	MCC	QC Standard	Nitrates (N-NO3-)	2017/08/24		101	%
1829505	MCC	Spiked Blank	Nitrites (N-NO2-)	2017/08/24		99	%
1829505	MCC	Method Blank	Nitrates (N-NO3-)	2017/08/24	<0.020		mg/L
			Nitrites (N-NO2-)	2017/08/24	<0.020		mg/L
1829698	CB8	QC Standard	pH	2017/08/24		100	%
1829712	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2017/08/24		101	%
1829712	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2017/08/24	<1.0		mg/L
1829714	CB8	QC Standard	Conductivity	2017/08/24		98	%
1829714	CB8	Method Blank	Conductivity	2017/08/24	<0.0010		mS/cm
1829786	MCC	Spiked Blank	Total suspended solids (TSS)	2017/08/25		103	%
1829786	MCC	Method Blank	Total suspended solids (TSS)	2017/08/25	<2.0		mg/L
1829841	CRO	QC Standard	Aluminum (Al)	2017/08/26		95	%
			Antimony (Sb)	2017/08/26		99	%
			Arsenic (As)	2017/08/26		102	%
			Barium (Ba)	2017/08/26		93	%
			Beryllium (Be)	2017/08/26		103	%
			Boron (B)	2017/08/26		98	%
			Cadmium (Cd)	2017/08/26		98	%
			Calcium (Ca)	2017/08/26		95	%
			Chromium (Cr)	2017/08/26		101	%
			Cobalt (Co)	2017/08/26		103	%
			Copper (Cu)	2017/08/26		102	%
			Iron (Fe)	2017/08/26		114	%
			Magnesium (Mg)	2017/08/26		102	%
			Manganese (Mn)	2017/08/26		102	%
			Molybdenum (Mo)	2017/08/26		93	%
			Nickel (Ni)	2017/08/26		102	%
			Lead (Pb)	2017/08/26		99	%
			Potassium (K)	2017/08/26		103	%
			Selenium (Se)	2017/08/26		99	%
			Sodium (Na)	2017/08/26		99	%
			Strontium (Sr)	2017/08/26		97	%
			Thallium (Tl)	2017/08/26		111	%
			Uranium (U)	2017/08/26		99	%
			Vanadium (V)	2017/08/26		100	%
			Zinc (Zn)	2017/08/26		103	%
1829841	CRO	Spiked Blank	Aluminum (Al)	2017/08/26		105	%
			Antimony (Sb)	2017/08/26		102	%
			Silver (Ag)	2017/08/26		100	%
			Arsenic (As)	2017/08/26		104	%
			Barium (Ba)	2017/08/26		96	%
			Beryllium (Be)	2017/08/26		103	%
			Bismuth (Bi)	2017/08/26		94	%
			Boron (B)	2017/08/26		94	%
			Cadmium (Cd)	2017/08/26		101	%
			Calcium (Ca)	2017/08/26		99	%

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Report Date: 2017/09/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Chromium (Cr)	2017/08/26		102	%
			Cobalt (Co)	2017/08/26		102	%
			Copper (Cu)	2017/08/26		101	%
			Tin (Sn)	2017/08/26		101	%
			Iron (Fe)	2017/08/26		103	%
			Magnesium (Mg)	2017/08/26		103	%
			Manganese (Mn)	2017/08/26		101	%
			Molybdenum (Mo)	2017/08/26		97	%
			Nickel (Ni)	2017/08/26		100	%
			Lead (Pb)	2017/08/26		99	%
			Potassium (K)	2017/08/26		102	%
			Selenium (Se)	2017/08/26		104	%
			Sodium (Na)	2017/08/26		100	%
			Strontium (Sr)	2017/08/26		103	%
			Thallium (Tl)	2017/08/26		110	%
			Titanium (Ti)	2017/08/26		104	%
			Uranium (U)	2017/08/26		97	%
			Vanadium (V)	2017/08/26		105	%
			Zinc (Zn)	2017/08/26		106	%
1829841	CRO	Method Blank	Aluminum (Al)	2017/08/26	<10		ug/L
			Antimony (Sb)	2017/08/26	<1.0		ug/L
			Silver (Ag)	2017/08/26	<1.0		ug/L
			Arsenic (As)	2017/08/26	<1.0		ug/L
			Barium (Ba)	2017/08/26	<2.0		ug/L
			Beryllium (Be)	2017/08/26	<2.0		ug/L
			Bismuth (Bi)	2017/08/26	<1.0		ug/L
			Boron (B)	2017/08/26	<50		ug/L
			Cadmium (Cd)	2017/08/26	<0.20		ug/L
			Calcium (Ca)	2017/08/26	<500		ug/L
			Chromium (Cr)	2017/08/26	<5.0		ug/L
			Cobalt (Co)	2017/08/26	<1.0		ug/L
			Copper (Cu)	2017/08/26	<1.0		ug/L
			Total Hardness (CaCO3)	2017/08/26	<1000		ug/L
			Tin (Sn)	2017/08/26	<2.0		ug/L
			Iron (Fe)	2017/08/26	<60		ug/L
			Magnesium (Mg)	2017/08/26	<100		ug/L
			Manganese (Mn)	2017/08/26	<1.0		ug/L
			Molybdenum (Mo)	2017/08/26	<1.0		ug/L
			Nickel (Ni)	2017/08/26	<2.0		ug/L
			Lead (Pb)	2017/08/26	<0.50		ug/L
			Potassium (K)	2017/08/26	<500		ug/L
			Selenium (Se)	2017/08/26	<3.0		ug/L
			Sodium (Na)	2017/08/26	<500		ug/L
			Strontium (Sr)	2017/08/26	<2.0		ug/L
			Thallium (Tl)	2017/08/26	<2.0		ug/L
			Titanium (Ti)	2017/08/26	<10		ug/L
			Uranium (U)	2017/08/26	<1.0		ug/L
			Vanadium (V)	2017/08/26	<2.0		ug/L
			Zinc (Zn)	2017/08/26	<7.0		ug/L
1829914	CB8	QC Standard	TKN Total Kjeldahl Nitrogen	2017/08/28		99	%

Maxxam Job #: B751280
Report Date: 2017/09/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1829914	CB8	Method Blank	TKN Total Kjeldahl Nitrogen	2017/08/28	<0.40		mg/L
1829951	BLA	Spiked Blank	1-Chlorooctadecane	2017/08/25		74	%
			Petroleum Hydrocarbons (C10-C50)	2017/08/25		82	%
1829951	BLA	Method Blank	1-Chlorooctadecane	2017/08/29		74	%
			Petroleum Hydrocarbons (C10-C50)	2017/08/29	<100		ug/L
1829963	GG1	Spiked Blank	BOD5	2017/08/30		92	%
1829963	GG1	Spiked Blank DUP	BOD5	2017/08/30		93	%
1829963	GG1	Method Blank	BOD5	2017/08/30	<4.0		mg/L
1829963	GG1	Method Blank DUP	BOD5	2017/08/30	<4.0		mg/L
1830523	LAR	QC Standard	COD	2017/08/28		90	%
1830523	LAR	QC Standard DUP	COD	2017/08/28		93	%
1830523	LAR	Method Blank	COD	2017/08/28	<10		mg/L
1830523	LAR	Method Blank DUP	COD	2017/08/28	<10		mg/L
1830542	EMA	QC Standard	Mercury (Hg)	2017/08/29		104	%
1830542	EMA	Spiked Blank	Mercury (Hg)	2017/08/29		108	%
1830542	EMA	Method Blank	Mercury (Hg)	2017/08/29	<0.000010		mg/L
1830572	CRO	QC Standard	Total phosphorous	2017/08/28		109	%
1830572	CRO	Method Blank	Total phosphorous	2017/08/28	<2.0		ug/L
1830635	MR4	Spiked Blank	Dissolved organic carbon	2017/08/28		101	%
1830635	MR4	Method Blank	Dissolved organic carbon	2017/08/28	1.4, RDL=0.20		mg/L
1830714	CB8	QC Standard	Fluoride (F)	2017/08/28		108	%
1830714	CB8	Method Blank	Fluoride (F)	2017/08/28	<0.10		mg/L
1830757	GG1	QC Standard	Reactive silica (SiO2)	2017/08/28		87	%
1830757	GG1	Method Blank	Reactive silica (SiO2)	2017/08/28	<0.10		mg/L
1831057	CB8	QC Standard	Nitrogen ammonia (N-NH3)	2017/08/29		102	%
1831057	CB8	Method Blank	Nitrogen ammonia (N-NH3)	2017/08/29	<0.020		mg/L
1831119	MR4	QC Standard	Hexavalent Chromium (Cr 6+)	2017/08/29		98	%
1831119	MR4	Spiked Blank	Hexavalent Chromium (Cr 6+)	2017/08/29		102	%
1831119	MR4	Method Blank	Hexavalent Chromium (Cr 6+)	2017/08/29	<0.0080		mg/L
1831890	MR4	Spiked Blank	Total Organic Carbon	2017/08/30		100	%
1831890	MR4	Method Blank	Total Organic Carbon	2017/08/30	<0.20		mg/L
1832453	CB8	QC Standard	Total Cyanide (CN)	2017/08/31		102	%
1832453	CB8	Method Blank	Total Cyanide (CN)	2017/08/31	<0.010		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Report Date: 2017/09/12

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4 1A
Your P.O. #: 2200001778
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

David Provencher, B.Sc., Chemist, Senior Analyst

Frédéric Gagné, B. Sc., Microbiologist, Supervisor

Jonathan Fauvel, B.Sc, Chimiste, Analyste II

Kassy Blais, B. Sc., Microbiologist

Madina Hamrouni, B.Sc., Chemist

Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
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VALIDATION SIGNATURE PAGE(CONT'D)

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

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.

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Votre # du projet: B753589

Attention:Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/09/15
Rapport: R4705539
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7J3293
Reçu: 2017/09/06, 14:15

Matrice: Eau de Surface
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2017/09/14	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B753589

Attention:Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/09/15
Rapport: R4705539
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7J3293
Reçu: 2017/09/06, 14:15

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Simona Vatamanescu,
Courriel: SVatamanescu@maxxam.ca
Téléphone (905)826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B7J3293
Date du rapport: 2017/09/15

Maxxam Analytique
Votre # du projet: B753589

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU DE SURFACE

Identification Maxxam		FBN832		
Date d'échantillonnage		2017/09/04 06:50		
	Unités	**EN0279\DSO4-EE-GW-Q3-2017**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5152030

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B7J3293
Date du rapport: 2017/09/15

Maxxam Analytique
Votre # du projet: B753589

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B7J3293
Date du rapport: 2017/09/15

Maxxam Analytique
Votre # du projet: B753589

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5152030	FA5	Blanc fortifié	Radium-226	2017/09/12		105	%	85 - 115
5152030	FA5	Blanc de méthode	Radium-226	2017/09/12	<0.0050		Bq/L	
5152030	FA5	RPD	Radium-226	2017/09/12	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

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Dossier Maxxam: B7J3293
Date du rapport: 2017/09/15

Maxxam Analytique
Votre # du projet: B753589

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your P.O. #: 2200001778
Your Project #: GOODWOOD SURFACE WATER
Your C.O.C. #: 161195-04-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/09/19
Report #: R2320743
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B753589
Received: 2017/09/05, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2017/09/09	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions*	1	N/A	2017/09/05	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Non-Typical Bacteria*	1	N/A	2017/09/05	QUE SOP-00304	MA 700-COL 1.0
Biochemical Oxygen Demand (5 days) (3)*	1	2017/09/06	2017/09/11	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	1	2017/09/08	2017/09/09	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide*	1	2017/09/08	2017/09/08	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand*	1	2017/09/06	2017/09/06	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms*	1	N/A	2017/09/05	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms*	1	N/A	2017/09/05	QUE SOP-00304	MA.700-Col 1.0
Conductivity*	1	N/A	2017/09/09	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2017/09/08	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)***	1	2017/09/08	2017/09/09	STL SOP-00243	MA.300-C1.0 R6m
Fluoride (1)*	1	N/A	2017/09/09	STL SOP-00038	SM 22 4500-F m
Radium 226 (MMER LOW LEVEL) (2)	1	N/A	N/A		
Total Suspended Solids*	1	2017/09/05	2017/09/05	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractible Trace Metals by ICP-MS (1)***	1	2017/09/13	2017/09/14	STL SOP-00006	MA203–Mét Tra1.1 R1m
Ammonia Nitrogen*	1	N/A	2017/09/07	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite*	1	N/A	2017/09/05	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen***	1	N/A	2017/09/05	SM 421 F	MA315-DBO 1.1 R3 m
pH*	1	N/A	2017/09/09	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus Low Level by ICP-MS*	1	2017/09/09	2017/09/10	QUE SOP-00132	MA.200-Mét. 1.2 R5 m
Reactive Silica (SiO2)***	1	N/A	2017/09/05	QUE SOP-00150	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN)*	1	2017/09/06	2017/09/07	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 5)*	1	N/A	2017/09/08	STL SOP-00243	MA.300-C1.0 R6m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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Your P.O. #: 2200001778
Your Project #: GOODWOOD SURFACE WATER
Your C.O.C. #: 161195-04-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/09/19
Report #: R2320743
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B753589
Received: 2017/09/05, 08:30

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam-Radiological Lab
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

==========

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 #: B753589
Report Date: 2017/09/19

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Your P.O. #: 2200001778

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		EN0279		
Sampling Date		2017/09/04 06:50		
COC Number		161195-04-01		
	Units	**DSO4-EE-GW-Q3-2017**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1834989
Surrogate Recovery (%)				
1-Chlorooctadecane	%	80	N/A	1834989

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

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Maxxam Job #: B753589
Report Date: 2017/09/19

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Your P.O. #: 2200001778

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		EN0279	EN0279		
Sampling Date		2017/09/04 06:50	2017/09/04 06:50		
COC Number		161195-04-01	161195-04-01		
	Units	DSO4-EE-GW-Q3-2017	DSO4-EE-GW-Q3-2017 Lab-Dup	RDL	QC Batch
METALS					
Total phosphorous	ug/L	23	23	2.0	1835566
Aluminum (Al)	ug/L	170	N/A	5.0	1836744
Antimony (Sb)	ug/L	0.013	N/A	0.0050	1836744
Silver (Ag)	ug/L	<0.0030	N/A	0.0030	1836744
Arsenic (As)	ug/L	0.16	N/A	0.080	1836744
Barium (Ba)	ug/L	2.1	N/A	0.030	1836744
Boron (B)	ug/L	2.0	N/A	0.30	1836744
Cadmium (Cd)	ug/L	<0.0060	N/A	0.0060	1836744
Calcium (Ca)	ug/L	180	N/A	20	1836744
Chromium (Cr)	ug/L	0.27	N/A	0.040	1836744
Cobalt (Co)	ug/L	0.090	N/A	0.0080	1836744
Copper (Cu)	ug/L	0.42	N/A	0.050	1836744
Tin (Sn)	ug/L	<0.050	N/A	0.050	1836744
Iron (Fe)	ug/L	370	N/A	0.50	1836744
Magnesium (Mg)	ug/L	140	N/A	10	1836744
Manganese (Mn)	ug/L	38	N/A	0.030	1836744
Mercury (Hg)	ug/L	0.0020	N/A	0.0020	1836744
Molybdenum (Mo)	ug/L	0.016	N/A	0.010	1836744
Nickel (Ni)	ug/L	0.32	N/A	0.030	1836744
Lead (Pb)	ug/L	0.048	N/A	0.010	1836744
Potassium (K)	ug/L	110	N/A	10	1836744
Selenium (Se)	ug/L	<0.050	N/A	0.050	1836744
Sodium (Na)	ug/L	230	N/A	10	1836744
Thallium (Tl)	ug/L	<0.010	N/A	0.010	1836744
Titanium (Ti)	ug/L	5.9	N/A	0.40	1836744
Uranium (U)	ug/L	0.022	N/A	0.0010	1836744
Vanadium (V)	ug/L	0.39	N/A	0.050	1836744
Zinc (Zn)	ug/L	1.3	N/A	0.50	1836744
Total Hardness (CaCO3)	ug/L	1000	N/A	40	1836744

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

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Maxxam Job #: B753589
Report Date: 2017/09/19

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Your P.O. #: 2200001778

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		EN0279	EN0279		
Sampling Date		2017/09/04 06:50	2017/09/04 06:50		
COC Number		161195-04-01	161195-04-01		
	Units	**DSO4-EE-GW-Q3-2017**	**DSO4-EE-GW-Q3-2017 Lab-Dup**	**RDL**	**QC Batch**
CONVENTIONALS					
BOD5	mg/L	<4.0	N/A	4.0	1834081
COD	mg/L	<10	N/A	10	1833861
Conductivity	mS/cm	0.0028	N/A	0.0010	1833803
Dissolved organic carbon	mg/L	1.4	N/A	0.20	1835367
Dissolved oxygen	mg/L	9.0	N/A	1.0	1833606
Fluoride (F)	mg/L	<0.10	N/A	0.10	1835619
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	N/A	0.0080	1835058
Nitrates (N-NO3-)	mg/L	<0.020	N/A	0.020	1833576
Nitrites (N-NO2-)	mg/L	<0.020	N/A	0.020	1833576
Nitrogen ammonia (N-NH3)	mg/L	<0.020	<0.020	0.020	1834394
pH	pH	6.31	N/A	N/A	1833801
Reactive silica (SiO2)	mg/L	2.4	N/A	0.50	1833643
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	N/A	0.40	1833959
Total Cyanide (CN)	mg/L	<0.010	N/A	0.010	1835111
Total Organic Carbon	mg/L	1.8	N/A	0.20	1835359
Alkalinity Total (as CaCO3) pH 4.5	mg/L	1.5	N/A	1.0	1833802
Chloride (Cl)	mg/L	0.12	N/A	0.050	1833335
Sulfates (SO4)	mg/L	<0.50	N/A	0.50	1833335
Total suspended solids (TSS)	mg/L	4.0	N/A	2.0	1833631

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

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Report Date: 2017/09/19

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Your P.O. #: 2200001778

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		EN0279		
Sampling Date		2017/09/04 06:50		
COC Number		161195-04-01		
	Units	DSO4-EE-GW-Q3-2017	RDL	QC Batch
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	6500	100	1833611
Non-typical bacteria	/membrane	3200	100	1833612
Fecal coliforms	UFC/100ml	<10 (1)	10	1833586

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Detection limit raised due to matrix interference.

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Maxxam Job #: B753589
Report Date: 2017/09/19

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Your P.O. #: 2200001778

GENERAL COMMENTS

Total Phosphorus Low Level by ICP-MS: Arrived unpreserved, preserved upon reception at the laboratory.: EN0279

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Reported detection limits are multiplied by dilution factors used for sample analysis.

Results relate only to the items tested.

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Maxxam Job #: B753589
Report Date: 2017/09/19

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Your P.O. #: 2200001778

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1833335	MCC	QC Standard	Chloride (Cl)	2017/09/05		95	%
			Sulfates (SO4)	2017/09/05		97	%
1833335	MCC	Method Blank	Chloride (Cl)	2017/09/05	<0.050		mg/L
			Sulfates (SO4)	2017/09/05	<0.50		mg/L
1833576	MCC	QC Standard	Nitrates (N-NO3-)	2017/09/05		96	%
1833576	MCC	Spiked Blank	Nitrites (N-NO2-)	2017/09/05		90	%
1833576	MCC	Method Blank	Nitrates (N-NO3-)	2017/09/05	<0.020		mg/L
			Nitrites (N-NO2-)	2017/09/05	<0.020		mg/L
1833631	MCC	Spiked Blank	Total suspended solids (TSS)	2017/09/05		108	%
1833631	MCC	Method Blank	Total suspended solids (TSS)	2017/09/05	<2.0		mg/L
1833643	GG1	QC Standard	Reactive silica (SiO2)	2017/09/05		103	%
1833643	GG1	Method Blank	Reactive silica (SiO2)	2017/09/05	0.13, RDL=0.10		mg/L
1833801	GG1	QC Standard	pH	2017/09/05		100	%
1833802	GG1	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2017/09/05		98	%
1833802	GG1	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2017/09/05	<1.0		mg/L
1833803	GG1	QC Standard	Conductivity	2017/09/05		95	%
1833803	GG1	Method Blank	Conductivity	2017/09/05	<0.0010		mS/cm
1833861	LAR	QC Standard	COD	2017/09/06		95	%
1833861	LAR	QC Standard DUP	COD	2017/09/06		106	%
1833861	LAR	Method Blank	COD	2017/09/06	<10		mg/L
1833861	LAR	Method Blank DUP	COD	2017/09/06	<10		mg/L
1833959	CB8	QC Standard	TKN Total Kjeldahl Nitrogen	2017/09/07		98	%
1833959	CB8	Method Blank	TKN Total Kjeldahl Nitrogen	2017/09/07	<0.40		mg/L
1834081	CB8	Spiked Blank	BOD5	2017/09/11		87	%
1834081	CB8	Spiked Blank DUP	BOD5	2017/09/11		87	%
1834081	CB8	Method Blank	BOD5	2017/09/11	<4.0		mg/L
1834081	CB8	Method Blank DUP	BOD5	2017/09/11	<4.0		mg/L
1834394	AG5	QC Standard	Nitrogen ammonia (N-NH3)	2017/09/07		100	%
1834394	AG5	Method Blank	Nitrogen ammonia (N-NH3)	2017/09/07	<0.020		mg/L
1834989	VBO	Spiked Blank	1-Chlorooctadecane	2017/09/08		109	%
			Petroleum Hydrocarbons (C10-C50)	2017/09/08		108	%
1834989	VBO	Method Blank	1-Chlorooctadecane	2017/09/08		102	%
			Petroleum Hydrocarbons (C10-C50)	2017/09/08	<100		ug/L
1835058	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2017/09/08		98	%
1835058	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2017/09/08		98	%
1835058	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2017/09/08	<0.0080		mg/L
1835111	CB8	QC Standard	Total Cyanide (CN)	2017/09/08		91	%
1835111	CB8	Method Blank	Total Cyanide (CN)	2017/09/08	<0.010		mg/L
1835359	MR4	Spiked Blank	Total Organic Carbon	2017/09/08		103	%
1835359	MR4	Method Blank	Total Organic Carbon	2017/09/08	<0.20		mg/L
1835367	MR4	Spiked Blank	Dissolved organic carbon	2017/09/09		103	%
1835367	MR4	Method Blank	Dissolved organic carbon	2017/09/09	1.6, RDL=0.20		mg/L
1835566	NS	QC Standard	Total phosphorous	2017/09/10		100	%
1835566	NS	Method Blank	Total phosphorous	2017/09/10	<2.0		ug/L
1835619	MH1	Spiked Blank	Fluoride (F)	2017/09/09		96	%
1835619	MH1	Method Blank	Fluoride (F)	2017/09/09	<0.10		mg/L
1836744	JF1	Spiked Blank	Aluminum (Al)	2017/09/13		107	%
			Antimony (Sb)	2017/09/13		108	%
			Silver (Ag)	2017/09/13		105	%
			Arsenic (As)	2017/09/13		110	%

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Barium (Ba)	2017/09/13		104	%
			Boron (B)	2017/09/13		106	%
			Cadmium (Cd)	2017/09/13		101	%
			Calcium (Ca)	2017/09/13		114	%
			Chromium (Cr)	2017/09/13		111	%
			Cobalt (Co)	2017/09/13		110	%
			Copper (Cu)	2017/09/13		107	%
			Tin (Sn)	2017/09/13		106	%
			Iron (Fe)	2017/09/13		113	%
			Magnesium (Mg)	2017/09/13		104	%
			Manganese (Mn)	2017/09/13		111	%
			Mercury (Hg)	2017/09/13		111	%
			Molybdenum (Mo)	2017/09/13		101	%
			Nickel (Ni)	2017/09/13		101	%
			Lead (Pb)	2017/09/13		106	%
			Potassium (K)	2017/09/13		110	%
			Selenium (Se)	2017/09/13		107	%
			Sodium (Na)	2017/09/13		107	%
			Thallium (Tl)	2017/09/13		118	%
			Titanium (Ti)	2017/09/13		107	%
			Uranium (U)	2017/09/13		103	%
			Vanadium (V)	2017/09/13		110	%
			Zinc (Zn)	2017/09/13		94	%
1836744	JF1	Method Blank	Aluminum (Al)	2017/09/13	<5.0		ug/L
			Antimony (Sb)	2017/09/13	<0.0050		ug/L
			Silver (Ag)	2017/09/13	<0.0030		ug/L
			Arsenic (As)	2017/09/13	<0.080		ug/L
			Barium (Ba)	2017/09/13	<0.030		ug/L
			Boron (B)	2017/09/13	<0.30		ug/L
			Cadmium (Cd)	2017/09/13	<0.0060		ug/L
			Calcium (Ca)	2017/09/13	<20		ug/L
			Chromium (Cr)	2017/09/13	<0.040		ug/L
			Cobalt (Co)	2017/09/13	<0.0080		ug/L
			Copper (Cu)	2017/09/13	<0.050		ug/L
			Tin (Sn)	2017/09/13	<0.050		ug/L
			Iron (Fe)	2017/09/13	<0.50		ug/L
			Magnesium (Mg)	2017/09/13	<10		ug/L
			Manganese (Mn)	2017/09/13	<0.030		ug/L
			Mercury (Hg)	2017/09/13	<0.0020		ug/L
			Molybdenum (Mo)	2017/09/13	<0.010		ug/L
			Nickel (Ni)	2017/09/13	<0.030		ug/L
			Lead (Pb)	2017/09/13	<0.010		ug/L
			Potassium (K)	2017/09/13	<10		ug/L
			Selenium (Se)	2017/09/13	<0.050		ug/L
			Sodium (Na)	2017/09/13	<10		ug/L
			Thallium (Tl)	2017/09/13	<0.010		ug/L
			Titanium (Ti)	2017/09/13	<0.40		ug/L
			Uranium (U)	2017/09/13	<0.0010		ug/L
			Vanadium (V)	2017/09/13	<0.050		ug/L
			Zinc (Zn)	2017/09/13	<0.50		ug/L

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Maxxam Job #: B753589
Report Date: 2017/09/19

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Your P.O. #: 2200001778

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Total Hardness (CaCO3)	2017/09/13	<40		ug/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Maxxam Job #: B753589
Report Date: 2017/09/19

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Your P.O. #: 2200001778

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

David Provencher, B.Sc., Chemist, Senior Analyst

Kassy Blais, B. Sc., Microbiologist

Miryam Assayag

Madina Hamrouni, B.Sc., Chemist

Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Your P.O. #: 2200001778
Your Project #: GOODWOOD SURFACE WATER
Site#: TSMC
Site Location: DSO4
Your C.O.C. #: 157352-04-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/10/26
Report #: R2330260
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B758972
Received: 2017/09/28, 09:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)***	1	N/A	2017/09/28	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions*	1	N/A	2017/09/28	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Non-Typical Bacteria*	1	N/A	2017/09/28	QUE SOP-00304	MA 700-COL 1.0
Biochemical Oxygen Demand (5 days) (3)*	1	2017/09/28	2017/10/03	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)*	1	2017/10/02	2017/10/04	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide*	1	2017/09/29	2017/09/29	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand*	1	2017/09/29	2017/09/29	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms*	1	N/A	2017/09/28	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms*	1	N/A	2017/09/28	QUE SOP-00304	MA.700-Col 1.0
Conductivity*	1	N/A	2017/09/28	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)*	1	N/A	2017/10/03	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)***	1	2017/10/03	2017/10/03	STL SOP-00243	MA.300-C1.0 R6m
Fluoride*	1	N/A	2017/09/28	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)***	1	2017/10/10	2017/10/11	STL SOP-00042	MA.200–Hg 1.1 R1 m
Radium 226 (MMER LOW LEVEL) (2)	1	N/A	N/A		
Total Suspended Solids*	1	2017/09/28	2017/09/28	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)*	1	2017/10/03	2017/10/03	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Total Extractible Trace Metals by ICP-MS (1)***	1	2017/10/10	2017/10/11	STL SOP-00006	MA203–Mét Tra1.1 R1m
Ammonia Nitrogen*	1	N/A	2017/09/29	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite*	1	N/A	2017/09/28	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen***	1	N/A	2017/09/28	SM 421 F	MA315-DBO 1.1 R3 m
pH*	1	N/A	2017/09/28	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phosphorus Low Level by ICP-MS*	1	2017/10/03	2017/10/04	QUE SOP-00132	MA.200-Mét. 1.2 R5 m
Reactive Silica (SiO2)***	1	N/A	2017/10/02	QUE SOP-00150	HACH DR/890-8186m
Total KJELDAHL Nitrogen (TKN)*	1	2017/10/03	2017/10/05	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 5)*	1	N/A	2017/10/03	STL SOP-00243	MA.300-C1.0 R6m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

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Your P.O. #: 2200001778
Your Project #: GOODWOOD SURFACE WATER
Site#: TSMC
Site Location: DSO4
Your C.O.C. #: 157352-04-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/10/26
Report #: R2330260
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B758972
Received: 2017/09/28, 09:00

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam-Radiological Lab
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

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Maxxam Job #: B758972
Report Date: 2017/10/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001778
Sampler Initials: YE

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		EQ2889		
Sampling Date		2017/09/27 10:35		
COC Number		157352-04-01		
	Units	DSO4-ER-GW-Q4-2017	RDL	QC Batch
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1843585
Surrogate Recovery (%)				
1-Chlorooctadecane	%	106	N/A	1843585

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

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Maxxam Job #: B758972
Report Date: 2017/10/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001778
Sampler Initials: YE

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		EQ2889	EQ2889		
Sampling Date		2017/09/27 10:35	2017/09/27 10:35		
COC Number		157352-04-01	157352-04-01		
	Units	**DSO4-ER-GW-Q4-2017**	**DSO4-ER-GW-Q4-2017 Lab-Dup**	**RDL**	**QC Batch**
METALS					
Mercury (Hg)	mg/L	0.000010	N/A	0.000010	1845732
Total phosphorous	ug/L	4.3	4.6	2.0	1843775
Aluminum (Al)	ug/L	<5.0	N/A	5.0	1845816
Antimony (Sb)	ug/L	0.0053	N/A	0.0050	1845816
Silver (Ag)	ug/L	<0.0030	N/A	0.0030	1845816
Arsenic (As)	ug/L	<0.080	N/A	0.080	1845816
Barium (Ba)	ug/L	0.23	N/A	0.030	1845816
Boron (B)	ug/L	1.1	N/A	0.30	1845816
Cadmium (Cd)	ug/L	<0.0060	N/A	0.0060	1845816
Calcium (Ca)	ug/L	96	N/A	20	1845816
Chromium (Cr)	ug/L	<0.040	N/A	0.040	1845816
Cobalt (Co)	ug/L	0.014	N/A	0.0080	1845816
Copper (Cu)	ug/L	0.24	N/A	0.050	1845816
Tin (Sn)	ug/L	<0.050	N/A	0.050	1845816
Iron (Fe)	ug/L	4.0	N/A	0.50	1845816
Magnesium (Mg)	ug/L	50	N/A	10	1845816
Manganese (Mn)	ug/L	5.7	N/A	0.030	1845816
Mercury (Hg)	ug/L	<0.0020	N/A	0.0020	1845816
Molybdenum (Mo)	ug/L	<0.010	N/A	0.010	1845816
Nickel (Ni)	ug/L	0.067	N/A	0.030	1845816
Lead (Pb)	ug/L	<0.010	N/A	0.010	1845816
Potassium (K)	ug/L	65	N/A	10	1845816
Selenium (Se)	ug/L	<0.050	N/A	0.050	1845816
Sodium (Na)	ug/L	97	N/A	10	1845816
Thallium (Tl)	ug/L	<0.010	N/A	0.010	1845816
Titanium (Ti)	ug/L	<0.40	N/A	0.40	1845816
Uranium (U)	ug/L	<0.0010	N/A	0.0010	1845816
Vanadium (V)	ug/L	<0.050	N/A	0.050	1845816
Zinc (Zn)	ug/L	0.64	N/A	0.50	1845816
METALS ICP-MS					
Calcium (Ca)	ug/L	<500	N/A	500	1843777
Total Hardness (CaCO3)	ug/L	<1000	N/A	1000	1843777

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

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Maxxam Job #: B758972
Report Date: 2017/10/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001778
Sampler Initials: YE

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		EQ2889	EQ2889		
Sampling Date		2017/09/27 10:35	2017/09/27 10:35		
COC Number		157352-04-01	157352-04-01		
	Units	**DSO4-ER-GW-Q4-2017**	**DSO4-ER-GW-Q4-2017 Lab-Dup**	**RDL**	**QC Batch**
Magnesium (Mg)	ug/L	<100	N/A	100	1843777

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

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Maxxam Job #: B758972
Report Date: 2017/10/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001778
Sampler Initials: YE

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		EQ2889	EQ2889		
Sampling Date		2017/09/27 10:35	2017/09/27 10:35		
COC Number		157352-04-01	157352-04-01		
	Units	**DSO4-ER-GW-Q4-2017**	**DSO4-ER-GW-Q4-2017 Lab-Dup**	**RDL**	**QC Batch**
CONVENTIONALS					
BOD5	mg/L	<4.0	N/A	4.0	1842520
COD	mg/L	<10	N/A	10	1842735
Conductivity	mS/cm	0.0028	N/A	0.0010	1842633
Dissolved organic carbon	mg/L	0.89	N/A	0.20	1843789
Dissolved oxygen	mg/L	9.2	N/A	1.0	1842652
Fluoride (F)	mg/L	<0.10	N/A	0.10	1842634
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	N/A	0.0080	1843838
Nitrates (N-NO3-)	mg/L	<0.020	N/A	0.020	1842514
Nitrites (N-NO2-)	mg/L	<0.020	N/A	0.020	1842514
Nitrogen ammonia (N-NH3)	mg/L	<0.020	<0.020	0.020	1842933
pH	pH	5.19	N/A	N/A	1842630
Reactive silica (SiO2)	mg/L	0.26	N/A	0.10	1843526
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	N/A	0.40	1843657
Total Cyanide (CN)	mg/L	<0.010	N/A	0.010	1842890
Total Organic Carbon	mg/L	0.93	N/A	0.20	1843670
Alkalinity Total (as CaCO3) pH 4.5	mg/L	<1.0	N/A	1.0	1842632
Chloride (Cl)	mg/L	0.070	N/A	0.050	1842428
Sulfates (SO4)	mg/L	<0.50	N/A	0.50	1842428
Total suspended solids (TSS)	mg/L	<2.0	N/A	2.0	1842518

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

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Maxxam Job #: B758972
Report Date: 2017/10/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001778
Sampler Initials: YE

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		EQ2889		
Sampling Date		2017/09/27 10:35		
COC Number		157352-04-01		
	Units	**DSO4-ER-GW-Q4-2017**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	680	10	1842469
Non-typical bacteria	/membrane	250	10	1842474
Fecal coliforms	UFC/100ml	0	N/A	1842470

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

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Report Date: 2017/10/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001778
Sampler Initials: YE

GENERAL COMMENTS

Total Organic Carbon: Arrived unpreserved, preserved upon reception at the laboratory.: EQ2889
Total Phosphorus Low Level by ICP-MS: Arrived unpreserved, preserved upon reception at the laboratory.: EQ2889

HYDROCARBONS BY GCFID (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries (spiked blank and surrogates). Please note that the results have not been corrected for the method blank.

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Due to the sample matrix for EQ2889, a better detection limit cannot be reported.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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Maxxam Job #: B758972
Report Date: 2017/10/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001778
Sampler Initials: YE

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1842428	MCC	QC Standard	Chloride (Cl)	2017/09/28		93	%
			Sulfates (SO4)	2017/09/28		94	%
1842428	MCC	Method Blank	Chloride (Cl)	2017/09/28	<0.050		mg/L
			Sulfates (SO4)	2017/09/28	<0.50		mg/L
1842514	MCC	QC Standard	Nitrates (N-NO3-)	2017/09/28		93	%
1842514	MCC	Spiked Blank	Nitrites (N-NO2-)	2017/09/28		94	%
1842514	MCC	Method Blank	Nitrates (N-NO3-)	2017/09/28	<0.020		mg/L
			Nitrites (N-NO2-)	2017/09/28	<0.020		mg/L
1842518	LAR	Spiked Blank	Total suspended solids (TSS)	2017/09/28		93	%
1842518	LAR	Method Blank	Total suspended solids (TSS)	2017/09/28	<2.0		mg/L
1842520	JAU	Spiked Blank	BOD5	2017/10/03		118	%
1842520	JAU	Spiked Blank DUP	BOD5	2017/10/03		111	%
1842520	JAU	Method Blank	BOD5	2017/10/03	<4.0		mg/L
1842520	JAU	Method Blank DUP	BOD5	2017/10/03	<4.0		mg/L
1842630	CB8	QC Standard	pH	2017/09/28		100	%
1842632	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2017/09/28		96	%
1842632	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2017/09/28	<1.0		mg/L
1842633	CB8	QC Standard	Conductivity	2017/09/28		100	%
1842633	CB8	Method Blank	Conductivity	2017/09/28	<0.0010		mS/cm
1842634	CB8	QC Standard	Fluoride (F)	2017/09/28		100	%
1842735	LAR	QC Standard	COD	2017/09/29		88	%
1842735	LAR	QC Standard DUP	COD	2017/09/29		106	%
1842735	LAR	Method Blank	COD	2017/09/29	<10		mg/L
1842735	LAR	Method Blank DUP	COD	2017/09/29	<10		mg/L
1842890	CB8	QC Standard	Total Cyanide (CN)	2017/09/29		119	%
1842890	CB8	Method Blank	Total Cyanide (CN)	2017/09/29	<0.010		mg/L
1842933	CB8	QC Standard	Nitrogen ammonia (N-NH3)	2017/09/29		96	%
1842933	CB8	Method Blank	Nitrogen ammonia (N-NH3)	2017/09/29	<0.020		mg/L
1843526	GG1	QC Standard	Reactive silica (SiO2)	2017/10/02		106	%
1843526	GG1	Method Blank	Reactive silica (SiO2)	2017/10/02	<0.10		mg/L
1843585	VBO	Spiked Blank	1-Chlorooctadecane	2017/10/03		90	%
			Petroleum Hydrocarbons (C10-C50)	2017/10/03		93	%
1843585	VBO	Method Blank	1-Chlorooctadecane	2017/10/04		98	%
			Petroleum Hydrocarbons (C10-C50)	2017/10/04	<100		ug/L
1843657	CB8	QC Standard	TKN Total Kjeldahl Nitrogen	2017/10/05		103	%
1843657	CB8	Method Blank	TKN Total Kjeldahl Nitrogen	2017/10/05	<0.40		mg/L
1843670	MR4	Spiked Blank	Total Organic Carbon	2017/10/03		103	%
1843670	MR4	Method Blank	Total Organic Carbon	2017/10/03	<0.20		mg/L
1843775	ML8	QC Standard	Total phosphorous	2017/10/03		108	%
1843775	ML8	QC Standard DUP	Total phosphorous	2017/10/03		107	%
1843775	ML8	Method Blank	Total phosphorous	2017/10/03	<2.0		ug/L
1843775	ML8	Method Blank DUP	Total phosphorous	2017/10/03	<2.0		ug/L
1843777	ML8	QC Standard	Calcium (Ca)	2017/10/03		91	%
			Magnesium (Mg)	2017/10/03		110	%
1843777	ML8	Spiked Blank	Calcium (Ca)	2017/10/03		84	%
			Magnesium (Mg)	2017/10/03		86	%
1843777	ML8	Method Blank	Calcium (Ca)	2017/10/03	<500		ug/L
			Total Hardness (CaCO3)	2017/10/03	<1000		ug/L
			Magnesium (Mg)	2017/10/03	<100		ug/L
1843789	MR4	Spiked Blank	Dissolved organic carbon	2017/10/03		104	%

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Maxxam Job #: B758972
Report Date: 2017/10/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001778
Sampler Initials: YE

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1843789	MR4	Method Blank	Dissolved organic carbon	2017/10/03	0.27, RDL=0.20		mg/L
1843838	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2017/10/03		96	%
1843838	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2017/10/03		100	%
1843838	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2017/10/03	<0.0080		mg/L
1845732	EMA	Spiked Blank	Mercury (Hg)	2017/10/11		99	%
1845732	EMA	Method Blank	Mercury (Hg)	2017/10/11	<0.000010		mg/L
1845816	EMA	Spiked Blank	Aluminum (Al)	2017/10/11		108	%
			Antimony (Sb)	2017/10/11		108	%
			Silver (Ag)	2017/10/11		104	%
			Arsenic (As)	2017/10/11		103	%
			Barium (Ba)	2017/10/11		105	%
			Boron (B)	2017/10/11		104	%
			Cadmium (Cd)	2017/10/11		102	%
			Calcium (Ca)	2017/10/11		103	%
			Chromium (Cr)	2017/10/11		98	%
			Cobalt (Co)	2017/10/11		112	%
			Copper (Cu)	2017/10/11		97	%
			Tin (Sn)	2017/10/11		109	%
			Iron (Fe)	2017/10/11		98	%
			Magnesium (Mg)	2017/10/11		98	%
			Manganese (Mn)	2017/10/11		107	%
			Mercury (Hg)	2017/10/11		106	%
			Molybdenum (Mo)	2017/10/11		101	%
			Nickel (Ni)	2017/10/11		104	%
			Lead (Pb)	2017/10/11		104	%
			Potassium (K)	2017/10/11		107	%
			Selenium (Se)	2017/10/11		100	%
			Sodium (Na)	2017/10/11		106	%
			Thallium (Tl)	2017/10/11		110	%
			Titanium (Ti)	2017/10/11		101	%
			Uranium (U)	2017/10/11		94	%
			Vanadium (V)	2017/10/11		101	%
			Zinc (Zn)	2017/10/11		95	%
1845816	EMA	Method Blank	Aluminum (Al)	2017/10/10	<5.0		ug/L
			Antimony (Sb)	2017/10/10	<0.0050		ug/L
			Silver (Ag)	2017/10/10	<0.0030		ug/L
			Arsenic (As)	2017/10/10	<0.080		ug/L
			Barium (Ba)	2017/10/10	<0.030		ug/L
			Boron (B)	2017/10/10	<0.30		ug/L
			Cadmium (Cd)	2017/10/10	<0.0060		ug/L
			Calcium (Ca)	2017/10/10	<20		ug/L
			Chromium (Cr)	2017/10/10	<0.040		ug/L
			Cobalt (Co)	2017/10/10	<0.0080		ug/L
			Copper (Cu)	2017/10/10	<0.050		ug/L
			Tin (Sn)	2017/10/10	<0.050		ug/L
			Iron (Fe)	2017/10/10	<0.50		ug/L
			Magnesium (Mg)	2017/10/10	<10		ug/L
			Manganese (Mn)	2017/10/10	<0.030		ug/L
			Mercury (Hg)	2017/10/10	<0.0020		ug/L

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B758972
Report Date: 2017/10/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001778
Sampler Initials: YE

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Molybdenum (Mo)	2017/10/10	<0.010		ug/L
			Nickel (Ni)	2017/10/10	<0.030		ug/L
			Lead (Pb)	2017/10/10	<0.010		ug/L
			Potassium (K)	2017/10/10	<10		ug/L
			Selenium (Se)	2017/10/10	<0.050		ug/L
			Sodium (Na)	2017/10/10	<10		ug/L
			Thallium (Tl)	2017/10/10	<0.010		ug/L
			Titanium (Ti)	2017/10/10	<0.40		ug/L
			Uranium (U)	2017/10/10	<0.0010		ug/L
			Vanadium (V)	2017/10/10	<0.050		ug/L
			Zinc (Zn)	2017/10/10	<0.50		ug/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Maxxam Job #: B758972
Report Date: 2017/10/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SURFACE WATER
Site Location: DSO4
Your P.O. #: 2200001778
Sampler Initials: YE

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

David Provencher, B.Sc., Chemist, Senior Analyst

Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics

Kassy Blais, B. Sc., Microbiologist

Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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.

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Votre # du projet: B758972

Attention:Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/10/12
Rapport: R4773812
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7L4742
Reçu: 2017/09/29, 09:00

Matrice: Eau de Surface
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2017/10/05	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B758972

Attention:Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2017/10/12
Rapport: R4773812
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B7L4742
Reçu: 2017/09/29, 09:00

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Simona Vatamanescu,
Courriel: SVatamanescu@maxxam.ca
Téléphone (905)826-3080

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Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B7L4742
Date du rapport: 2017/10/12

Maxxam Analytique
Votre # du projet: B758972

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU DE SURFACE

Identification Maxxam		FFP421		
Date d'échantillonnage		2017/09/27 10:35		
	Unités	**EQ2889\DSO4-ER-GW-Q4-2017**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5190044

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

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Dossier Maxxam: B7L4742
Date du rapport: 2017/10/12

Maxxam Analytique
Votre # du projet: B758972

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B7L4742
Date du rapport: 2017/10/12

Maxxam Analytique
Votre # du projet: B758972

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5190044	FA5	Blanc fortifié	Radium-226	2017/10/04		97	%	85 - 115
5190044	FA5	Blanc de méthode	Radium-226	2017/10/04	<0.0050		Bq/L	
5190044	FA5	RPD	Radium-226	2017/10/04	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

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Dossier Maxxam: B7L4742
Date du rapport: 2017/10/12

Maxxam Analytique
Votre # du projet: B758972

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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B. Water Quality

2018

Votre # du projet: B830094

Attention: Maxime Fournier

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/02
Rapport: R5333905
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I5523
Reçu: 2018/07/24, 08:47

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/08/01	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B830094

Attention: Maxime Fournier

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/02
Rapport: R5333905
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I5523
Reçu: 2018/07/24, 08:47

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

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Dossier Maxxam: B8I5523
Date du rapport: 2018/08/02

Maxxam Analytique
Votre # du projet: B830094

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HHH557		
Date d'échantillonnage		2018/07/19 10:05		
	Unités	**FO0919-01R\DSO4-GW-SP-OUT-20**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5651559

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

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Dossier Maxxam: B8I5523
Date du rapport: 2018/08/02

Maxxam Analytique
Votre # du projet: B830094

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8I5523
Date du rapport: 2018/08/02

Maxxam Analytique
Votre # du projet: B830094

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5651559	RK6	Blanc fortifié	Radium-226	2018/08/01		91	%	85 - 115
5651559	RK6	Blanc de méthode	Radium-226	2018/08/01	<0.0050		Bq/L	
5651559	RK6	RPD	Radium-226	2018/08/01	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

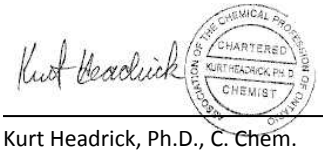
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Dossier Maxxam: B8I5523
Date du rapport: 2018/08/02

Maxxam Analytique
Votre # du projet: B830094

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-05-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/06
Report #: R2387845
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830094
Received: 2018/07/20, 10:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-05-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/06
Report #: R2387845
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830094
Received: 2018/07/20, 10:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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 Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B830094
Report Date: 2018/08/06

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

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Votre # du projet: B830026

Attention: Maxime Fournier

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/08
Rapport: R5348530
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I5530
Reçu: 2018/07/24, 08:47

Matrice: Eau
Nombre d'échantillons reçus: 2

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/08/01	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/08/02	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont certifiés ISO/IEC 17025:2005 pour certains paramètres précis des portées d'accréditation. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tels que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliqués par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères de CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire. Le cas échéant, sauf indication contraire, l'incertitude de mesure n'a pas été prise en considération lors de la déclaration de la conformité à la norme de référence.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit. Maxxam ne peut pas garantir l'exactitude des résultats qui dépendent des renseignements fournis par le client ou son représentant.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés. Si l'échantillonnage n'est pas effectué par Maxxam, les résultats se rapportent aux échantillons fournis pour analyse.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B830026

Attention: Maxime Fournier

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/08
Rapport: R5348530
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I5530
Reçu: 2018/07/24, 08:47

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8I5530
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B830026

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HHH572	HHH575		
Date d'échantillonnage		2018/07/18 09:50	2018/07/18 09:15		
	Unités	**FO0663-01R\DSO4-GW-SP-OUT-9**	**FO0667-01R\DSO4-EE-GW-2**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	<0.0050	0.0050	5651559

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8I5530
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B830026

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8I5530
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B830026

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5651559	RK6	Blanc fortifié	Radium-226	2018/08/01		91	%	85 - 115
5651559	RK6	Blanc de méthode	Radium-226	2018/08/01	<0.0050		Bq/L	
5651559	RK6	RPD	Radium-226	2018/08/01	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

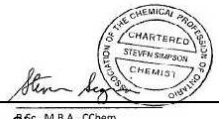
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Dossier Maxxam: B8I5530
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B830026

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SE POND
Site#: TSMC
Your C.O.C. #: 175757-04-02

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388825
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830026
Received: 2018/07/19, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	2	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SE POND
Site#: TSMC
Your C.O.C. #: 175757-04-02

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388825
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830026
Received: 2018/07/19, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B830026
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SE POND
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-05-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388893
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829969
Received: 2018/07/20, 10:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)	1	N/A	2018/07/20	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions	1	N/A	2018/07/20	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (2)	1	2018/07/20	2018/07/25	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)	1	2018/07/24	2018/07/24	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide	1	2018/07/24	2018/07/24	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand	1	2018/07/23	2018/07/23	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms	1	N/A	2018/07/20	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms	1	N/A	2018/07/21	QUE SOP-00304	MA.700-Col 1.0
Conductivity	1	N/A	2018/07/20	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)	1	N/A	2018/07/24	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)	1	2018/07/21	2018/07/23	STL SOP-00243	SM 23 5310-B m
Fluoride	1	N/A	2018/07/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)	1	2018/07/23	2018/07/24	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids	1	2018/07/23	2018/07/23	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/07/23	2018/07/23	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen	1	N/A	2018/07/24	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite	1	N/A	2018/07/20	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen	1	N/A	2018/07/20	SM 421 F	MA315-DBO 1.1 R3 m
pH	1	N/A	2018/07/20	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP (1)	1	2018/07/26	2018/07/26	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-)	1	2018/07/24	2018/07/24	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2)	1	N/A	2018/07/23	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids	1	2018/07/23	2018/07/23	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN)	1	2018/07/24	2018/07/25	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 4)	1	N/A	2018/07/25	STL SOP-00243	SM 23 5310-B m

Remarks:

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-05-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388893
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829969
Received: 2018/07/20, 10:30

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FO0390		
Sampling Date		2018/07/19		
COC Number		175757-05-01		
	Units	**DS04-GW-SP-OUT-10**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1919039
Surrogate Recovery (%)				
1-Chlorooctadecane	%	81	N/A	1919039

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

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Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FO0390		
Sampling Date		2018/07/19		
COC Number		175757-05-01		
	Units	DS04-GW-SP-OUT-10	RDL	QC Batch
METALS				
Mercury (Hg) ††	mg/L	<0.000010	0.000010	1918737
METALS ICP-MS				
Aluminum (Al)	ug/L	<10	10	1918942
Antimony (Sb) †	ug/L	<1.0	1.0	1918942
Silver (Ag)	ug/L	<1.0	1.0	1918942
Arsenic (As)	ug/L	<1.0	1.0	1918942
Barium (Ba) †	ug/L	3.3	2.0	1918942
Boron (B) †	ug/L	<50	50	1918942
Cadmium (Cd)	ug/L	<0.20	0.20	1918942
Calcium (Ca) †	ug/L	2100	500	1918942
Chromium (Cr)	ug/L	<5.0	5.0	1918942
Cobalt (Co) †	ug/L	<1.0	1.0	1918942
Copper (Cu)	ug/L	<1.0	1.0	1918942
Total Hardness (CaCO3) ††	ug/L	15000	1000	1918942
Tin (Sn) †	ug/L	<2.0	2.0	1918942
Iron (Fe)	ug/L	<60	60	1918942
Magnesium (Mg) †	ug/L	2300	100	1918942
Manganese (Mn)	ug/L	140	1.0	1918942
Molybdenum (Mo) †	ug/L	<1.0	1.0	1918942
Nickel (Ni)	ug/L	<2.0	2.0	1918942
Total phosphorous	ug/L	<10	10	1918942
Lead (Pb)	ug/L	<0.50	0.50	1918942
Potassium (K) †	ug/L	950	500	1918942
Selenium (Se)	ug/L	<3.0	3.0	1918942
Sodium (Na)	ug/L	950	500	1918942
Thallium (Tl) †	ug/L	<2.0	2.0	1918942
Titanium (Ti) ††	ug/L	<10	10	1918942
Uranium (U) ††	ug/L	<1.0	1.0	1918942
Vanadium (V)	ug/L	<2.0	2.0	1918942
Zinc (Zn)	ug/L	14	7.0	1918942

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FO0390	FO0390		
Sampling Date		2018/07/19	2018/07/19		
COC Number		175757-05-01	175757-05-01		
	Units	DS04-GW-SP-OUT-10	DS04-GW-SP-OUT-10 Lab-Dup	RDL	QC Batch
CONVENTIONALS					
BOD5	mg/L	<4.0	N/A	4.0	1918422
COD	mg/L	<10	N/A	10	1918718
Conductivity	mS/cm	0.042	N/A	0.0010	1918545
Dissolved organic carbon †	mg/L	0.90	N/A	0.20	1923887
Dissolved oxygen †	mg/L	8.5	N/A	1.0	1918527
Fluoride (F)	mg/L	<0.10	<0.10	0.10	1919424
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	N/A	0.0080	1919199
Nitrates (N-NO3-)	mg/L	4.5	N/A	0.020	1918182
Nitrites (N-NO2-)	mg/L	<0.020	N/A	0.020	1918182
Nitrogen ammonia (N-NH3)	mg/L	0.50	N/A	0.020	1919026
pH	pH	6.34	N/A	N/A	1918542
Phenols-4AAP	mg/L	<0.0020	N/A	0.0020	1919874
Reactive silica (SiO2) †	mg/L	5.7	N/A	0.50	1918863
Sulfides (S2-)	mg/L	<0.020	N/A	0.020	1919040
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	<0.40	0.40	1919228
Total Cyanide (CN)	mg/L	<0.010	N/A	0.010	1919386
Total Organic Carbon	mg/L	0.56	N/A	0.20	1919633
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	2.1	N/A	1.0	1918548
Chloride (Cl)	mg/L	0.47	N/A	0.050	1918180
Sulfates (SO4)	mg/L	<0.50	N/A	0.50	1918180
Total Dissolved Solids	mg/L	66	N/A	10	1918681
Total suspended solids (TSS)	mg/L	<2.0	N/A	2.0	1918726

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
† Parameter is not accreditable

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FO0390		
Sampling Date		2018/07/19		
COC Number		175757-05-01		
	Units	**DS04-GW-SP-OUT-10**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	4	1	1918603
Non-typical bacteria	UFC/100ml	20	1	1918603
Fecal coliforms	UFC/100ml	0	N/A	1918352

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

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
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GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

Results relate only to the items tested.

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Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1918180	MCC	QC Standard	Chloride (Cl)	2018/07/20		102	%
			Sulfates (SO4)	2018/07/20		100	%
1918180	MCC	QC Standard DUP	Chloride (Cl)	2018/07/20		103	%
			Sulfates (SO4)	2018/07/20		101	%
1918180	MCC	Method Blank	Chloride (Cl)	2018/07/20	<0.050		mg/L
			Sulfates (SO4)	2018/07/20	<0.50		mg/L
1918180	MCC	Method Blank DUP	Chloride (Cl)	2018/07/20	<0.050		mg/L
			Sulfates (SO4)	2018/07/20	<0.50		mg/L
1918182	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/20		99	%
1918182	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/20		106	%
1918182	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/20	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/20	<0.020		mg/L
1918422	AG5	Spiked Blank	BOD5	2018/07/25		77	%
1918422	AG5	Spiked Blank DUP	BOD5	2018/07/25		93	%
1918422	AG5	Method Blank	BOD5	2018/07/25	<4.0		mg/L
1918422	AG5	Method Blank DUP	BOD5	2018/07/25	<4.0		mg/L
1918542	LAR	QC Standard	pH	2018/07/20		100	%
1918545	LAR	QC Standard	Conductivity	2018/07/20		97	%
1918545	LAR	Method Blank	Conductivity	2018/07/20	<0.0010		mS/cm
1918548	LAR	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/20		94	%
1918548	LAR	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/20	<1.0		mg/L
1918681	FRB	Spiked Blank	Total Dissolved Solids	2018/07/23		108	%
1918681	FRB	Method Blank	Total Dissolved Solids	2018/07/23	<10		mg/L
1918718	SSK	QC Standard	COD	2018/07/23		108	%
1918718	SSK	QC Standard DUP	COD	2018/07/23		108	%
1918718	SSK	QC Standard DUP 2	COD	2018/07/23		96	%
1918718	SSK	Method Blank	COD	2018/07/23	<10		mg/L
1918718	SSK	Method Blank DUP	COD	2018/07/23	<10		mg/L
1918726	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/23		87	%
1918726	SSK	Method Blank	Total suspended solids (TSS)	2018/07/23	<2.0		mg/L
1918737	EHA	QC Standard	Mercury (Hg)	2018/07/24		88	%
1918737	EHA	Spiked Blank	Mercury (Hg)	2018/07/24		108	%
1918737	EHA	Method Blank	Mercury (Hg)	2018/07/24	<0.000010		mg/L
1918863	GG1	QC Standard	Reactive silica (SiO2)	2018/07/23		81	%
1918863	GG1	Method Blank	Reactive silica (SiO2)	2018/07/23	<0.10		mg/L
1918942	JRC	QC Standard	Aluminum (Al)	2018/07/23		95	%
			Antimony (Sb)	2018/07/23		102	%
			Arsenic (As)	2018/07/23		104	%
			Barium (Ba)	2018/07/23		97	%
			Boron (B)	2018/07/23		97	%
			Cadmium (Cd)	2018/07/23		99	%
			Calcium (Ca)	2018/07/23		103	%
			Chromium (Cr)	2018/07/23		103	%
			Cobalt (Co)	2018/07/23		104	%
			Copper (Cu)	2018/07/23		103	%
			Iron (Fe)	2018/07/23		114	%
			Magnesium (Mg)	2018/07/23		106	%
			Manganese (Mn)	2018/07/23		103	%
			Molybdenum (Mo)	2018/07/23		104	%
			Nickel (Ni)	2018/07/23		104	%

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Total phosphorous	2018/07/23		99	%
			Lead (Pb)	2018/07/23		102	%
			Potassium (K)	2018/07/23		105	%
			Selenium (Se)	2018/07/23		97	%
			Sodium (Na)	2018/07/23		105	%
			Thallium (Tl)	2018/07/23		100	%
			Uranium (U)	2018/07/23		103	%
			Vanadium (V)	2018/07/23		101	%
			Zinc (Zn)	2018/07/23		98	%
1918942	JRC	Spiked Blank	Aluminum (Al)	2018/07/23		99	%
			Antimony (Sb)	2018/07/23		102	%
			Silver (Ag)	2018/07/23		98	%
			Arsenic (As)	2018/07/23		106	%
			Barium (Ba)	2018/07/23		96	%
			Boron (B)	2018/07/23		94	%
			Cadmium (Cd)	2018/07/23		101	%
			Calcium (Ca)	2018/07/23		99	%
			Chromium (Cr)	2018/07/23		103	%
			Cobalt (Co)	2018/07/23		98	%
			Copper (Cu)	2018/07/23		99	%
			Tin (Sn)	2018/07/23		105	%
			Iron (Fe)	2018/07/23		105	%
			Magnesium (Mg)	2018/07/23		106	%
			Manganese (Mn)	2018/07/23		105	%
			Molybdenum (Mo)	2018/07/23		106	%
			Nickel (Ni)	2018/07/23		103	%
			Total phosphorous	2018/07/23		100	%
			Lead (Pb)	2018/07/23		97	%
			Potassium (K)	2018/07/23		105	%
			Selenium (Se)	2018/07/23		98	%
			Sodium (Na)	2018/07/23		106	%
			Thallium (Tl)	2018/07/23		94	%
			Titanium (Ti)	2018/07/23		101	%
			Uranium (U)	2018/07/23		98	%
			Vanadium (V)	2018/07/23		102	%
			Zinc (Zn)	2018/07/23		97	%
1918942	JRC	Method Blank	Aluminum (Al)	2018/07/23	<10		ug/L
			Antimony (Sb)	2018/07/23	<1.0		ug/L
			Silver (Ag)	2018/07/23	<1.0		ug/L
			Arsenic (As)	2018/07/23	<1.0		ug/L
			Barium (Ba)	2018/07/23	<2.0		ug/L
			Boron (B)	2018/07/23	<50		ug/L
			Cadmium (Cd)	2018/07/23	<0.20		ug/L
			Calcium (Ca)	2018/07/23	<500		ug/L
			Chromium (Cr)	2018/07/23	<5.0		ug/L
			Cobalt (Co)	2018/07/23	<1.0		ug/L
			Copper (Cu)	2018/07/23	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/23	<1000		ug/L
			Tin (Sn)	2018/07/23	<2.0		ug/L
			Iron (Fe)	2018/07/23	<60		ug/L

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Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Magnesium (Mg)	2018/07/23	<100		ug/L
			Manganese (Mn)	2018/07/23	<1.0		ug/L
			Molybdenum (Mo)	2018/07/23	<1.0		ug/L
			Nickel (Ni)	2018/07/23	<2.0		ug/L
			Total phosphorous	2018/07/23	<10		ug/L
			Lead (Pb)	2018/07/23	<0.50		ug/L
			Potassium (K)	2018/07/23	<500		ug/L
			Selenium (Se)	2018/07/23	<3.0		ug/L
			Sodium (Na)	2018/07/23	<500		ug/L
			Thallium (Tl)	2018/07/23	<2.0		ug/L
			Titanium (Ti)	2018/07/23	<10		ug/L
			Uranium (U)	2018/07/23	<1.0		ug/L
			Vanadium (V)	2018/07/23	<2.0		ug/L
			Zinc (Zn)	2018/07/23	<7.0		ug/L
1919026	MCC	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/24		103	%
1919026	MCC	QC Standard DUP	Nitrogen ammonia (N-NH3)	2018/07/24		99	%
1919026	MCC	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/24	<0.020		mg/L
1919026	MCC	Method Blank DUP	Nitrogen ammonia (N-NH3)	2018/07/24	<0.020		mg/L
1919039	ADE	Spiked Blank	1-Chlorooctadecane	2018/07/24		87	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/24		88	%
1919039	ADE	Spiked Blank DUP	1-Chlorooctadecane	2018/07/24		90	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/24		95	%
1919039	ADE	Method Blank	1-Chlorooctadecane	2018/07/24		89	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/24	<100		ug/L
1919040	MCC	QC Standard	Sulfides (S2-)	2018/07/24		99	%
1919040	MCC	Method Blank	Sulfides (S2-)	2018/07/24	<0.020		mg/L
1919199	JGZ	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/24		96	%
1919199	JGZ	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/24		99	%
1919199	JGZ	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/24	<0.0080		mg/L
1919228	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/25		101	%
1919228	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/25	<0.40		mg/L
1919386	CB8	QC Standard	Total Cyanide (CN)	2018/07/24		87	%
1919386	CB8	Method Blank	Total Cyanide (CN)	2018/07/24	<0.010		mg/L
1919424	GG1	QC Standard	Fluoride (F)	2018/07/24		103	%
1919424	GG1	Method Blank	Fluoride (F)	2018/07/24	<0.10		mg/L
1919633	MR4	Spiked Blank	Total Organic Carbon	2018/07/25		100	%
1919633	MR4	Method Blank	Total Organic Carbon	2018/07/25	<0.20		mg/L
1919874	JL1	Spiked Blank	Phenols-4AAP	2018/07/26		90	%
1919874	JL1	Method Blank	Phenols-4AAP	2018/07/26	<0.0020		mg/L
1923887	MR4	Spiked Blank	Dissolved organic carbon	2018/07/23		101	%
1923887	MR4	Method Blank	Dissolved organic carbon	2018/07/23	1.2, RDL=0.20		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Report Date: 2018/08/09

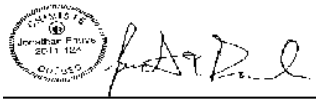
TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

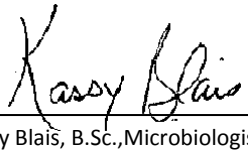
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



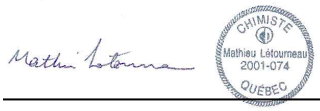
Caroline Bougie, B.Sc. Chemist



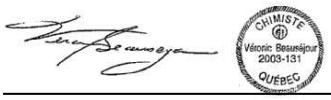
Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics



Kassy Blais, B.Sc.,Microbiologist



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist



Veronic Beausejour, B.Sc., Chemist, Supervisor

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.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-04-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388843
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829821
Received: 2018/07/19, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)	2	N/A	2018/07/20	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions	2	N/A	2018/07/20	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (2)	2	2018/07/20	2018/07/25	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)	2	2018/07/23	2018/07/24	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide	2	2018/07/23	2018/07/24	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand	2	2018/07/20	2018/07/20	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms	2	N/A	2018/07/20	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms	2	N/A	2018/07/20	QUE SOP-00304	MA.700-Col 1.0
Conductivity	2	N/A	2018/07/19	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)	2	N/A	2018/07/24	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)	2	2018/07/27	2018/07/27	STL SOP-00243	SM 23 5310-B m
Fluoride	2	N/A	2018/07/19	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)	2	2018/07/23	2018/07/24	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids	2	2018/07/20	2018/07/20	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	2	2018/07/23	2018/07/23	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen	2	N/A	2018/07/26	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite	2	N/A	2018/07/20	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen	2	N/A	2018/07/19	SM 421 F	MA315-DBO 1.1 R3 m
pH	2	N/A	2018/07/20	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP (1)	2	2018/07/24	2018/07/24	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-)	1	2018/07/20	2018/07/20	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Sulfides (S2-)	1	2018/07/23	2018/07/23	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2)	2	N/A	2018/07/23	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids	2	2018/07/23	2018/07/23	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN)	2	2018/07/26	2018/07/27	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 4)	2	N/A	2018/07/27	STL SOP-00243	SM 23 5310-B m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-04-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388843
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829821
Received: 2018/07/19, 08:30

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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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.

Maxxam Job #: B829821
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FN9694	FN9775		
Sampling Date		2018/07/18 09:50	2018/07/18 09:15		
COC Number		175757-04-01	175757-04-01		
	Units	**DSO4-GW-SP-OUT-9**	**DSO4-EE-GW-2**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS					
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	<100	100	1918854
Surrogate Recovery (%)					
1-Chlorooctadecane	%	91	94	N/A	1918854

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

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B829821
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FN9694	FN9775		
Sampling Date		2018/07/18 09:50	2018/07/18 09:15		
COC Number		175757-04-01	175757-04-01		
	Units	DSO4-GW-SP-OUT-9	DSO4-EE-GW-2	RDL	QC Batch
METALS					
Mercury (Hg) ††	mg/L	<0.000010	<0.000010	0.000010	1918737
METALS ICP-MS					
Aluminum (Al)	ug/L	18	120	10	1918942
Antimony (Sb) †	ug/L	<1.0	<1.0	1.0	1918942
Silver (Ag)	ug/L	<1.0	<1.0	1.0	1918942
Arsenic (As)	ug/L	<1.0	<1.0	1.0	1918942
Barium (Ba) †	ug/L	3.1	2.3	2.0	1918942
Beryllium (Be) †	ug/L	<2.0	<2.0	2.0	1918942
Bismuth (Bi) ††	ug/L	<1.0	<1.0	1.0	1918942
Boron (B) †	ug/L	<50	<50	50	1918942
Cadmium (Cd)	ug/L	<0.20	<0.20	0.20	1918942
Calcium (Ca) †	ug/L	1900	<500	500	1918942
Chromium (Cr)	ug/L	<5.0	<5.0	5.0	1918942
Cobalt (Co) †	ug/L	<1.0	<1.0	1.0	1918942
Copper (Cu)	ug/L	<1.0	<1.0	1.0	1918942
Total Hardness (CaCO3) ††	ug/L	13000	1000	1000	1918942
Tin (Sn) †	ug/L	<2.0	<2.0	2.0	1918942
Iron (Fe)	ug/L	100	320	60	1918942
Magnesium (Mg) †	ug/L	2100	130	100	1918942
Manganese (Mn)	ug/L	130	22	1.0	1918942
Molybdenum (Mo) †	ug/L	<1.0	<1.0	1.0	1918942
Nickel (Ni)	ug/L	<2.0	<2.0	2.0	1918942
Total phosphorous	ug/L	<10	13	10	1918942
Lead (Pb)	ug/L	<0.50	<0.50	0.50	1918942
Potassium (K) †	ug/L	850	<500	500	1918942
Selenium (Se)	ug/L	<3.0	<3.0	3.0	1918942
Sodium (Na)	ug/L	840	<500	500	1918942
Strontium (Sr) †	ug/L	10	<2.0	2.0	1918942
Thallium (Tl) †	ug/L	<2.0	<2.0	2.0	1918942
Titanium (Ti) ††	ug/L	<10	<10	10	1918942
Uranium (U) ††	ug/L	<1.0	<1.0	1.0	1918942

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B829821
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FN9694	FN9775		
Sampling Date		2018/07/18 09:50	2018/07/18 09:15		
COC Number		175757-04-01	175757-04-01		
	Units	DSO4-GW-SP-OUT-9	DSO4-EE-GW-2	RDL	QC Batch
Vanadium (V)	ug/L	<2.0	<2.0	2.0	1918942
Zinc (Zn)	ug/L	<7.0	<7.0	7.0	1918942

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B829821
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FN9694			FN9775	FN9775		
Sampling Date		2018/07/18 09:50			2018/07/18 09:15	2018/07/18 09:15		
COC Number		175757-04-01			175757-04-01	175757-04-01		
	Units	DSO4-GW-SP-OUT-9	RDL	QC Batch	DSO4-EE-GW-2	DSO4-EE-GW-2 Lab-Dup	RDL	QC Batch
CONVENTIONALS								
BOD5	mg/L	<4.0	4.0	1918422	<4.0	N/A	4.0	1918422
COD	mg/L	<10	10	1918243	<10	N/A	10	1918243
Conductivity	mS/cm	0.040	0.0010	1918134	0.0024	N/A	0.0010	1918134
Dissolved organic carbon †	mg/L	<0.20	0.20	1923783	1.1	N/A	0.20	1923783
Dissolved oxygen †	mg/L	8.9	1.0	1918144	8.8	N/A	1.0	1918144
Fluoride (F)	mg/L	<0.10	0.10	1918000	<0.10	N/A	0.10	1918000
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	0.0080	1919199	<0.0080	N/A	0.0080	1919199
Nitrates (N-NO3-)	mg/L	4.2	0.020	1918182	0.039	N/A	0.020	1918182
Nitrites (N-NO2-)	mg/L	<0.020	0.020	1918182	<0.020	N/A	0.020	1918182
Nitrogen ammonia (N-NH3)	mg/L	0.69	0.080	1919801	0.11	N/A	0.040	1919801
pH	pH	6.42	N/A	1918131	5.78	N/A	N/A	1918131
Phenols-4AAP	mg/L	<0.0020	0.0020	1919107	<0.0020	<0.0020	0.0020	1919107
Reactive silica (SiO2) †	mg/L	5.7	0.50	1918863	2.1	N/A	0.50	1918863
Sulfides (S2-)	mg/L	<0.020	0.020	1918245	<0.020	N/A	0.020	1918704
TKN Total Kjeldahl Nitrogen	mg/L	0.79	0.40	1919880	<0.40	N/A	0.40	1919880
Total Cyanide (CN)	mg/L	<0.010	0.010	1918937	<0.010	N/A	0.010	1918937
Total Organic Carbon	mg/L	0.57	0.20	1920495	1.7	N/A	0.20	1920495
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	2.0	1.0	1918548	<1.0	N/A	1.0	1918548
Chloride (Cl)	mg/L	0.42	0.050	1918180	0.10	N/A	0.050	1918180
Sulfates (SO4)	mg/L	<0.50	0.50	1918180	<0.50	N/A	0.50	1918180
Total Dissolved Solids	mg/L	60	10	1918681	16	N/A	10	1918681
Total suspended solids (TSS)	mg/L	5.2	2.0	1918438	<2.0	N/A	2.0	1918438

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
† Parameter is not accreditable

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FN9694		FN9775		
Sampling Date		2018/07/18 09:50		2018/07/18 09:15		
COC Number		175757-04-01		175757-04-01		
	Units	DSO4-GW-SP-OUT-9	RDL	DSO4-EE-GW-2	RDL	QC Batch
MICROBIOLGICAL TESTS						
Total coliforms	UFC/100ml	<10	10	1400	100	1918186
Non-typical bacteria	UFC/100ml	10	10	700	100	1918186
Fecal coliforms	UFC/100ml	0	N/A	2	1	1918190

RDL = Reportable Detection Limit
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N/A = Not Applicable

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
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GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

pH: analyzed past hold time due to instrumental problems.

Reported detection limits are multiplied by dilution factors used for sample analysis.

ammonia: Due to the sample matrix, a better detection limit cannot be reported.
Please note that dissolved organic carbon results have been corrected for the method blank.

Results relate only to the items tested.

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1918000	LAR	QC Standard	Fluoride (F)	2018/07/19		104	%
1918000	LAR	QC Standard DUP	Fluoride (F)	2018/07/19		104	%
1918000	LAR	Method Blank	Fluoride (F)	2018/07/19	<0.10		mg/L
1918000	LAR	Method Blank DUP	Fluoride (F)	2018/07/19	<0.10		mg/L
1918131	LAR	QC Standard	pH	2018/07/19		100	%
1918134	LAR	QC Standard	Conductivity	2018/07/19		99	%
1918134	LAR	QC Standard DUP	Conductivity	2018/07/19		99	%
1918134	LAR	Method Blank	Conductivity	2018/07/19	<0.0010		mS/cm
1918134	LAR	Method Blank DUP	Conductivity	2018/07/19	<0.0010		mS/cm
1918180	MCC	QC Standard	Chloride (Cl)	2018/07/20		102	%
			Sulfates (SO4)	2018/07/20		100	%
1918180	MCC	QC Standard DUP	Chloride (Cl)	2018/07/20		103	%
			Sulfates (SO4)	2018/07/20		101	%
1918180	MCC	Method Blank	Chloride (Cl)	2018/07/20	<0.050		mg/L
			Sulfates (SO4)	2018/07/20	<0.50		mg/L
1918180	MCC	Method Blank DUP	Chloride (Cl)	2018/07/20	<0.050		mg/L
			Sulfates (SO4)	2018/07/20	<0.50		mg/L
1918182	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/20		99	%
1918182	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/20		106	%
1918182	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/20	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/20	<0.020		mg/L
1918243	SSK	QC Standard	COD	2018/07/20		107	%
1918243	SSK	QC Standard DUP	COD	2018/07/20		106	%
1918243	SSK	QC Standard DUP 2	COD	2018/07/20		96	%
1918243	SSK	Method Blank	COD	2018/07/20	<10		mg/L
1918243	SSK	Method Blank DUP	COD	2018/07/20	<10		mg/L
1918245	AG5	QC Standard	Sulfides (S2-)	2018/07/20		103	%
1918245	AG5	Method Blank	Sulfides (S2-)	2018/07/20	<0.020		mg/L
1918422	AG5	Spiked Blank	BOD5	2018/07/25		77	%
1918422	AG5	Spiked Blank DUP	BOD5	2018/07/25		93	%
1918422	AG5	Method Blank	BOD5	2018/07/25	<4.0		mg/L
1918422	AG5	Method Blank DUP	BOD5	2018/07/25	<4.0		mg/L
1918438	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/20		90	%
1918438	SSK	Method Blank	Total suspended solids (TSS)	2018/07/20	<2.0		mg/L
1918548	LAR	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/20		94	%
1918548	LAR	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/20	<1.0		mg/L
1918681	FRB	Spiked Blank	Total Dissolved Solids	2018/07/23		108	%
1918681	FRB	Method Blank	Total Dissolved Solids	2018/07/23	<10		mg/L
1918704	MCC	QC Standard	Sulfides (S2-)	2018/07/23		107	%
1918704	MCC	Method Blank	Sulfides (S2-)	2018/07/23	<0.020		mg/L
1918737	EHA	QC Standard	Mercury (Hg)	2018/07/24		88	%
1918737	EHA	Spiked Blank	Mercury (Hg)	2018/07/24		108	%
1918737	EHA	Method Blank	Mercury (Hg)	2018/07/24	<0.000010		mg/L
1918854	ADE	Spiked Blank	1-Chlorooctadecane	2018/07/23		94	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/23		90	%
1918854	ADE	Spiked Blank DUP	1-Chlorooctadecane	2018/07/23		110	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/23		102	%
1918854	ADE	Method Blank	1-Chlorooctadecane	2018/07/23		91	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/23	<100		ug/L
1918863	GG1	QC Standard	Reactive silica (SiO2)	2018/07/23		81	%

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Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1918863	GG1	Method Blank	Reactive silica (SiO2)	2018/07/23	<0.10		mg/L
1918937	CB8	QC Standard	Total Cyanide (CN)	2018/07/24		91	%
1918937	CB8	Method Blank	Total Cyanide (CN)	2018/07/24	<0.010		mg/L
1918942	JRC	QC Standard	Aluminum (Al)	2018/07/23		95	%
			Antimony (Sb)	2018/07/23		102	%
			Arsenic (As)	2018/07/23		104	%
			Barium (Ba)	2018/07/23		97	%
			Beryllium (Be)	2018/07/23		104	%
			Boron (B)	2018/07/23		97	%
			Cadmium (Cd)	2018/07/23		99	%
			Calcium (Ca)	2018/07/23		103	%
			Chromium (Cr)	2018/07/23		103	%
			Cobalt (Co)	2018/07/23		104	%
			Copper (Cu)	2018/07/23		103	%
			Iron (Fe)	2018/07/23		114	%
			Magnesium (Mg)	2018/07/23		106	%
			Manganese (Mn)	2018/07/23		103	%
			Molybdenum (Mo)	2018/07/23		104	%
			Nickel (Ni)	2018/07/23		104	%
			Total phosphorous	2018/07/23		99	%
			Lead (Pb)	2018/07/23		102	%
			Potassium (K)	2018/07/23		105	%
			Selenium (Se)	2018/07/23		97	%
			Sodium (Na)	2018/07/23		105	%
			Strontium (Sr)	2018/07/23		100	%
			Thallium (Tl)	2018/07/23		100	%
			Uranium (U)	2018/07/23		103	%
			Vanadium (V)	2018/07/23		101	%
			Zinc (Zn)	2018/07/23		98	%
1918942	JRC	Spiked Blank	Aluminum (Al)	2018/07/23		99	%
			Antimony (Sb)	2018/07/23		102	%
			Silver (Ag)	2018/07/23		98	%
			Arsenic (As)	2018/07/23		106	%
			Barium (Ba)	2018/07/23		96	%
			Beryllium (Be)	2018/07/23		101	%
			Bismuth (Bi)	2018/07/23		101	%
			Boron (B)	2018/07/23		94	%
			Cadmium (Cd)	2018/07/23		101	%
			Calcium (Ca)	2018/07/23		99	%
			Chromium (Cr)	2018/07/23		103	%
			Cobalt (Co)	2018/07/23		98	%
			Copper (Cu)	2018/07/23		99	%
			Tin (Sn)	2018/07/23		105	%
			Iron (Fe)	2018/07/23		105	%
			Magnesium (Mg)	2018/07/23		106	%
			Manganese (Mn)	2018/07/23		105	%
			Molybdenum (Mo)	2018/07/23		106	%
			Nickel (Ni)	2018/07/23		103	%
			Total phosphorous	2018/07/23		100	%
			Lead (Pb)	2018/07/23		97	%

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Potassium (K)	2018/07/23		105	%
			Selenium (Se)	2018/07/23		98	%
			Sodium (Na)	2018/07/23		106	%
			Strontium (Sr)	2018/07/23		101	%
			Thallium (Tl)	2018/07/23		94	%
			Titanium (Ti)	2018/07/23		101	%
			Uranium (U)	2018/07/23		98	%
			Vanadium (V)	2018/07/23		102	%
			Zinc (Zn)	2018/07/23		97	%
1918942	JRC	Method Blank	Aluminum (Al)	2018/07/23	<10		ug/L
			Antimony (Sb)	2018/07/23	<1.0		ug/L
			Silver (Ag)	2018/07/23	<1.0		ug/L
			Arsenic (As)	2018/07/23	<1.0		ug/L
			Barium (Ba)	2018/07/23	<2.0		ug/L
			Beryllium (Be)	2018/07/23	<2.0		ug/L
			Bismuth (Bi)	2018/07/23	<1.0		ug/L
			Boron (B)	2018/07/23	<50		ug/L
			Cadmium (Cd)	2018/07/23	<0.20		ug/L
			Calcium (Ca)	2018/07/23	<500		ug/L
			Chromium (Cr)	2018/07/23	<5.0		ug/L
			Cobalt (Co)	2018/07/23	<1.0		ug/L
			Copper (Cu)	2018/07/23	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/23	<1000		ug/L
			Tin (Sn)	2018/07/23	<2.0		ug/L
			Iron (Fe)	2018/07/23	<60		ug/L
			Magnesium (Mg)	2018/07/23	<100		ug/L
			Manganese (Mn)	2018/07/23	<1.0		ug/L
			Molybdenum (Mo)	2018/07/23	<1.0		ug/L
			Nickel (Ni)	2018/07/23	<2.0		ug/L
			Total phosphorous	2018/07/23	<10		ug/L
			Lead (Pb)	2018/07/23	<0.50		ug/L
			Potassium (K)	2018/07/23	<500		ug/L
			Selenium (Se)	2018/07/23	<3.0		ug/L
			Sodium (Na)	2018/07/23	<500		ug/L
			Strontium (Sr)	2018/07/23	<2.0		ug/L
			Thallium (Tl)	2018/07/23	<2.0		ug/L
			Titanium (Ti)	2018/07/23	<10		ug/L
			Uranium (U)	2018/07/23	<1.0		ug/L
			Vanadium (V)	2018/07/23	<2.0		ug/L
			Zinc (Zn)	2018/07/23	<7.0		ug/L
1919107	JL1	Spiked Blank	Phenols-4AAP	2018/07/24		98	%
1919107	JL1	Method Blank	Phenols-4AAP	2018/07/24	<0.0020		mg/L
1919199	JGZ	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/24		96	%
1919199	JGZ	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/24		99	%
1919199	JGZ	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/24	<0.0080		mg/L
1919801	MCC	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/26		104	%
1919801	MCC	QC Standard DUP	Nitrogen ammonia (N-NH3)	2018/07/26		99	%
1919801	MCC	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/26	<0.020		mg/L
1919801	MCC	Method Blank DUP	Nitrogen ammonia (N-NH3)	2018/07/26	<0.020		mg/L
1919880	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/27		100	%

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B829821
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1919880	MCC	QC Standard DUP	TKN Total Kjeldahl Nitrogen	2018/07/27		92	%
1919880	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/27	<0.40		mg/L
1919880	MCC	Method Blank DUP	TKN Total Kjeldahl Nitrogen	2018/07/27	<0.40		mg/L
1920495	MR4	Spiked Blank	Total Organic Carbon	2018/07/27		100	%
1920495	MR4	Method Blank	Total Organic Carbon	2018/07/27	<0.20		mg/L
1923783	MR4	Spiked Blank	Dissolved organic carbon	2018/07/27		98	%
1923783	MR4	Method Blank	Dissolved organic carbon	2018/07/27	1.5, RDL=0.20		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Maxxam Job #: B829821
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

Caroline Bougie, B.Sc. Chemist

Dochka Koleva Hristova, B.Sc., Chemist

Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics

Kassy Blais, B.Sc.,Microbiologist

Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

Veronic Beausejour, B.Sc., Chemist, Supervisor

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Success Through Science®

Your P.O. #: 2200002147
Your Project #: QC Quarterly Surface Water
Site Location: GOODWOOD SED POND
Your C.O.C. #: 175757-03-03

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/03
Report #: R2387566
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829776
Received: 2018/07/19, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Daphnia - LC50 (acute-48h)-Federal	1	N/A	2018/07/22	QUE SOP-00406	EPS1/RM/14
Hardness by ICP-MS	1	2018/07/19	2018/07/20	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Rainbow Trout - LC50 (acute-96h)	1	N/A	2018/07/20	QUE SOP - 00408	EPS1/RM/13

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: QC Quarterly Surface Water
Site Location: GOODWOOD SED POND
Your C.O.C. #: 175757-03-03

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/03
Report #: R2387566
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829776
Received: 2018/07/19, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B829776
Report Date: 2018/08/03

TATA STEEL MINERALS CANADA
Client Project #: QC Quarterly Surface Water
Site Location: GOODWOOD SED POND
Your P.O. #: 2200002147
Sampler Initials: PS

ECOTOXICOLOGY (SURFACE WATER)

Maxxam ID		FN9450	
Sampling Date		2018/07/18 09:50	
COC Number		175757-03-03	
	Units	**DS04-GW-SP-OUT-9**	**QC Batch**
Daphnia Magna - Can			
LC50	%v/v	ATTACHED	1918672
Rainbow Trout			
LC50	%v/v	ATTACHED	1918151
QC Batch = Quality Control Batch			

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Maxxam Job #: B829776
Report Date: 2018/08/03

TATA STEEL MINERALS CANADA
Client Project #: QC Quarterly Surface Water
Site Location: GOODWOOD SED POND
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B829776
Report Date: 2018/08/03

TATA STEEL MINERALS CANADA
Client Project #: QC Quarterly Surface Water
Site Location: GOODWOOD SED POND
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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



Angela Paquet-Walsh, M.Sc. Biologist, Analyst 2

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B829776

Client Project Name & Number: GOODWOOD SED POND QC Quarterly Surface Water

Test Result:

96 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual

Toxic unit: <1

Comment: Non-toxique

Sample Name : DS04-GW-SP-OUT-9

Sample Matrix : SURFACE WATER

Description: Beige rose, translucide et peu de solides

Sample Number: FN9450-02

Sample Collected: Jul 18, 2018 09:15 AM Sampling Method : Grab

Site Collection: N/A

Sample Collected By: PS Volume Received: 38 L

Temp.Upon Arrival: 21 °C Storage: 2-6°C

Sample Received: Jul 19, 2018 08:30 AM pH: 5.8

Dissolved Oxygen: 9.7 mg/L

Analysis Start : Jul 20, 2018 10:55 AM Temperature : 16 °C

Sample Conductance: 41 µS/cm

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	96 hrs	96 hr	96 hrs	24 hrs	24 hrs	24 hrs	24 hrs
0	16	7.6	274	9.6	15	7.7	9.8	0	0	0	0
6.25	16	7.6	261	9.7	15	7.4	7.4	0	0	0	0
12.5	16	7.6	247	9.8	15	7.6	9.8	0	0	0	0
25	16	7.5	224	9.7	15	7.6	9.8	0	0	0	0
50	16	7.4	167	9.9	15	7.5	10.0	0	0	0	0
100	16	5.9	42	9.9	15	6.3	9.9	0	0	0	0

Concentration	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	48 hrs	48 hrs	48 hrs	48 hrs	72 hrs	72 hrs	72 hrs	72 hrs	96 hrs	96 hrs	96 hrs	96 hrs
0	0	0	0	0	0	0	0	0	0	0	0	0
6.25	0	0	0	0	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	2	20.0	0	0	4	40.0	0	0	4	40.0

Comments :

Culture/Control/Dilution Water Dechlorinated municipal tap water

Hardness: 101 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	35 cm
Total # of Organisms Used :	60	Pre-aeration Time :	30 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	16 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.3 g/L	Photoperiod :	16 hours of of light; 8 hours of darkness		
Test vessel:	20L glass aquarium with polyethylene bag.				

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client :	4526	TATA STEEL MINERALS CANADA		Job Number:	B829776
Client Project Name & Number:		GOODWOOD SED POND QC Quarterly Surface Water		Sample Number:	FN9450-02

Test Organism :	Rainbow Trout *(Oncorhynchus mykiss)*	Source :	Piscicultures Les Arpents Verts		
Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.5 ± 0.1 g	Length (Mean) +- SD :	3.75 ± 0.22 cm
Culture Water Renewal :	2 liters/min	Weight (Range) :	0.4 – 0.6 g	Length (Range) :	3.40 – 4.10 cm
Culture Photoperiod :	16 hours of of light; 8 hours of darkness			% Mortality within 7 days :	0%
Feeding rate and frequency :	1-2x a day; 1-5% of the body weights.			Acclimation Time:	>14 days

Reference chemical:	Phenol	Test Date:	Jul 19, 2018
Test Endpoint 96 hrs LC50 (95% confidence interval) :	10.8 (9.00, 13.0)mg/L	Statistical Method :	Binomial
Historical Mean LC50 (warning limits) :	9.85 (7.82, 12.4) mg/L	Concentration :	0,4,6,9,13,18 mg/L

Test Method

QUE SOP - 00408. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS1/RM/13 - Second Edition. Environment Canada. 2000. (Including Amendments: May 2007).

This is essentially a 96H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations : Aucune

Analyst : Alexis Roy, Olivier Roberge

Verified By : Angela Paquet-Walsh, Analyst 2

Date: Aug 01, 2018 04:23 PM

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B829776

Client Project Name & Number: GOODWOOD SED POND QC Quarterly Surface Water No. d'échantillon : FN9450-01

Test Result:

48 hrs LC50 %v/v (95% CL): 17.8 (9.98-28.1) Statistical Method: Probit **Toxic unit:** 5.62

48 hrs EC50 %v/v (95% CL): 17.8 (9.98-28.1) Statistical Method: Probit **Comment:** Toxique

Sample Name : DS04-GW-SP-OUT-9 Sample Matrix : SURFACE WATER

Description: Incolore, translucide, inodore, aucun solide décantable

Sample Prior to Analysis:

Sample Collected:	Jul 18, 2018 09:50 AM	Sampling Method :	Grab	pH:	6.0
Sample Collected By:	PS	Site Collection:	N/A	Temperature :	19 °C
Sample Received:	Jul 19, 2018 08:30 AM	Volume Received:	1 L	Dissolved Oxygen:	9.9 mg/L
Analysis Start :	Jul 22, 2018 11:40 AM	Temp.Upon Arrival:	21 °C	Sample Conductance:	42 µS/cm
End :	Jul 24, 2018 11:30 AM	Storage:	2-6°C	Hardness:	163 mg $CaCO_3$/L

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Immobility (#)	Immobility (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	48 hrs	48 hr	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
0	20	7.8	473	8.5	21	7.6	8.2	0	0	1	10.0
6.25	21	7.5	445	8.6	21	7.5	8.3	0	0	3	30.0
12.5	21	7.5	426	8.6	21	7.5	8.4	0	0	3	30.0
25	21	7.5	372	8.7	21	7.5	8.3	0	0	4	40.0
50	20	7.3	266	9.0	21	7.4	8.3	0	0	9	90.0
100	19	6.0	43	9.7	21	6.2	8.4	0	0	10	100

Comments : Conc. 100% (v/v): O2 sursaturée après aération 30 min.

Culture/Control/Dilution Water: Reconstitued water for Daphnia

Hardness: 170 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Pre-aeration Time :	30 min	Rate of Pre-aeration :	40±5 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	No
Test Volume :	150 mL	Vessel Volume :	270 ml	Test pH Adjusted:	No
Loading Density :	15.0 mL/Daphnia	Photoperiod :	16 hours of of light; 8 hours of darkness		

Test Organism : *Daphnia magna* Source : Maxxam Lab Culture

Age at Test Initiation :	<24 hres	Average Brood Size :	32.6
Culture Photoperiod :	16 hours of of light; 8 hours of darkness	% Mortality within 7 days :	0
Culture Temperature :	20 ± 2 °C	Time To First Brood :	8 Days
Culture Diet	Fed once a day.		

Reference chemical: Potassium Dichromate Test Date: Jul 15, 2018

Test Endpoint 48 hrs LC50 (95% confidence interval) :	0.16 (N/A, 0.25)mg/L	Statistical Method :	Binomial
Historical Mean LC50 (warning limits) :	0.17 (0.10, 0.30) mg/L	Concentration :	0,0.0625,0.125,0.25,0.5,1 mg/L

Test Method QUE SOP-00406. Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. EPS1/RM/14 - Second Edition. Environment Canada. 2000.

This is essentially a 48H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations: Aucune

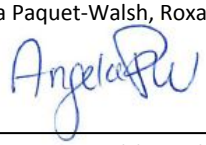
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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B829776

Client Project Name & Number: GOODWOOD SED POND QC Quarterly Surface Water No. d'échantillon : FN9450-01

Analyst : Angela Paquet-Walsh, Roxane Champagne



Verified By : Angela Paquet-Walsh, Analyst 2 Date: Aug 03, 2018 08:16 AM

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Votre # du projet: B829058

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/26
Rapport: R5318992
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I0224
Reçu: 2018/07/18, 11:18

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/07/24	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B829058

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/26
Rapport: R5318992
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I0224
Reçu: 2018/07/18, 11:18

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8I0224
Date du rapport: 2018/07/26

Maxxam Analytique
Votre # du projet: B829058

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HGD451		
Date d'échantillonnage		2018/07/15 18:02		
	Unités	**FN6360-01R\DSO4-GW-SP-OUT-8**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5639492

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

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Dossier Maxxam: B8I0224
Date du rapport: 2018/07/26

Maxxam Analytique
Votre # du projet: B829058

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8I0224
Date du rapport: 2018/07/26

Maxxam Analytique
Votre # du projet: B829058

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5639492	RK6	Blanc fortifié	Radium-226	2018/07/24		89	%	85 - 115
5639492	RK6	Blanc de méthode	Radium-226	2018/07/24	<0.0050		Bq/L	
5639492	RK6	RPD	Radium-226	2018/07/25	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

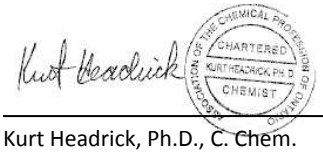
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Dossier Maxxam: B8I0224
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Maxxam Analytique
Votre # du projet: B829058

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-03-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/27
Report #: R2386105
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829058
Received: 2018/07/17, 10:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)	1	N/A	2018/07/17	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions	1	N/A	2018/07/17	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (3)	1	2018/07/18	2018/07/23	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)	1	2018/07/19	2018/07/20	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide	1	2018/07/18	2018/07/18	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand	1	2018/07/18	2018/07/18	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms	1	N/A	2018/07/17	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms	1	N/A	2018/07/17	QUE SOP-00304	MA.700-Col 1.0
Conductivity	1	N/A	2018/07/17	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)	1	N/A	2018/07/20	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)	1	2018/07/18	2018/07/20	STL SOP-00243	SM 23 5310-B m
Fluoride	1	N/A	2018/07/19	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)	1	2018/07/23	2018/07/24	STL SOP-00042	MA.200–Hg 1.1 R1 m
Radium 226 (MMER LOW LEVEL) (2)	1	N/A	N/A		
Total Suspended Solids	1	2018/07/18	2018/07/18	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/07/18	2018/07/19	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen	1	N/A	2018/07/18	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite	1	N/A	2018/07/17	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen	1	N/A	2018/07/17	SM 421 F	MA315-DBO 1.1 R3 m
pH	1	N/A	2018/07/17	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP (1)	1	2018/07/20	2018/07/20	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-)	1	2018/07/18	2018/07/18	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2)	1	N/A	2018/07/17	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids	1	2018/07/18	2018/07/18	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN)	1	2018/07/19	2018/07/20	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 5)	1	N/A	2018/07/20	STL SOP-00243	SM 23 5310-B m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-03-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/27
Report #: R2386105
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829058
Received: 2018/07/17, 10:00

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam-Radiological Lab
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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 #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FN6360		
Sampling Date		2018/07/15 18:02		
COC Number		175757-03-01		
	Units	**DS04-GW-SP-OUT-8**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1917959
Surrogate Recovery (%)				
1-Chlorooctadecane	%	85	N/A	1917959

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

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Maxxam Job #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FN6360		
Sampling Date		2018/07/15 18:02		
COC Number		175757-03-01		
	Units	**DS04-GW-SP-OUT-8**	**RDL**	**QC Batch**
METALS				
Mercury (Hg) ††	mg/L	<0.000010	0.000010	1918737
METALS ICP-MS				
Aluminum (Al)	ug/L	56	10	1917117
Antimony (Sb) †	ug/L	<1.0	1.0	1917117
Silver (Ag)	ug/L	<1.0	1.0	1917117
Arsenic (As)	ug/L	<1.0	1.0	1917117
Barium (Ba) †	ug/L	2.7	2.0	1917117
Boron (B) †	ug/L	<50	50	1917117
Cadmium (Cd)	ug/L	<0.20	0.20	1917117
Calcium (Ca) †	ug/L	1500	500	1917117
Chromium (Cr)	ug/L	<5.0	5.0	1917117
Cobalt (Co) †	ug/L	<1.0	1.0	1917117
Copper (Cu)	ug/L	<1.0	1.0	1917117
Total Hardness (CaCO3) ††	ug/L	11000	1000	1917117
Tin (Sn) †	ug/L	<2.0	2.0	1917117
Iron (Fe)	ug/L	120	60	1917117
Magnesium (Mg) †	ug/L	1700	100	1917117
Manganese (Mn)	ug/L	100	1.0	1917117
Molybdenum (Mo) †	ug/L	<1.0	1.0	1917117
Nickel (Ni)	ug/L	<2.0	2.0	1917117
Total phosphorous	ug/L	<10	10	1917117
Lead (Pb)	ug/L	<0.50	0.50	1917117
Potassium (K) †	ug/L	870	500	1917117
Selenium (Se)	ug/L	<3.0	3.0	1917117
Sodium (Na)	ug/L	590	500	1917117
Thallium (Tl) †	ug/L	<2.0	2.0	1917117
Titanium (Ti) ††	ug/L	<10	10	1917117
Uranium (U) ††	ug/L	<1.0	1.0	1917117
Vanadium (V)	ug/L	<2.0	2.0	1917117
Zinc (Zn)	ug/L	<7.0	7.0	1917117

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FN6360		
Sampling Date		2018/07/15 18:02		
COC Number		175757-03-01		
	Units	**DS04-GW-SP-OUT-8**	**RDL**	**QC Batch**
CONVENTIONALS				
BOD5	mg/L	<4.0	4.0	1917296
COD	mg/L	<10	10	1917333
Conductivity	mS/cm	0.034	0.0010	1917186
Dissolved organic carbon †	mg/L	2.8	0.20	1917644
Dissolved oxygen †	mg/L	9.3	1.0	1917216
Fluoride (F)	mg/L	<0.10	0.10	1918000
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	0.0080	1918214
Nitrates (N-NO3-)	mg/L	3.6	0.020	1917240
Nitrites (N-NO2-)	mg/L	<0.020	0.020	1917240
Nitrogen ammonia (N-NH3)	mg/L	0.88	0.020	1917251
pH	pH	6.12	N/A	1917183
Phenols-4AAP	mg/L	<0.0020	0.0020	1918284
Reactive silica (SiO2) †	mg/L	4.7	0.50	1917138
Sulfides (S2-)	mg/L	<0.020	0.020	1917676
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	0.40	1917710
Total Cyanide (CN)	mg/L	<0.010	0.010	1917558
Total Organic Carbon	mg/L	0.61	0.20	1918499
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	<1.0	1.0	1917185
Chloride (Cl)	mg/L	0.41	0.050	1917241
Sulfates (SO4)	mg/L	<0.50	0.50	1917241
Total Dissolved Solids	mg/L	36	10	1917341
Total suspended solids (TSS)	mg/L	<2.0	2.0	1917278

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable
N/A = Not Applicable

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Maxxam Job #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FN6360		
Sampling Date		2018/07/15 18:02		
COC Number		175757-03-01		
	Units	**DS04-GW-SP-OUT-8**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	1	1	1917166
Non-typical bacteria	UFC/100ml	72	1	1917166
Fecal coliforms	UFC/100ml	0	N/A	1917167

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

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Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

Results relate only to the items tested.

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Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1917117	JRC	QC Standard	Aluminum (Al)	2018/07/18		96	%
			Antimony (Sb)	2018/07/18		99	%
			Arsenic (As)	2018/07/18		104	%
			Barium (Ba)	2018/07/18		94	%
			Boron (B)	2018/07/18		102	%
			Cadmium (Cd)	2018/07/18		100	%
			Calcium (Ca)	2018/07/18		97	%
			Chromium (Cr)	2018/07/18		102	%
			Cobalt (Co)	2018/07/18		104	%
			Copper (Cu)	2018/07/18		103	%
			Iron (Fe)	2018/07/18		114	%
			Magnesium (Mg)	2018/07/18		105	%
			Manganese (Mn)	2018/07/18		102	%
			Molybdenum (Mo)	2018/07/18		99	%
			Nickel (Ni)	2018/07/18		103	%
			Total phosphorous	2018/07/18		101	%
			Lead (Pb)	2018/07/18		94	%
			Potassium (K)	2018/07/18		104	%
			Selenium (Se)	2018/07/18		99	%
			Sodium (Na)	2018/07/18		101	%
			Thallium (Tl)	2018/07/18		97	%
			Uranium (U)	2018/07/18		99	%
			Vanadium (V)	2018/07/18		100	%
			Zinc (Zn)	2018/07/18		101	%
1917117	JRC	Spiked Blank	Aluminum (Al)	2018/07/19		113	%
			Antimony (Sb)	2018/07/19		100	%
			Silver (Ag)	2018/07/19		98	%
			Arsenic (As)	2018/07/19		105	%
			Barium (Ba)	2018/07/19		99	%
			Boron (B)	2018/07/19		104	%
			Cadmium (Cd)	2018/07/19		102	%
			Calcium (Ca)	2018/07/19		97	%
			Chromium (Cr)	2018/07/19		102	%
			Cobalt (Co)	2018/07/19		101	%
			Copper (Cu)	2018/07/19		101	%
			Tin (Sn)	2018/07/19		102	%
			Iron (Fe)	2018/07/19		102	%
			Magnesium (Mg)	2018/07/19		106	%
			Manganese (Mn)	2018/07/19		105	%
			Molybdenum (Mo)	2018/07/19		104	%
			Nickel (Ni)	2018/07/19		103	%
			Total phosphorous	2018/07/19		104	%
			Lead (Pb)	2018/07/19		96	%
			Potassium (K)	2018/07/19		103	%
			Selenium (Se)	2018/07/19		104	%
			Sodium (Na)	2018/07/19		98	%
			Thallium (Tl)	2018/07/19		100	%
			Titanium (Ti)	2018/07/19		106	%
			Uranium (U)	2018/07/19		101	%
			Vanadium (V)	2018/07/19		101	%

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Maxxam Job #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Zinc (Zn)	2018/07/19		103	%
1917117	JRC	Method Blank	Aluminum (Al)	2018/07/19	<10		ug/L
			Antimony (Sb)	2018/07/19	<1.0		ug/L
			Silver (Ag)	2018/07/19	<1.0		ug/L
			Arsenic (As)	2018/07/19	<1.0		ug/L
			Barium (Ba)	2018/07/19	<2.0		ug/L
			Boron (B)	2018/07/19	<50		ug/L
			Cadmium (Cd)	2018/07/19	<0.20		ug/L
			Calcium (Ca)	2018/07/19	<500		ug/L
			Chromium (Cr)	2018/07/19	<5.0		ug/L
			Cobalt (Co)	2018/07/19	<1.0		ug/L
			Copper (Cu)	2018/07/19	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/19	<1000		ug/L
			Tin (Sn)	2018/07/19	<2.0		ug/L
			Iron (Fe)	2018/07/19	<60		ug/L
			Magnesium (Mg)	2018/07/19	<100		ug/L
			Manganese (Mn)	2018/07/19	<1.0		ug/L
			Molybdenum (Mo)	2018/07/19	<1.0		ug/L
			Nickel (Ni)	2018/07/19	<2.0		ug/L
			Total phosphorous	2018/07/19	<10		ug/L
			Lead (Pb)	2018/07/19	<0.50		ug/L
			Potassium (K)	2018/07/19	<500		ug/L
			Selenium (Se)	2018/07/19	<3.0		ug/L
			Sodium (Na)	2018/07/19	<500		ug/L
			Thallium (Tl)	2018/07/19	<2.0		ug/L
			Titanium (Ti)	2018/07/19	<10		ug/L
			Uranium (U)	2018/07/19	<1.0		ug/L
			Vanadium (V)	2018/07/19	<2.0		ug/L
			Zinc (Zn)	2018/07/19	<7.0		ug/L
1917138	GG1	QC Standard	Reactive silica (SiO2)	2018/07/17		90	%
1917138	GG1	Method Blank	Reactive silica (SiO2)	2018/07/17	<0.10		mg/L
1917183	LAR	QC Standard	pH	2018/07/17		100	%
1917185	LAR	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/17		86	%
1917185	LAR	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/17	<1.0		mg/L
1917186	LAR	QC Standard	Conductivity	2018/07/17		98	%
1917186	LAR	Method Blank	Conductivity	2018/07/17	<0.0010		mS/cm
1917240	LAR	QC Standard	Nitrates (N-NO3-)	2018/07/17		98	%
1917240	LAR	Spiked Blank	Nitrites (N-NO2-)	2018/07/17		104	%
1917240	LAR	Method Blank	Nitrates (N-NO3-)	2018/07/17	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/17	<0.020		mg/L
1917241	LAR	QC Standard	Chloride (Cl)	2018/07/17		103	%
			Sulfates (SO4)	2018/07/17		102	%
1917241	LAR	Method Blank	Chloride (Cl)	2018/07/17	<0.050		mg/L
			Sulfates (SO4)	2018/07/17	<0.50		mg/L
1917251	MCC	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/18		100	%
1917251	MCC	QC Standard DUP	Nitrogen ammonia (N-NH3)	2018/07/18		99	%
1917251	MCC	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/18	<0.020		mg/L
1917251	MCC	Method Blank DUP	Nitrogen ammonia (N-NH3)	2018/07/18	<0.020		mg/L
1917278	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/18		95	%
1917278	SSK	Method Blank	Total suspended solids (TSS)	2018/07/18	<2.0		mg/L

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Maxxam Job #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1917296	AG5	Spiked Blank	BOD5	2018/07/23		85	%
1917296	AG5	Spiked Blank DUP	BOD5	2018/07/23		92	%
1917296	AG5	Method Blank	BOD5	2018/07/23	<4.0		mg/L
1917296	AG5	Method Blank DUP	BOD5	2018/07/23	<4.0		mg/L
1917333	SSK	QC Standard	COD	2018/07/18		107	%
1917333	SSK	QC Standard DUP	COD	2018/07/18		104	%
1917333	SSK	QC Standard DUP 2	COD	2018/07/18		91	%
1917333	SSK	Method Blank	COD	2018/07/18	<10		mg/L
1917333	SSK	Method Blank DUP	COD	2018/07/18	<10		mg/L
1917341	FRB	Spiked Blank	Total Dissolved Solids	2018/07/18		103	%
1917341	FRB	Method Blank	Total Dissolved Solids	2018/07/18	<10		mg/L
1917558	GG1	QC Standard	Total Cyanide (CN)	2018/07/18		96	%
1917558	GG1	Method Blank	Total Cyanide (CN)	2018/07/18	<0.010		mg/L
1917644	MR4	Spiked Blank	Dissolved organic carbon	2018/07/20		100	%
1917644	MR4	Method Blank	Dissolved organic carbon	2018/07/20	1.5, RDL=0.20		mg/L
1917676	GG1	QC Standard	Sulfides (S2-)	2018/07/18		97	%
1917676	GG1	Method Blank	Sulfides (S2-)	2018/07/18	<0.020		mg/L
1917710	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/20		98	%
1917710	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/20	<0.40		mg/L
1917959	DF4	Spiked Blank	1-Chlorooctadecane	2018/07/20		90	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/20		81	%
1917959	DF4	Method Blank	1-Chlorooctadecane	2018/07/20		82	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/20	<100		ug/L
1918000	LAR	QC Standard	Fluoride (F)	2018/07/19		104	%
1918000	LAR	QC Standard DUP	Fluoride (F)	2018/07/19		104	%
1918000	LAR	Method Blank	Fluoride (F)	2018/07/19	<0.10		mg/L
1918000	LAR	Method Blank DUP	Fluoride (F)	2018/07/19	<0.10		mg/L
1918214	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/20		98	%
1918214	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/20		101	%
1918214	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/20	<0.0080		mg/L
1918284	MR4	Spiked Blank	Phenols-4AAP	2018/07/20		90	%
1918284	MR4	Method Blank	Phenols-4AAP	2018/07/20	<0.0020		mg/L
1918499	MR4	Spiked Blank	Total Organic Carbon	2018/07/20		100	%
1918499	MR4	Method Blank	Total Organic Carbon	2018/07/20	<0.20		mg/L
1918737	EHA	QC Standard	Mercury (Hg)	2018/07/24		88	%
1918737	EHA	Spiked Blank	Mercury (Hg)	2018/07/24		108	%
1918737	EHA	Method Blank	Mercury (Hg)	2018/07/24	<0.000010		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Maxxam Job #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics

Kassy Blais, B.Sc.,Microbiologist

Miryam Assayag

Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Success Through Science®

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POUD
Site#: TSMC
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/13
Report #: R2382696
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B828352
Received: 2018/07/12, 09:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Suspended Solids	1	2018/07/12	2018/07/12	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/07/13	2018/07/13	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
pH	1	N/A	2018/07/12	QUE SOP-00142	MA.303-TitrAuto 2.1m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POUD
Site#: TSMC
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/13
Report #: R2382696
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B828352
Received: 2018/07/12, 09:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B828352
Report Date: 2018/07/13

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POUD
Your P.O. #: 2200002147
Sampler Initials: TFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FN2117		
Sampling Date		2018/07/11 09:11		
COC Number		157354-13-01		
	Units	**DS04-GW-SP-OUT-7**	**RDL**	**QC Batch**
METALS ICP-MS				
Arsenic (As)	ug/L	<1.0	1.0	1915964
Copper (Cu)	ug/L	1.2	1.0	1915964
Iron (Fe)	ug/L	960	60	1915964
Nickel (Ni)	ug/L	<2.0	2.0	1915964
Lead (Pb)	ug/L	<0.50	0.50	1915964
Zinc (Zn)	ug/L	<7.0	7.0	1915964

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B828352
Report Date: 2018/07/13

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POUD
Your P.O. #: 2200002147
Sampler Initials: TFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FN2117		
Sampling Date		2018/07/11 09:11		
COC Number		157354-13-01		
	Units	**DS04-GW-SP-OUT-7**	**RDL**	**QC Batch**
CONVENTIONALS				
pH	pH	6.14	N/A	1915854
Total suspended solids (TSS)	mg/L	2.2	2.0	1915857

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

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B828352
Report Date: 2018/07/13

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POUD
Your P.O. #: 2200002147
Sampler Initials: TFD

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B828352
Report Date: 2018/07/13

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POUD
Your P.O. #: 2200002147
Sampler Initials: TFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1915854	LAR	QC Standard	pH	2018/07/12		100	%
1915857	LAR	Spiked Blank	Total suspended solids (TSS)	2018/07/12		94	%
1915857	LAR	Method Blank	Total suspended solids (TSS)	2018/07/12	<2.0		mg/L
1915964	JRC	QC Standard	Arsenic (As)	2018/07/13		99	%
			Copper (Cu)	2018/07/13		99	%
			Iron (Fe)	2018/07/13		110	%
			Nickel (Ni)	2018/07/13		98	%
			Lead (Pb)	2018/07/13		100	%
			Zinc (Zn)	2018/07/13		97	%
1915964	JRC	Spiked Blank	Arsenic (As)	2018/07/13		102	%
			Copper (Cu)	2018/07/13		102	%
			Iron (Fe)	2018/07/13		100	%
			Nickel (Ni)	2018/07/13		97	%
			Lead (Pb)	2018/07/13		103	%
			Zinc (Zn)	2018/07/13		101	%
1915964	JRC	Method Blank	Arsenic (As)	2018/07/13	<1.0		ug/L
			Copper (Cu)	2018/07/13	<1.0		ug/L
			Iron (Fe)	2018/07/13	<60		ug/L
			Nickel (Ni)	2018/07/13	<2.0		ug/L
			Lead (Pb)	2018/07/13	<0.50		ug/L
			Zinc (Zn)	2018/07/13	<7.0		ug/L

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

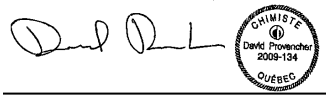
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Maxxam Job #: B828352
Report Date: 2018/07/13

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POUD
Your P.O. #: 2200002147
Sampler Initials: TFD

VALIDATION SIGNATURE PAGE

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



David Provencher, B.Sc., Chemist, Senior Analyst

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Votre # du projet: B827734

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/25
Rapport: R5317258
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8H3891
Reçu: 2018/07/12, 09:40

Matrice: Eau
Nombre d'échantillons reçus: 3

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	3	N/A	2018/07/24	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B827734

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/25
Rapport: R5317258
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8H3891
Reçu: 2018/07/12, 09:40

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8H3891
Date du rapport: 2018/07/25

Maxxam Analytique
Votre # du projet: B827734

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HEU799	HEU800	HEU801		
Date d'échantillonnage		2018/07/09	2018/07/09	2018/07/09		
	Unités	**FM9344-01R\DSO4-GW-SP-OUT-6**	**FM9345-01R\DSO4-EE-GW-Q1-2018**	**FM9346-01R\DSO4-ER-GW-Q1-2018**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	<0.0050	<0.0050	0.0050	5631188

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8H3891
Date du rapport: 2018/07/25

Maxxam Analytique
Votre # du projet: B827734

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8H3891
Date du rapport: 2018/07/25

Maxxam Analytique
Votre # du projet: B827734

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5631188	RK6	Blanc fortifié	Radium-226	2018/07/24		97	%	85 - 115
5631188	RK6	Blanc de méthode	Radium-226	2018/07/24	<0.0050		Bq/L	
5631188	RK6	RPD	Radium-226	2018/07/24	3.1		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération

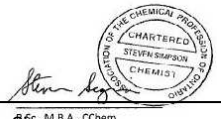
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Dossier Maxxam: B8H3891
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Maxxam Analytique
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PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Your P.O. #: 2200002147
Your Project #: QC QUATERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/26
Report #: R2385684
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827734
Received: 2018/07/11, 09:23

Sample Matrix: SURFACE WATER
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	3	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: QC QUATERLY SURFACE WATER
Site#: TSMC
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CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827734
Received: 2018/07/11, 09:23

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B827734
Report Date: 2018/07/26

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

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Maxxam
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Your P.O. #: 2200002147
Your Project #: QC QUTERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/19
Report #: R2384013
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827623
Received: 2018/07/10, 16:44

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5) (1)	2	N/A	2018/07/10	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions (1)	2	N/A	2018/07/11	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (1, 2)	2	2018/07/11	2018/07/16	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50) (1)	2	2018/07/17	2018/07/18	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide (1)	2	2018/07/11	2018/07/11	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand (1)	2	2018/07/11	2018/07/11	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms (1)	2	N/A	2018/07/11	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms (1)	2	N/A	2018/07/11	QUE SOP-00304	MA.700-Col 1.0
Conductivity (1)	2	N/A	2018/07/10	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+)	2	N/A	2018/07/17	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (3)	2	2018/07/13	2018/07/13	STL SOP-00243	SM 23 5310-B m
Fluoride (1)	2	N/A	2018/07/12	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour	2	2018/07/16	2018/07/17	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids (1)	2	2018/07/11	2018/07/11	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	2	2018/07/13	2018/07/14	STL SOP-00006	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen (1)	2	N/A	2018/07/11	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite (1)	2	N/A	2018/07/11	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen (1)	2	N/A	2018/07/10	SM 421 F	MA315-DBO 1.1 R3 m
pH (1)	2	N/A	2018/07/10	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP	2	2018/07/17	2018/07/17	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-) (1)	2	2018/07/12	2018/07/12	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2) (1)	2	N/A	2018/07/11	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids (1)	2	2018/07/12	2018/07/13	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN) (1)	2	2018/07/11	2018/07/12	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (4)	2	N/A	2018/07/16	STL SOP-00243	SM 23 5310-B m
Uranium by ICP-MS	2	2018/07/10	N/A	STL SOP-00006	MA.200–Mét. 1.2 R5 m

Remarks:

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Your P.O. #: 2200002147
Your Project #: QC QUTERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
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BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/19
Report #: R2384013
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827623
Received: 2018/07/10, 16:44

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Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam - Québec
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

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Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FM8809	FM8833		
Sampling Date		2018/07/09	2018/07/09		
COC Number		175757	175757		
	Units	**DSO4-EE-GW-11-2018**	**DSO4-ER-GW-Q1-2018**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS					
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	<100	100	1917137
Surrogate Recovery (%)					
1-Chlorooctadecane	%	104	94	N/A	1917137

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

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FM8809	FM8833		
Sampling Date		2018/07/09	2018/07/09		
COC Number		175757	175757		
	Units	DSO4-EE-GW-11-2018	DSO4-ER-GW-Q1-2018	RDL	QC Batch
METALS					
Mercury (Hg) ††	mg/L	<0.000010	<0.000010	0.000010	1916495
METALS ICP-MS					
Aluminum (Al)	ug/L	120	21	10	1916132
Antimony (Sb)	ug/L	<1.0	<1.0	1.0	1916132
Silver (Ag)	ug/L	<1.0	<1.0	1.0	1916132
Arsenic (As)	ug/L	<1.0	<1.0	1.0	1916132
Barium (Ba)	ug/L	2.6	<2.0	2.0	1916132
Boron (B) †	ug/L	<50	<50	50	1916132
Cadmium (Cd)	ug/L	<0.20	<0.20	0.20	1916132
Calcium (Ca) †	ug/L	<500	<500	500	1916132
Chromium (Cr)	ug/L	<5.0	<5.0	5.0	1916132
Cobalt (Co)	ug/L	<1.0	<1.0	1.0	1916132
Copper (Cu)	ug/L	<1.0	<1.0	1.0	1916132
Total Hardness (CaCO3) ††	ug/L	<1000	<1000	1000	1916132
Tin (Sn)	ug/L	<2.0	<2.0	2.0	1916132
Iron (Fe)	ug/L	280	<60	60	1916132
Magnesium (Mg) †	ug/L	130	<100	100	1916132
Manganese (Mn)	ug/L	28	21	1.0	1916132
Molybdenum (Mo)	ug/L	<1.0	<1.0	1.0	1916132
Nickel (Ni)	ug/L	<2.0	<2.0	2.0	1916132
Total phosphorous	ug/L	<10	<10	10	1916132
Lead (Pb)	ug/L	<0.50	<0.50	0.50	1916132
Potassium (K) †	ug/L	<500	<500	500	1916132
Selenium (Se)	ug/L	<3.0	<3.0	3.0	1916132
Sodium (Na)	ug/L	<500	<500	500	1916132
Thallium (Tl)	ug/L	<2.0	<2.0	2.0	1916132
Titanium (Ti) ††	ug/L	<10	<10	10	1916132
Uranium (U) ††	ug/L	<1.0	<1.0	1.0	1916132
Vanadium (V)	ug/L	<2.0	<2.0	2.0	1916132
Zinc (Zn)	ug/L	<7.0	<7.0	7.0	1916132

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FM8809	FM8809		FM8833		
Sampling Date		2018/07/09	2018/07/09		2018/07/09		
COC Number		175757	175757		175757		
	Units	DSO4-EE-GW-11-2018	DSO4-EE-GW-11-2018 Lab-Dup	RDL	DSO4-ER-GW-Q1-2018	RDL	QC Batch
CONVENTIONALS							
BOD5	mg/L	<4.0	N/A	4.0	<4.0	4.0	1915344
COD	mg/L	<10	N/A	10	<10	10	1914946
Conductivity	mS/cm	0.0040	N/A	0.0010	0.0020	0.0010	1914893
Dissolved organic carbon †	mg/L	1.5	N/A	0.20	1.6	0.20	1916224
Dissolved oxygen †	mg/L	9.7	N/A	1.0	9.4	1.0	1914863
Fluoride (F)	mg/L	<0.10	N/A	0.10	<0.10	0.10	1915358
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	<0.0080	0.0080	<0.0080	0.0080	1916981
Nitrates (N-NO3-)	mg/L	0.096	N/A	0.020	<0.020	0.020	1915073
Nitrites (N-NO2-)	mg/L	<0.020	N/A	0.020	<0.020	0.020	1915073
Nitrogen ammonia (N-NH3)	mg/L	1.4	N/A	0.020	0.060	0.020	1915076
pH	pH	5.65	N/A	N/A	5.41	N/A	1914879
Phenols-4AAP	mg/L	<0.0020	N/A	0.0020	<0.0020	0.0020	1916852
Reactive silica (SiO2) †	mg/L	1.8	N/A	0.50	0.20	0.10	1914943
Sulfides (S2-)	mg/L	<0.020	N/A	0.020	<0.020	0.020	1915696
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	N/A	0.40	<0.40	0.40	1914956
Total Cyanide (CN)	mg/L	<0.010	N/A	0.010	<0.010	0.010	1915292
Total Organic Carbon	mg/L	1.8	N/A	0.20	2.0	0.20	1916640
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	<1.0	N/A	1.0	<1.0	1.0	1914891
Chloride (Cl)	mg/L	0.10	N/A	0.050	0.079	0.050	1915075
Sulfates (SO4)	mg/L	<0.50	N/A	0.50	<0.50	0.50	1915075
Total Dissolved Solids	mg/L	15	N/A	10	14	10	1915400
Total suspended solids (TSS)	mg/L	2.0	N/A	2.0	2.0	2.0	1914977

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
† Parameter is not accreditable

Maxxam ID		FM8833		
Sampling Date		2018/07/09		
COC Number		175757		
	Units	DSO4-ER-GW-Q1-2018 Lab-Dup	RDL	QC Batch
CONVENTIONALS				
Total Organic Carbon	mg/L	2.0	0.20	1916640

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FM8809		FM8833		
Sampling Date		2018/07/09		2018/07/09		
COC Number		175757		175757		
	Units	DSO4-EE-GW-11-2018	RDL	DSO4-ER-GW-Q1-2018	RDL	QC Batch
MICROBIOLGICAL TESTS						
Total coliforms	UFC/100ml	850	10	1600	100	1915045
Non-typical bacteria	UFC/100ml	<10	10	4200	100	1915045
Fecal coliforms	UFC/100ml	0	N/A	0	N/A	1915041

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

2018/07/19 10:45

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

GENERAL COMMENTS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Reported detection limits are multiplied by dilution factors used for sample analysis.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Reported detection limits are multiplied by dilution factors used for sample analysis.

Results relate only to the items tested.

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TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1914879	CB8	QC Standard	pH	2018/07/10		100	%
1914891	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/10		96	%
1914891	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/10	<1.0		mg/L
1914893	CB8	QC Standard	Conductivity	2018/07/10		98	%
1914893	CB8	Method Blank	Conductivity	2018/07/10	<0.0010		mS/cm
1914943	AG5	QC Standard	Reactive silica (SiO2)	2018/07/11		87	%
1914943	AG5	Method Blank	Reactive silica (SiO2)	2018/07/11	<0.10		mg/L
1914946	SSK	QC Standard	COD	2018/07/11		104	%
1914946	SSK	QC Standard DUP	COD	2018/07/11		93	%
1914946	SSK	Method Blank	COD	2018/07/11	<10		mg/L
1914956	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/12		100	%
1914956	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/12	<0.40		mg/L
1914977	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/11		96	%
1914977	SSK	Method Blank	Total suspended solids (TSS)	2018/07/11	<2.0		mg/L
1915073	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/11		99	%
1915073	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/11		107	%
1915073	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/11	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/11	<0.020		mg/L
1915075	MCC	QC Standard	Chloride (Cl)	2018/07/11		105	%
			Sulfates (SO4)	2018/07/11		102	%
1915075	MCC	Method Blank	Chloride (Cl)	2018/07/11	<0.050		mg/L
			Sulfates (SO4)	2018/07/11	<0.50		mg/L
1915076	CB8	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/11		106	%
1915076	CB8	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/11	<0.020		mg/L
1915292	CB8	QC Standard	Total Cyanide (CN)	2018/07/11		88	%
1915292	CB8	Method Blank	Total Cyanide (CN)	2018/07/11	<0.010		mg/L
1915344	AG5	Spiked Blank	BOD5	2018/07/16		103	%
1915344	AG5	Spiked Blank DUP	BOD5	2018/07/16		102	%
1915344	AG5	Method Blank	BOD5	2018/07/16	<4.0		mg/L
1915344	AG5	Method Blank DUP	BOD5	2018/07/16	<4.0		mg/L
1915358	LAR	QC Standard	Fluoride (F)	2018/07/11		106	%
1915358	LAR	Method Blank	Fluoride (F)	2018/07/11	<0.10		mg/L
1915400	FRB	Spiked Blank	Total Dissolved Solids	2018/07/13		105	%
1915400	FRB	Method Blank	Total Dissolved Solids	2018/07/13	<10		mg/L
1915696	LAR	QC Standard	Sulfides (S2-)	2018/07/12		87	%
1915696	LAR	Method Blank	Sulfides (S2-)	2018/07/12	<0.020		mg/L
1916132	RNP	Spiked Blank	Aluminum (Al)	2018/07/14		99	%
			Antimony (Sb)	2018/07/14		112	%
			Silver (Ag)	2018/07/14		105	%
			Arsenic (As)	2018/07/14		102	%
			Barium (Ba)	2018/07/14		104	%
			Boron (B)	2018/07/14		105	%
			Cadmium (Cd)	2018/07/14		106	%
			Calcium (Ca)	2018/07/14		99	%
			Chromium (Cr)	2018/07/14		98	%
			Cobalt (Co)	2018/07/14		97	%
			Copper (Cu)	2018/07/14		98	%
			Tin (Sn)	2018/07/14		113	%
			Iron (Fe)	2018/07/14		99	%
			Magnesium (Mg)	2018/07/14		101	%
			Manganese (Mn)	2018/07/14		112	%

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Molybdenum (Mo)	2018/07/14		109	%
			Nickel (Ni)	2018/07/14		98	%
			Total phosphorous	2018/07/14		93	%
			Lead (Pb)	2018/07/14		107	%
			Potassium (K)	2018/07/14		102	%
			Selenium (Se)	2018/07/14		114	%
			Sodium (Na)	2018/07/14		95	%
			Thallium (Tl)	2018/07/14		101	%
			Titanium (Ti)	2018/07/14		97	%
			Uranium (U)	2018/07/14		102	%
			Vanadium (V)	2018/07/14		97	%
			Zinc (Zn)	2018/07/14		98	%
1916132	RNP	Method Blank	Aluminum (Al)	2018/07/14	<10		ug/L
			Antimony (Sb)	2018/07/14	<1.0		ug/L
			Silver (Ag)	2018/07/14	<1.0		ug/L
			Arsenic (As)	2018/07/14	<1.0		ug/L
			Barium (Ba)	2018/07/14	<2.0		ug/L
			Boron (B)	2018/07/14	<50		ug/L
			Cadmium (Cd)	2018/07/14	<0.20		ug/L
			Calcium (Ca)	2018/07/14	<500		ug/L
			Chromium (Cr)	2018/07/14	<5.0		ug/L
			Cobalt (Co)	2018/07/14	<1.0		ug/L
			Copper (Cu)	2018/07/14	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/14	<1000		ug/L
			Tin (Sn)	2018/07/14	<2.0		ug/L
			Iron (Fe)	2018/07/14	<60		ug/L
			Magnesium (Mg)	2018/07/14	<100		ug/L
			Manganese (Mn)	2018/07/14	<1.0		ug/L
			Molybdenum (Mo)	2018/07/14	<1.0		ug/L
			Nickel (Ni)	2018/07/14	<2.0		ug/L
			Total phosphorous	2018/07/14	<10		ug/L
			Lead (Pb)	2018/07/14	<0.50		ug/L
			Potassium (K)	2018/07/14	<500		ug/L
			Selenium (Se)	2018/07/14	<3.0		ug/L
			Sodium (Na)	2018/07/14	<500		ug/L
			Thallium (Tl)	2018/07/14	<2.0		ug/L
			Titanium (Ti)	2018/07/14	<10		ug/L
			Uranium (U)	2018/07/14	<1.0		ug/L
			Vanadium (V)	2018/07/14	<2.0		ug/L
			Zinc (Zn)	2018/07/14	<7.0		ug/L
1916224	MR4	Spiked Blank	Dissolved organic carbon	2018/07/13		98	%
1916224	MR4	Method Blank	Dissolved organic carbon	2018/07/13	0.37, RDL=0.20		mg/L
1916495	SD2	Spiked Blank	Mercury (Hg)	2018/07/17		105	%
1916495	SD2	Method Blank	Mercury (Hg)	2018/07/17	<0.000010		mg/L
1916640	HMS	Spiked Blank	Total Organic Carbon	2018/07/16		98	%
1916640	HMS	Method Blank	Total Organic Carbon	2018/07/16	<0.20		mg/L
1916852	MR4	Spiked Blank	Phenols-4AAP	2018/07/17		89	%
1916852	MR4	Method Blank	Phenols-4AAP	2018/07/17	<0.0020		mg/L
1916981	ECA	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/17		102	%
1916981	ECA	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/17		97	%

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1916981	ECA	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/17	<0.0080		mg/L
1917137	VLP	Spiked Blank	1-Chlorooctadecane	2018/07/17		103	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/17		87	%
1917137	VLP	Spiked Blank DUP	1-Chlorooctadecane	2018/07/17		98	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/17		84	%
1917137	VLP	Method Blank	1-Chlorooctadecane	2018/07/17		101	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/17	<100		ug/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

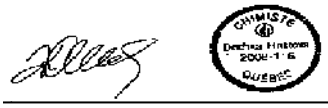
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Maxxam Job #: B827623
Report Date: 2018/07/19

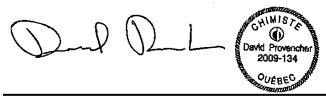
TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

VALIDATION SIGNATURE PAGE

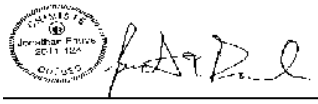
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



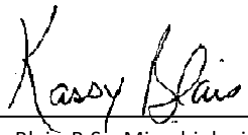
Dochka Koleva Hristova, B.Sc., Chemist



David Provencher, B.Sc., Chemist, Senior Analyst



Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics



Kassy Blais, B.Sc.,Microbiologist, Ste-Foy



Miryam Assayag



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Your P.O. #: 2200002147
Your Project #: QC QUATERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/17
Report #: R2383464
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827486
Received: 2018/07/10, 12:58

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5) (1)	1	N/A	2018/07/10	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions (1)	1	N/A	2018/07/10	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (1, 2)	1	2018/07/11	2018/07/16	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50) (1)	1	2018/07/10	2018/07/11	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide (1)	1	2018/07/11	2018/07/11	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand (1)	1	2018/07/11	2018/07/11	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms (1)	1	N/A	2018/07/11	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms (1)	1	N/A	2018/07/11	QUE SOP-00304	MA.700-Col 1.0
Conductivity (1)	1	N/A	2018/07/10	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+)	1	N/A	2018/07/11	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (3)	1	2018/07/14	2018/07/14	STL SOP-00243	SM 23 5310-B m
Fluoride (1)	1	N/A	2018/07/12	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour	1	2018/07/16	2018/07/17	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids (1)	1	2018/07/10	2018/07/10	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/07/11	2018/07/12	STL SOP-00006	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen (1)	1	N/A	2018/07/11	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite (1)	1	N/A	2018/07/10	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen (1)	1	N/A	2018/07/10	SM 421 F	MA315-DBO 1.1 R3 m
pH (1)	1	N/A	2018/07/10	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP	1	2018/07/12	2018/07/12	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-) (1)	1	2018/07/10	2018/07/10	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2) (1)	1	N/A	2018/07/11	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids (1)	1	2018/07/10	2018/07/10	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN) (1)	1	2018/07/11	2018/07/12	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (4)	1	N/A	2018/07/12	STL SOP-00243	SM 23 5310-B m
Uranium by ICP-MS	1	2018/07/10	2018/07/10	STL SOP-00006	MA.200–Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

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Your P.O. #: 2200002147
Your Project #: QC QUATERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/17
Report #: R2383464
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827486
Received: 2018/07/10, 12:58

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam - Québec
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FM8132		
Sampling Date		2018/07/09		
COC Number		175757		
	Units	**DSO4-GW-SP-OUT**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	590	100	1914904
Surrogate Recovery (%)				
1-Chlorooctadecane	%	100	N/A	1914904

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

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FM8132		
Sampling Date		2018/07/09		
COC Number		175757		
	Units	**DSO4-GW-SP-OUT**	**RDL**	**QC Batch**
METALS				
Mercury (Hg) ††	mg/L	0.000016	0.000010	1916495
METALS ICP-MS				
Aluminum (Al)	ug/L	450	10	1915295
Antimony (Sb)	ug/L	<1.0	1.0	1915295
Silver (Ag)	ug/L	<1.0	1.0	1915295
Arsenic (As)	ug/L	<1.0	1.0	1915295
Barium (Ba)	ug/L	4.8	2.0	1915295
Boron (B) †	ug/L	<50	50	1915295
Cadmium (Cd)	ug/L	0.80	0.20	1915295
Calcium (Ca) †	ug/L	1600	500	1915295
Chromium (Cr)	ug/L	<5.0	5.0	1915295
Cobalt (Co)	ug/L	1.1	1.0	1915295
Copper (Cu)	ug/L	3.1	1.0	1915295
Total Hardness (CaCO3) ††	ug/L	8600	1000	1915295
Tin (Sn)	ug/L	2.4	2.0	1915295
Iron (Fe)	ug/L	980	60	1915295
Magnesium (Mg) †	ug/L	1100	100	1915295
Manganese (Mn)	ug/L	130	1.0	1915295
Molybdenum (Mo)	ug/L	<1.0	1.0	1915295
Nickel (Ni)	ug/L	14	2.0	1915295
Total phosphorous	ug/L	66	10	1915295
Lead (Pb)	ug/L	1.2	0.50	1915295
Potassium (K) †	ug/L	730	500	1915295
Selenium (Se)	ug/L	<3.0	3.0	1915295
Sodium (Na)	ug/L	<500	500	1915295
Thallium (Tl)	ug/L	<2.0	2.0	1915295
Titanium (Ti) ††	ug/L	17	10	1915295
Uranium (U) ††	ug/L	1.2	1.0	1915295
Vanadium (V)	ug/L	<2.0	2.0	1915295
Zinc (Zn)	ug/L	65	7.0	1915295

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B827486
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TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FM8132		
Sampling Date		2018/07/09		
COC Number		175757		
	Units	DSO4-GW-SP-OUT	RDL	QC Batch
CONVENTIONALS				
BOD5	mg/L	<4.0	4.0	1915344
COD	mg/L	<10	10	1914946
Conductivity	mS/cm	0.027	0.0010	1914893
Dissolved organic carbon †	mg/L	0.51	0.20	1916390
Dissolved oxygen †	mg/L	9.8	1.0	1914813
Fluoride (F)	mg/L	<0.10	0.10	1915358
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	0.0080	1915070
Nitrates (N-NO3-)	mg/L	2.3	0.020	1914778
Nitrites (N-NO2-)	mg/L	<0.020	0.020	1914778
Nitrogen ammonia (N-NH3)	mg/L	0.45	0.020	1915076
pH	pH	6.42	N/A	1914879
Phenols-4AAP	mg/L	<0.0020	0.0020	1915607
Reactive silica (SiO2) †	mg/L	4.7	0.50	1914943
Sulfides (S2-)	mg/L	<0.020	0.020	1914812
TKN Total Kjeldahl Nitrogen	mg/L	0.53	0.40	1914956
Total Cyanide (CN)	mg/L	<0.010	0.010	1915292
Total Organic Carbon	mg/L	0.73	0.20	1915568
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	2.6	1.0	1914891
Chloride (Cl)	mg/L	0.34	0.050	1914779
Sulfates (SO4)	mg/L	<0.50	0.50	1914779
Total Dissolved Solids	mg/L	22	10	1914729
Total suspended solids (TSS)	mg/L	<2.0	2.0	1914837

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable
N/A = Not Applicable

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TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FM8132		
Sampling Date		2018/07/09		
COC Number		175757		
	Units	**DSO4-GW-SP-OUT**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	10	10	1915045
Non-typical bacteria	UFC/100ml	20	10	1915045
Fecal coliforms	UFC/100ml	<10	10	1915041

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2018/07/17 17:01

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Reported detection limits are multiplied by dilution factors used for sample analysis.

Results relate only to the items tested.

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1914729	FRB	Spiked Blank	Total Dissolved Solids	2018/07/10		98	%
1914729	FRB	Method Blank	Total Dissolved Solids	2018/07/10	<10		mg/L
1914778	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/10		99	%
1914778	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/10		107	%
1914778	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/10	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/10	<0.020		mg/L
1914779	MCC	QC Standard	Chloride (Cl)	2018/07/10		104	%
			Sulfates (SO4)	2018/07/10		102	%
1914779	MCC	Method Blank	Chloride (Cl)	2018/07/10	<0.050		mg/L
			Sulfates (SO4)	2018/07/10	<0.50		mg/L
1914812	LAR	QC Standard	Sulfides (S2-)	2018/07/10		102	%
1914812	LAR	Method Blank	Sulfides (S2-)	2018/07/10	<0.020		mg/L
1914837	MRT	Spiked Blank	Total suspended solids (TSS)	2018/07/10		98	%
1914837	MRT	Method Blank	Total suspended solids (TSS)	2018/07/10	<2.0		mg/L
1914879	CB8	QC Standard	pH	2018/07/10		100	%
1914891	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/10		96	%
1914891	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/10	<1.0		mg/L
1914893	CB8	QC Standard	Conductivity	2018/07/10		98	%
1914893	CB8	Method Blank	Conductivity	2018/07/10	<0.0010		mS/cm
1914904	DP3	Spiked Blank	1-Chlorooctadecane	2018/07/11		102	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/11		88	%
1914904	DP3	Method Blank	1-Chlorooctadecane	2018/07/11		99	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/11	<100		ug/L
1914943	AG5	QC Standard	Reactive silica (SiO2)	2018/07/11		87	%
1914943	AG5	Method Blank	Reactive silica (SiO2)	2018/07/11	<0.10		mg/L
1914946	SSK	QC Standard	COD	2018/07/11		104	%
1914946	SSK	QC Standard DUP	COD	2018/07/11		93	%
1914946	SSK	Method Blank	COD	2018/07/11	<10		mg/L
1914956	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/12		100	%
1914956	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/12	<0.40		mg/L
1915070	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/11		97	%
1915070	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/11		100	%
1915070	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/11	<0.0080		mg/L
1915076	CB8	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/11		106	%
1915076	CB8	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/11	<0.020		mg/L
1915292	CB8	QC Standard	Total Cyanide (CN)	2018/07/11		88	%
1915292	CB8	Method Blank	Total Cyanide (CN)	2018/07/11	<0.010		mg/L
1915295	EHA	Spiked Blank	Aluminum (Al)	2018/07/12		112	%
			Antimony (Sb)	2018/07/12		104	%
			Silver (Ag)	2018/07/12		118	%
			Arsenic (As)	2018/07/12		101	%
			Barium (Ba)	2018/07/12		98	%
			Boron (B)	2018/07/12		116	%
			Cadmium (Cd)	2018/07/12		93	%
			Calcium (Ca)	2018/07/12		120	%
			Chromium (Cr)	2018/07/12		96	%
			Cobalt (Co)	2018/07/12		96	%
			Copper (Cu)	2018/07/12		96	%
			Tin (Sn)	2018/07/12		105	%
			Iron (Fe)	2018/07/12		99	%

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Magnesium (Mg)	2018/07/12		99	%
			Manganese (Mn)	2018/07/12		101	%
			Molybdenum (Mo)	2018/07/12		97	%
			Nickel (Ni)	2018/07/12		96	%
			Total phosphorous	2018/07/12		97	%
			Lead (Pb)	2018/07/12		119	%
			Potassium (K)	2018/07/12		100	%
			Selenium (Se)	2018/07/12		99	%
			Sodium (Na)	2018/07/12		99	%
			Thallium (Tl)	2018/07/12		117	%
			Titanium (Ti)	2018/07/12		99	%
			Uranium (U)	2018/07/12		117	%
			Vanadium (V)	2018/07/12		97	%
			Zinc (Zn)	2018/07/12		97	%
1915295	EHA	Method Blank	Aluminum (Al)	2018/07/12	17, RDL=10		ug/L
			Antimony (Sb)	2018/07/12	<1.0		ug/L
			Silver (Ag)	2018/07/12	<1.0		ug/L
			Arsenic (As)	2018/07/12	<1.0		ug/L
			Barium (Ba)	2018/07/12	<2.0		ug/L
			Boron (B)	2018/07/12	<50		ug/L
			Cadmium (Cd)	2018/07/12	<0.20		ug/L
			Calcium (Ca)	2018/07/12	<500		ug/L
			Chromium (Cr)	2018/07/12	<5.0		ug/L
			Cobalt (Co)	2018/07/12	<1.0		ug/L
			Copper (Cu)	2018/07/12	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/12	<1000		ug/L
			Tin (Sn)	2018/07/12	<2.0		ug/L
			Iron (Fe)	2018/07/12	<60		ug/L
			Magnesium (Mg)	2018/07/12	<100		ug/L
			Manganese (Mn)	2018/07/12	<1.0		ug/L
			Molybdenum (Mo)	2018/07/12	<1.0		ug/L
			Nickel (Ni)	2018/07/12	<2.0		ug/L
			Total phosphorous	2018/07/12	<10		ug/L
			Lead (Pb)	2018/07/12	<0.50		ug/L
			Potassium (K)	2018/07/12	<500		ug/L
			Selenium (Se)	2018/07/12	<3.0		ug/L
			Sodium (Na)	2018/07/12	<500		ug/L
			Thallium (Tl)	2018/07/12	<2.0		ug/L
			Titanium (Ti)	2018/07/12	<10		ug/L
			Uranium (U)	2018/07/12	<1.0		ug/L
			Vanadium (V)	2018/07/12	<2.0		ug/L
			Zinc (Zn)	2018/07/12	<7.0		ug/L
1915344	AG5	Spiked Blank	BOD5	2018/07/16		103	%
1915344	AG5	Spiked Blank DUP	BOD5	2018/07/16		102	%
1915344	AG5	Method Blank	BOD5	2018/07/16	<4.0		mg/L
1915344	AG5	Method Blank DUP	BOD5	2018/07/16	<4.0		mg/L
1915358	LAR	QC Standard	Fluoride (F)	2018/07/11		106	%
1915358	LAR	Method Blank	Fluoride (F)	2018/07/11	<0.10		mg/L
1915568	HMS	Spiked Blank	Total Organic Carbon	2018/07/12		99	%

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1915568	HMS	Method Blank	Total Organic Carbon	2018/07/12	<0.20		mg/L
1915607	MR4	Spiked Blank	Phenols-4AAP	2018/07/12		89	%
1915607	MR4	Method Blank	Phenols-4AAP	2018/07/12	<0.0020		mg/L
1916390	MR4	Spiked Blank	Dissolved organic carbon	2018/07/14		98	%
1916390	MR4	Method Blank	Dissolved organic carbon	2018/07/14	<0.20		mg/L
1916495	SD2	Spiked Blank	Mercury (Hg)	2018/07/17		105	%
1916495	SD2	Method Blank	Mercury (Hg)	2018/07/17	<0.000010		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

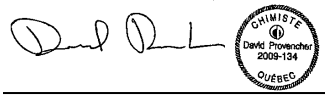
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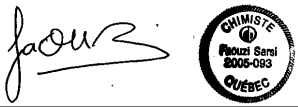
Alain Saint-Jean, B.Sc., Chemist, Supervisor



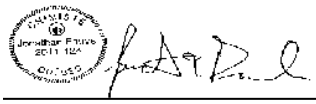
Dochka Koleva Hristova, B.Sc., Chemist



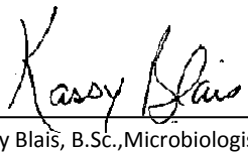
David Provencher, B.Sc., Chemist, Senior Analyst



Faouzi Sarsi, B.Sc. Chemist



Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics



Kassy Blais, B.Sc.,Microbiologist, Ste-Foy



Miryam Assayag

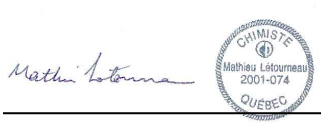
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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE(CONT'D)

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Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/16
Report #: R2382914
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825713
Received: 2018/06/29, 10:49

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Daphnia - LC50 (acute-48h)-Federal (1)	1	N/A	2018/07/03	QUE SOP-00406	EPS1/RM/14
Hardness by ICP-MS (1)	1	2018/06/29	2018/06/29	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Hardness by ICP-MS (1)	1	2018/07/03	2018/07/03	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Rainbow Trout - LC50 (acute-96h) (1)	1	N/A	2018/07/02	QUE SOP - 00408	EPS1/RM/13

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam - Québec

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/16
Report #: R2382914
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825713
Received: 2018/06/29, 10:49

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B825713
Report Date: 2018/07/16

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

ECOTOXICOLOGY (SURFACE WATER)

Maxxam ID		FL8745	
Sampling Date		2018/06/28 10:15	
COC Number		N-A	
	Units	**DSO4-GW-SP-OUT-4**	**QC Batch**
Daphnia Magna - Can			
LC50	%v/v	ATTACHED	1912246
Rainbow Trout			
LC50	%v/v	ATTACHED	1912167
QC Batch = Quality Control Batch			

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Maxxam Job #: B825713
Report Date: 2018/07/16

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

GENERAL COMMENTS

Results relate only to the items tested.

2018/07/16 10:58

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Maxxam Job #: B825713
Report Date: 2018/07/16

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

VALIDATION SIGNATURE PAGE

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



Angela Paquet-Walsh, M.Sc. Biologist, Analyst 2

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B825713

Client Project Name & Number: TSMC GOODWOOD SED POND

Test Result:

96 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual

Toxic unit: <1

Comment: Non-toxic

Sample Name : DSO4-GW-SP-OUT-4 Sample Matrix : SURFACE WATER

Description: Pink, few solids, opaque Sample Number: FL8745-01

Sample Collected: Jun 28, 2018 10:15 AM Sampling Method : Grab Site Collection: N/A

Sample Collected By: Youness Elhariri Volume Received: 40 L Temp.Upon Arrival: 18 °C Storage: 2-6°C

Sample Received: Jun 29, 2018 10:49 AM pH: 5.6 Dissolved Oxygen: 10.0 mg/L

Analysis Start : Jul 02, 2018 04:55 PM Temperature : 15 °C Sample Conductance: 16 µS/cm

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	96 hrs	96 hr	96 hrs	24 hrs	24 hrs	24 hrs	24 hrs
0	15	7.4	218	9.9	15	7.3	8.7	0	0	0	0
6.25	15	7.4	206	10.0	15	7.4	10.0	0	0	0	0
12.5	15	7.4	191	10.0	15	7.4	10.0	0	0	0	0
25	15	7.3	170	10.0	15	7.4	10.3	0	0	0	0
50	15	7.2	118	10.0	15	7.3	9.9	0	0	0	0
100	15	5.7	17	10.0	15	6.2	10.1	0	0	0	0

Concentration	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	48 hrs	48 hrs	48 hrs	48 hrs	72 hrs	72 hrs	72 hrs	72 hrs	96 hrs	96 hrs	96 hrs	96 hrs
0	0	0	0	0	0	0	0	0	0	0	0	0
6.25	0	0	0	0	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0

Comments : No discrepancies observed during the test.

Culture/Control/Dilution Water Dechlorinated municipal tap water

Hardness: 54 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	35 cm
Total # of Organisms Used :	60	Pre-aeration Time :	30 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	16 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.3 g/L	Photoperiod :	16 hours of of light; 8 hours of darkness		
Test vessel:	20L glass aquarium with polyethylene bag.				

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client :	4526	TATA STEEL MINERALS CANADA		Job Number:	B825713
Client Project Name & Number:		TSMC GOODWOOD SED POND		Sample Number:	FL8745-01

Test Organism :	Rainbow Trout *(Oncorhynchus mykiss)*		Source :	Piscicultures Les Arpents Verts	
Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.5 ± 0.1 g	Length (Mean) +- SD :	3.67 ± 0.26 cm
Culture Water Renewal :	2 liters/min	Weight (Range) :	0.3 – 0.7 g	Length (Range) :	3.20 – 4.20 cm
Culture Photoperiod :	16 hours of of light; 8 hours of darkness			% Mortality within 7 days :	0%
Feeding rate and frequency :	1-2x a day; 1-5% of the body weights.			Acclimation Time:	>14 days

Reference chemical:	Phenol	Test Date:	Jun 29, 2018
Test Endpoint 96 hrs LC50 (95% confidence interval) :	9.70 (8.22, 11.3)mg/L	Statistical Method :	Probit
Historical Mean LC50 (warning limits) :	9.78 (7.75, 12.3) mg/L	Concentration :	0,4,6,9,13,18 mg/L

Test Method

QUE SOP - 00408. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS1/RM/13 - Second Edition. Environment Canada. 2000. (Including Amendments: May 2007).

This is essentially a 96H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations : No change was made to the method.

Analyst : Alexandra Côté, Alexis Roy, Olivier Roberge

Verified By : Angela Paquet-Walsh, Analyst 2

Date: Jul 16, 2018 09:34 AM

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B825713
Client Project Name & Number: TSMC GOODWOOD SED POND No. d'échantillon : FL8745-01

Test Result:

48 hrs LC50 %v/v (95% CL): 80.4 (<6.25-100) Statistical Method: Binomial **Toxic unit:** 1.24
48 hrs EC50 %v/v (95% CL): 80.4 (<6.25-100) Statistical Method: Binomial **Comment:** Toxic

Sample Name : DSO4-GW-SP-OUT-4 Sample Matrix : SURFACE WATER
Description: orange, opaque, inodore Sample Prior to Analysis:
Sample Collected: Jun 28, 2018 10:15 AM Sampling Method : Grab pH: 6.2
Sample Collected By: Youness Elhariri Site Collection: N/A Temperature : 20 °C
Sample Received: Jun 29, 2018 10:49 AM Volume Received: 1L Dissolved Oxygen: 9.3 mg/L
Analysis Start : Jul 03, 2018 11:35 PM Temp.Upon Arrival: 18 °C Sample Conductance: 18 µS/cm
End : Jul 05, 2018 01:50 PM Storage: 2-6°C Hardness: 5 mg $CaCO_3$/L

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Immobility (#)	Immobility (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	48 hrs	48 hr	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
0	22	7.1	466	8.6	21	7.6	8.1	0	0	1	10.0
6.25	22	7.2	445	8.6	21	7.6	8.2	0	0	1	10.0
12.5	21	7.2	424	8.6	22	7.5	7.9	0	0	0	0
25	21	7.2	377	8.7	21	7.5	8.4	1	10.0	0	0
50	21	7.2	281	8.7	22	7.3	8.1	0	0	0	0
100	21	6.7	82	9.0	22	6.9	8.1	0	0	8	80.0

Comments :

Culture/Control/Dilution Water: Reconstitued water for Daphnia
Hardness: 170 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Pre-aeration Time :	0 min	Rate of Pre-aeration :	40±5 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	Yes, 31 mg $CaCO_3$/L
Test Volume :	150 mL	Vessel Volume :	270 ml	Test pH Adjusted:	No
Loading Density :	15.0 mL/Daphnia	Photoperiod :	16 hours of of light; 8 hours of darkness		

Test Organism : *Daphnia magna* Source : Maxxam Lab Culture
Age at Test Initiation : <24 hres Average Brood Size : 32.6
Culture Photoperiod : 16 hours of of light; 8 hours of darkness % Mortality within 7 days : 0
Culture Temperature : 20 ± 2 °C Time To First Brood : 8 Days
Culture Diet Fed once a day.

Reference chemical: Potassium Dichromate Test Date: Jun 26, 2018
Test Endpoint 48 hrs LC50 (95% confidence interval) : 0.18 (<6.25, 0.25)mg/L Statistical Method : Binomial
Historical Mean LC50 (warning limits) : 0.17 (0.099, 0.31) mg/L Concentration : 0,0.0625,0.125,0.25,0.5,1 mg/L

Test Method QUE SOP-00406. Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. EPS1/RM/14 - Second Edition. Environment Canada. 2000.

This is essentially a 48H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations: No change was made to the method.

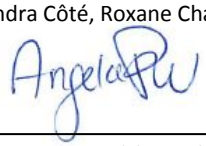
The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B825713

Client Project Name & Number: TSMC GOODWOOD SED POND No. d'échantillon : FL8745-01

Analyst : Alexandra Côté, Roxane Champagne



Verified By : Angela Paquet-Walsh, Analyst 2 Date: Jul 16, 2018 10:56 AM

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

Votre # du projet: B825709

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/17
Rapport: R5299224
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8G5902
Reçu: 2018/07/05, 09:10

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/07/16	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B825709

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/17
Rapport: R5299224
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8G5902
Reçu: 2018/07/05, 09:10

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8G5902
Date du rapport: 2018/07/17

Maxxam Analytique
Votre # du projet: B825709

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HDD219		
Date d'échantillonnage		2018/06/28 10:15		
	Unités	**FL8741-01R\DSO4-GW-SP-OUT-4**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5625014

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8G5902
Date du rapport: 2018/07/17

Maxxam Analytique
Votre # du projet: B825709

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8G5902
Date du rapport: 2018/07/17

Maxxam Analytique
Votre # du projet: B825709

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5625014	RK6	Blanc fortifié	Radium-226	2018/07/16		100	%	85 - 115
5625014	RK6	Blanc de méthode	Radium-226	2018/07/16	<0.0050		Bq/L	
5625014	RK6	RPD	Radium-226	2018/07/16	29		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération

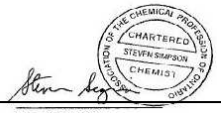
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Dossier Maxxam: B8G5902
Date du rapport: 2018/07/17

Maxxam Analytique
Votre # du projet: B825709

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/18
Report #: R2383544
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825709
Received: 2018/06/29, 10:43

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/18
Report #: R2383544
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825709
Received: 2018/06/29, 10:43

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B825709
Report Date: 2018/07/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

VALIDATION SIGNATURE PAGE

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

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/03
Report #: R2379818
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825695
Received: 2018/06/29, 10:02

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Suspended Solids (1)	1	2018/06/29	2018/06/29	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level) (1)	1	2018/06/29	2018/06/29	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
pH (1)	1	N/A	2018/06/29	QUE SOP-00142	MA.303-TitrAuto 2.1m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam - Québec

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/03
Report #: R2379818
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825695
Received: 2018/06/29, 10:02

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B825695
Report Date: 2018/07/03

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FL8726		
Sampling Date		2018/06/28 10:15		
COC Number		N-A		
	Units	**DSO4-GW-SP-OUT-4**	**RDL**	**QC Batch**
METALS ICP-MS				
Arsenic (As)	ug/L	1.1	1.0	1911733
Copper (Cu)	ug/L	2.4	1.0	1911733
Iron (Fe)	ug/L	4400	60	1911733
Nickel (Ni)	ug/L	<2.0	2.0	1911733
Lead (Pb)	ug/L	0.61	0.50	1911733
Zinc (Zn)	ug/L	8.6	7.0	1911733

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Maxxam Job #: B825695
Report Date: 2018/07/03

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FL8726		
Sampling Date		2018/06/28 10:15		
COC Number		N-A		
	Units	**DSO4-GW-SP-OUT-4**	**RDL**	**QC Batch**
CONVENTIONALS				
pH	pH	6.54	N/A	1912040
Total suspended solids (TSS)	mg/L	7.2	2.0	1911814

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

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Maxxam Job #: B825695
Report Date: 2018/07/03

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

GENERAL COMMENTS

Results relate only to the items tested.

2018/07/03 08:58

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Maxxam Job #: B825695
Report Date: 2018/07/03

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1911733	DRL	QC Standard	Arsenic (As)	2018/06/29		103	%
			Copper (Cu)	2018/06/29		103	%
			Iron (Fe)	2018/06/29		118	%
			Nickel (Ni)	2018/06/29		102	%
			Lead (Pb)	2018/06/29		103	%
			Zinc (Zn)	2018/06/29		101	%
1911733	DRL	Spiked Blank	Arsenic (As)	2018/06/29		105	%
			Copper (Cu)	2018/06/29		104	%
			Iron (Fe)	2018/06/29		105	%
			Nickel (Ni)	2018/06/29		100	%
			Lead (Pb)	2018/06/29		106	%
			Zinc (Zn)	2018/06/29		105	%
1911733	DRL	Method Blank	Arsenic (As)	2018/06/29	<1.0		ug/L
			Copper (Cu)	2018/06/29	<1.0		ug/L
			Iron (Fe)	2018/06/29	<60		ug/L
			Nickel (Ni)	2018/06/29	<2.0		ug/L
			Lead (Pb)	2018/06/29	<0.50		ug/L
			Zinc (Zn)	2018/06/29	<7.0		ug/L
1911814	SSK	Spiked Blank	Total suspended solids (TSS)	2018/06/29		108	%
1911814	SSK	Method Blank	Total suspended solids (TSS)	2018/06/29	<2.0		mg/L
1912040	CB8	QC Standard	pH	2018/06/29		100	%

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

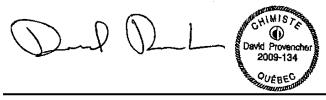
889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Maxxam Job #: B825695
Report Date: 2018/07/03

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

VALIDATION SIGNATURE PAGE

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



David Provencher, B.Sc., Chemist, Senior Analyst

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Success Through Science®

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/10
Report #: R2381591
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824562
Received: 2018/06/22, 11:22

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Daphnia - LC50 (acute-48h)-Federal (1)	1	N/A	2018/06/26	QUE SOP-00406	EPS1/RM/14
Hardness by ICP-MS (1)	1	2018/06/22	2018/06/22	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Hardness by ICP-MS (1)	1	2018/06/26	2018/06/26	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Rainbow Trout - LC50 (acute-96h) (1)	1	N/A	2018/06/23	QUE SOP - 00408	EPS1/RM/13

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam - Québec

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/10
Report #: R2381591
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824562
Received: 2018/06/22, 11:22

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B824562
Report Date: 2018/07/10

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

ECOTOXICOLOGY (SURFACE WATER)

Maxxam ID		FL3236	
Sampling Date		2018/06/21 10:00	
COC Number		N-A	
	Units	**DSO4-GW-SP-OUT-3**	**QC Batch**
Daphnia Magna - Can			
LC50	%v/v	ATTACHED	1910313
Rainbow Trout			
LC50	%v/v	ATTACHED	1910190
QC Batch = Quality Control Batch			

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Maxxam Job #: B824562
Report Date: 2018/07/10

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

Results relate only to the items tested.

2018/07/10 11:25

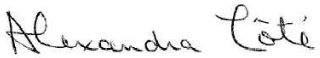
889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Maxxam Job #: B824562
Report Date: 2018/07/10

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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



Alexandra Côté, B.Sc. Biologist

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B824562

Client Project Name & Number: TSMC GOODWOOD SED POND No. d'échantillon : FL3236-01

Test Result:

48 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual **Toxic unit:** <1.0

48 hrs EC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual **Comment:** non-toxique

Sample Name : DSO4-GW-SP-OUT-3 Sample Matrix : SURFACE WATER

Description: Orange, opaque, inodore, présence de solides décantables Sample Prior to Analysis:

Sample Collected:	Jun 21, 2018 10:00 AM	Sampling Method :	Grab	pH:	6.5
Sample Collected By:	Pallav Sinha	Site Collection:	N/A	Temperature :	20 °C
Sample Received:	Jun 22, 2018 11:22 AM	Volume Received:	1 L	Dissolved Oxygen:	9.9 mg/L
Analysis Start :	Jun 26, 2018 11:00 AM	Temp.Upon Arrival:	19 °C	Sample Conductance:	87 µS/cm
End :	Jun 28, 2018 09:50 AM	Storage:	2-6°C	Hardness:	4 mg $CaCO_3$/L

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Immobility (#)	Immobility (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	48 hrs	48 hr	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
0	20	7.3	460	8.7	20	7.3	8.7	0	0	0	0
6.25	20	7.4	442	8.8	20	7.4	8.7	0	0	0	0
12.5	20	7.4	427	8.8	20	7.4	8.7	0	0	0	0
25	20	7.4	380	8.8	19	7.4	8.9	0	0	0	0
50	20	7.4	289	9.0	20	7.3	8.7	0	0	0	0
100	19	7.2	89	9.1	20	7.1	8.8	0	0	4	40.0

Comments : Présence de mortalités dans le 100% v/v.

Culture/Control/Dilution Water: Dechlorinated municipal tap water

Hardness: 54 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Pre-aeration Time :	30 min	Rate of Pre-aeration :	40±5 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	Yes, 32 mg $CaCO_3$/L
Test Volume :	150 mL	Vessel Volume :	270 ml	Test pH Adjusted:	No
Loading Density :	15.0 mL/Daphnia	Photoperiod :	16 hours of of light; 8 hours of darkness		

Test Organism : *Daphnia magna* Source : Maxxam Lab Culture

Age at Test Initiation :	<24 hres	Average Brood Size :	15.0
Culture Photoperiod :	16 hours of of light; 8 hours of darkness	% Mortality within 7 days :	0
Culture Temperature :	20 ± 2 °C	Time To First Brood :	8 Days
Culture Diet	Fed once a day.		

Reference chemical: Potassium Dichromate Test Date: Jun 26, 2018

Test Endpoint 48 hrs LC50 (95% confidence interval) : 0.18 (N/A, 0.25)mg/L Statistical Method : Binomial

Historical Mean LC50 (warning limits) : 0.17 (0.099, 0.31) mg/L Concentration : 0,0.0625,0.125,0.25,0.5,1 mg/L

Test Method QUE SOP-00406. Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. EPS1/RM/14 - Second Edition. Environment Canada. 2000.

This is essentially a 48H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations: Aucune

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Client : 4526 TATA STEEL MINERALS CANADA

Job Number: B824562

Client Project Name & Number: TSMC GOODWOOD SED POND

No. d'échantillon : FL3236-01

Analyst : Angela Paquet-Walsh, Roxane Champagne

Verified By : Alexandra Côté, B.Sc. Biologist

Date: Jul 10, 2018 10:47 AM

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

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Client : 4526 TATA STEEL MINERALS CANADA Job Number: B824562

Client Project Name & Number: TSMC GOODWOOD SED POND

Test Result:

96 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual

Toxic unit: <1.0

Comment: non-toxique

Sample Name : DSO4-GW-SP-OUT-3

Sample Matrix : SURFACE WATER

Description: Rouge, opaque et présence de solides

Sample Number: FL3236-02

Sample Collected: Jun 21, 2018 10:00 AM Sampling Method : Grab

Site Collection: N/A

Sample Collected By: Pallav Sinha Volume Received: 40 L

Temp.Upon Arrival: 19 °C Storage: 2-6°C

Sample Received: Jun 22, 2018 11:22 AM pH: 5.3

Dissolved Oxygen: 10.3 mg/L

Analysis Start : Jun 23, 2018 11:30 AM Temperature : 15 °C

Sample Conductance: 16 µS/cm

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	96 hrs	96 hr	96 hrs	24 hrs	24 hrs	24 hrs	24 hrs
0	16	7.1	181	10.0	15	7.4	10.2	0	0	0	0
6.25	16	7.1	172	9.9	15	7.1	9.3	0	0	0	0
12.5	16	7.0	161	10.0	15	7.2	10.0	0	0	0	0
25	16	7.0	143	10.0	15	7.2	10.2	0	0	0	0
50	16	6.9	102	10.2	15	7.1	10.3	0	0	0	0
100	15	5.4	16	10.2	15	6.0	10.2	0	0	0	0

Concentration	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	48 hrs	48 hrs	48 hrs	48 hrs	72 hrs	72 hrs	72 hrs	72 hrs	96 hrs	96 hrs	96 hrs	96 hrs
0	0	0	0	0	0	0	0	0	0	0	0	0
6.25	0	0	0	0	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0

Comments : Aucune anomalie observée durant l'essai.

Culture/Control/Dilution Water Dechlorinated municipal tap water

Hardness: 54 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	35 cm
Total # of Organisms Used :	60	Pre-aeration Time :	120 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	16 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.3 g/L	Photoperiod :	16 hours of of light; 8 hours of darkness		
Test vessel:	Plastic container with polyethylene bag.				

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client :	4526	TATA STEEL MINERALS CANADA		Job Number:	B824562
Client Project Name & Number:		TSMC GOODWOOD SED POND		Sample Number:	FL3236-02

Test Organism :	Rainbow Trout *(Oncorhynchus mykiss)*		Source :	Piscicultures Les Arpents Verts	
Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.4 ± 0.1 g	Length (Mean) +- SD :	3.67 ± 0.26 cm
Culture Water Renewal :	2 liters/min	Weight (Range) :	0.3 – 0.7 g	Length (Range) :	3.10 – 4.00 cm
Culture Photoperiod :	16 hours of of light; 8 hours of darkness			% Mortality within 7 days :	0.2%
Feeding rate and frequency :	1-2x a day; 1-5% of the body weights.			Acclimation Time:	>14 days

Reference chemical:	Phenol	Test Date:	Jun 19, 2018
Test Endpoint 96 hrs LC50 (95% confidence interval) :	11.6 (9.98, 13.3)mg/L	Statistical Method :	Probit
Historical Mean LC50 (warning limits) :	9.73 (7.75, 12.2) mg/L	Concentration :	0,4,6,9,13,18 mg/L

Test Method

QUE SOP - 00408. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS1/RM/13 - Second Edition. Environment Canada. 2000. (Including Amendments: May 2007).

This is essentially a 96H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations : Aucune

Analyst : Alexis Roy, Olivier Roberge, Roxane Champagne

Alexandra Côté

Verified By : Alexandra Côté, B.Sc. Biologist

Date: Jul 10, 2018 10:50 AM

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Votre # du projet: B824558

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/05
Rapport: R5281887
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8F7937
Reçu: 2018/06/27, 08:45

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/07/04	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B824558

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/05
Rapport: R5281887
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8F7937
Reçu: 2018/06/27, 08:45

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8F7937
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B824558

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HBI789		
Date d'échantillonnage		2018/06/21 10:00		
	Unités	**FL3232-01R\DSO4-GW -SP-OUT-3**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5597212

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8F7937
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B824558

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8F7937
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B824558

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5597212	RK6	Blanc fortifié	Radium-226	2018/07/04		91	%	85 - 115
5597212	RK6	Blanc de méthode	Radium-226	2018/07/04	<0.0050		Bq/L	
5597212	RK6	RPD [HBI789-01]	Radium-226	2018/07/04	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

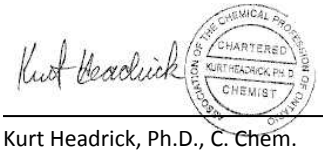
Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8F7937
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B824558

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/10
Report #: R2381563
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824558
Received: 2018/06/22, 11:17

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/10
Report #: R2381563
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824558
Received: 2018/06/22, 11:17

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B824558
Report Date: 2018/07/10

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/26
Report #: R2378427
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824526
Received: 2018/06/22, 10:22

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Suspended Solids (1)	1	2018/06/22	2018/06/22	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level) (1)	1	2018/06/22	2018/06/22	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
pH (1)	1	N/A	2018/06/22	QUE SOP-00142	MA.303-TitrAuto 2.1m

Remarks:

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam - Québec

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/26
Report #: R2378427
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824526
Received: 2018/06/22, 10:22

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B824526
Report Date: 2018/06/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FL3163		
Sampling Date		2018/06/21 10:00		
COC Number		N-A		
	Units	**DSO4-GW-SP-OUT-3**	**RDL**	**QC Batch**
METALS ICP-MS				
Arsenic (As)	ug/L	1.4	1.0	1909839
Copper (Cu)	ug/L	<1.0	1.0	1909839
Nickel (Ni)	ug/L	<2.0	2.0	1909839
Lead (Pb)	ug/L	<0.50	0.50	1909839
Zinc (Zn)	ug/L	7.1	7.0	1909839

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B824526
Report Date: 2018/06/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FL3163		
Sampling Date		2018/06/21 10:00		
COC Number		N-A		
	Units	**DSO4-GW-SP-OUT-3**	**RDL**	**QC Batch**
CONVENTIONALS				
pH	pH	6.38	N/A	1910128
Total suspended solids (TSS)	mg/L	<2.0	2.0	1909842

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

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Maxxam Job #: B824526
Report Date: 2018/06/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

Results relate only to the items tested.

2018/06/26 09:37

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Maxxam Job #: B824526
Report Date: 2018/06/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1909839	JRC	QC Standard	Arsenic (As)	2018/06/22		103	%
			Copper (Cu)	2018/06/22		102	%
			Nickel (Ni)	2018/06/22		101	%
			Lead (Pb)	2018/06/22		96	%
			Zinc (Zn)	2018/06/22		99	%
1909839	JRC	Spiked Blank	Arsenic (As)	2018/06/22		106	%
			Copper (Cu)	2018/06/22		96	%
			Nickel (Ni)	2018/06/22		101	%
			Lead (Pb)	2018/06/22		101	%
			Zinc (Zn)	2018/06/22		101	%
1909839	JRC	Method Blank	Arsenic (As)	2018/06/23	<1.0		ug/L
			Copper (Cu)	2018/06/23	<1.0		ug/L
			Nickel (Ni)	2018/06/23	<2.0		ug/L
			Lead (Pb)	2018/06/23	<0.50		ug/L
			Zinc (Zn)	2018/06/23	<7.0		ug/L
1909842	SSK	Spiked Blank	Total suspended solids (TSS)	2018/06/22		118	%
1909842	SSK	Method Blank	Total suspended solids (TSS)	2018/06/22	<2.0		mg/L
1910128	LAR	QC Standard	pH	2018/06/22		100	%

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

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Maxxam Job #: B824526
Report Date: 2018/06/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Votre # du projet: B823156

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/05
Rapport: R5281760
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8E9337
Reçu: 2018/06/19, 10:15

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/07/04	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B823156

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/05
Rapport: R5281760
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8E9337
Reçu: 2018/06/19, 10:15

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

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Dossier Maxxam: B8E9337
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B823156

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		GZN022		
Date d'échantillonnage		2018/06/14 07:48		
	Unités	**FK4964-01R\DSO4-GW-SP-OUT-2**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5592682

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

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Dossier Maxxam: B8E9337
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B823156

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8E9337
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B823156

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5592682	RK6	Blanc fortifié	Radium-226	2018/07/04		96	%	85 - 115
5592682	RK6	Blanc de méthode	Radium-226	2018/07/04	<0.0050		Bq/L	
5592682	RK6	RPD [GZN022-01]	Radium-226	2018/07/04	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

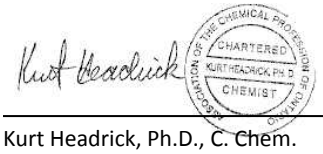
Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8E9337
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B823156

PAGE DES SIGNATURES DE VALIDATION

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Kurt Headrick, Ph.D., C. Chem.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: 175752

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/06
Report #: R2380845
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B823156
Received: 2018/06/15, 13:04

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

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Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: 175752

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/06
Report #: R2380845
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B823156
Received: 2018/06/15, 13:04

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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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.

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Maxxam Job #: B823156
Report Date: 2018/07/06

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: 1757752

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/18
Report #: R2376703
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B823102
Received: 2018/06/15, 10:36

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Suspended Solids (1)	1	2018/06/15	2018/06/15	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level) (1)	1	2018/06/15	2018/06/15	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
pH (1)	1	N/A	2018/06/15	QUE SOP-00142	MA.303-TitrAuto 2.1m

Remarks:

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(1) This test was performed by Maxxam - Québec

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: 1757752

Attention: Loic Didillon

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1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/18
Report #: R2376703
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B823102
Received: 2018/06/15, 10:36

Encryption Key

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Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B823102
Report Date: 2018/06/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FK3806		
Sampling Date		2018/06/14 07:48		
COC Number		1757752		
	Units	**DSO4-GW-SP-OUT-2**	**RDL**	**QC Batch**
METALS ICP-MS				
Arsenic (As)	ug/L	1.2	1.0	1907566
Copper (Cu)	ug/L	1.8	1.0	1907566
Iron (Fe)	ug/L	5600	60	1907566
Nickel (Ni)	ug/L	<2.0	2.0	1907566
Lead (Pb)	ug/L	0.75	0.50	1907566
Zinc (Zn)	ug/L	7.1	7.0	1907566

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B823102
Report Date: 2018/06/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FK3806	FK3806		
Sampling Date		2018/06/14 07:48	2018/06/14 07:48		
COC Number		1757752	1757752		
	Units	DSO4-GW-SP-OUT-2	DSO4-GW-SP-OUT-2 Lab-Dup	RDL	QC Batch
CONVENTIONALS					
pH	pH	6.69	N/A	N/A	1907775
Total suspended solids (TSS)	mg/L	<2.0	<2.0	2.0	1907526

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

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Maxxam Job #: B823102
Report Date: 2018/06/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

Results relate only to the items tested.

2018/06/18 07:58

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Maxxam Job #: B823102
Report Date: 2018/06/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1907526	FRB	Spiked Blank	Total suspended solids (TSS)	2018/06/15		109	%
1907526	FRB	Method Blank	Total suspended solids (TSS)	2018/06/15	<2.0		mg/L
1907566	JRC	QC Standard	Arsenic (As)	2018/06/15		104	%
			Copper (Cu)	2018/06/15		101	%
			Iron (Fe)	2018/06/15		106	%
			Nickel (Ni)	2018/06/15		102	%
			Lead (Pb)	2018/06/15		100	%
			Zinc (Zn)	2018/06/15		101	%
1907566	JRC	Spiked Blank	Arsenic (As)	2018/06/15		106	%
			Copper (Cu)	2018/06/15		101	%
			Iron (Fe)	2018/06/15		105	%
			Nickel (Ni)	2018/06/15		105	%
			Lead (Pb)	2018/06/15		99	%
			Zinc (Zn)	2018/06/15		99	%
1907566	JRC	Method Blank	Arsenic (As)	2018/06/15	<1.0		ug/L
			Copper (Cu)	2018/06/15	<1.0		ug/L
			Iron (Fe)	2018/06/15	<60		ug/L
			Nickel (Ni)	2018/06/15	<2.0		ug/L
			Lead (Pb)	2018/06/15	<0.50		ug/L
			Zinc (Zn)	2018/06/15	<7.0		ug/L
1907775	GG1	QC Standard	pH	2018/06/15		100	%

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

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Maxxam Job #: B823102
Report Date: 2018/06/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Votre # du projet: B822102

Attention: Martine Lepage

Maxxam for TATA Steels
2690 Ave Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/06/20
Rapport: R5258119
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8E1563
Reçu: 2018/06/12, 08:50

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/06/19	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B822102

Attention: Martine Lepage

Maxxam for TATA Steels
2690 Ave Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/06/20
Rapport: R5258119
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8E1563
Reçu: 2018/06/12, 08:50

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

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Dossier Maxxam: B8E1563
Date du rapport: 2018/06/20

Maxxam for TATA Steels
Votre # du projet: B822102

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		GXU723		
Date d'échantillonnage		2018/06/07 08:45		
	Unités	**FJ8353-01R\DSO4-GW -SP-OUT-1**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5576164

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8E1563
Date du rapport: 2018/06/20

Maxxam for TATA Steels
Votre # du projet: B822102

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8E1563
Date du rapport: 2018/06/20

Maxxam for TATA Steels
Votre # du projet: B822102

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5576164	RK6	Blanc fortifié	Radium-226	2018/06/18		98	%	85 - 115
5576164	RK6	Blanc de méthode	Radium-226	2018/06/18	<0.0050		Bq/L	
5576164	RK6	RPD	Radium-226	2018/06/18	4.5		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération

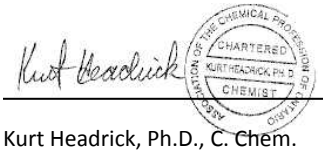
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Dossier Maxxam: B8E1563
Date du rapport: 2018/06/20

Maxxam for TATA Steels
Votre # du projet: B822102

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/21
Report #: R2377937
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B822102
Received: 2018/06/08, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

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(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/21
Report #: R2377937
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B822102
Received: 2018/06/08, 08:30

Encryption Key

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Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B822102
Report Date: 2018/06/21

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND (ECOTOX)
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/20
Report #: R2377419
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B821844
Received: 2018/06/08, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Daphnia - LC50 (acute-48h)-Federal	1	N/A	2018/06/11	QUE SOP-00406	EPS1/RM/14
Hardness by ICP-MS	1	2018/06/11	2018/06/11	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Hardness by ICP-MS	1	2018/06/11	2018/06/12	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Rainbow Trout - LC50 (acute-96h)	1	N/A	2018/06/09	QUE SOP - 00408	EPS1/RM/13

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND (ECOTOX)
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/20
Report #: R2377419
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B821844
Received: 2018/06/08, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B821844
Report Date: 2018/06/20

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND (ECOTOX)
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

ECOTOXICOLOGY (SURFACE WATER)

Maxxam ID		FJ6803	
Sampling Date		2018/06/06 08:45	
COC Number		157354-13-01	
	Units	**DSO4-GW-SP-OUT-1**	**QC Batch**
Daphnia Magna - Can			
LC50	%v/v	ATTACHED	1905731
Rainbow Trout			
LC50	%v/v	ATTACHED	1905481
QC Batch = Quality Control Batch			

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Maxxam Job #: B821844
Report Date: 2018/06/20

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND (ECOTOX)
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B821844
Report Date: 2018/06/20

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND (ECOTOX)
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

Alexandra Côté

Alexandra Côté, B.Sc. Biologist

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Maxxam
A Bureau Veritas Group Company

RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B821844

Client Project Name & Number: DSO4 1A GOODWOOD SED POND (ECOTOX)

Test Result:

96 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual

Toxic unit: <1.0

Comment: non-toxique

Sample Name : DSO4-GW-SP-OUT-1

Sample Matrix : SURFACE WATER

Description: orange, opaque, particules fines, inodore

Sample Number: FJ6803-01

Sample Collected: Jun 06, 2018 08:45 AM Sampling Method : Grab

Site Collection: N/A

Sample Collected By: J.F.DION Volume Received: 40L

Temp.Upon Arrival: 18 °C Storage: 2-6°C

Sample Received: Jun 08, 2018 08:30 AM pH: 6.1

Dissolved Oxygen: 9.6 mg/L

Analysis Start : Jun 09, 2018 12:45 PM Temperature : 15 °C

Sample Conductance: 16 µS/cm

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	96 hrs	96 hr	96 hrs	24 hrs	24 hrs	24 hrs	24 hrs
0	15	7.2	219	9.4	14	7.4	10.3	0	0	0	0
6.25	15	7.3	208	9.5	15	7.4	10.2	0	0	0	0
12.5	15	7.4	196	9.6	15	7.4	10.2	0	0	0	0
25	15	7.4	172	9.6	15	7.3	9.9	0	0	0	0
50	15	7.3	124	9.6	15	7.2	10.2	0	0	0	0
100	15	6.4	16	9.3	15	6.2	10.2	0	0	0	0

Concentration	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	48 hrs	48 hrs	48 hrs	48 hrs	72 hrs	72 hrs	72 hrs	72 hrs	96 hrs	96 hrs	96 hrs	96 hrs
0	0	0	0	0	0	0	0	0	0	0	1	10.0
6.25	0	0	0	0	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0

Comments :

Culture/Control/Dilution Water Dechlorinated municipal tap water

Hardness: 79 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	35 cm
Total # of Organisms Used :	60	Pre-aeration Time :	30 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	16 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.3 g/L	Photoperiod :	16 hours of of light; 8 hours of darkness		
Test vessel:	Plastic container with polyethylene bag.				

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B821844

Client Project Name & Number: DSO4 1A GOODWOOD SED POND (ECOTOX) Sample Number: FJ6803-01

Test Organism :	Rainbow Trout *(Oncorhynchus mykiss)*	Source :	Piscicultures Les Arpents Verts		
Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.4 ± 0.1 g	Length (Mean) +- SD :	3.46 ± 0.28 cm
Culture Water Renewal :	2 liters/min	Weight (Range) :	0.3 – 0.7 g	Length (Range) :	3.10 – 4.10 cm
Culture Photoperiod :	16 hours of of light; 8 hours of darkness			% Mortality within 7 days :	0%
Feeding rate and frequency :	1-2x a day; 1-5% of the body weights.			Acclimation Time:	>14 days

Reference chemical:	Phenol	Test Date:	Jun 14, 2018
Test Endpoint 96 hrs LC50 (95% confidence interval) :	10.8 (9.48, 12.3)mg/L	Statistical Method :	Probit
Historical Mean LC50 (warning limits) :	9.66 (7.67, 12.2) mg/L	Concentration :	0,4,6,9,13,18 mg/L

Test Method

QUE SOP - 00408. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS1/RM/13 - Second Edition. Environment Canada. 2000. (Including Amendments: May 2007).

This is essentially a 96H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations : Aucune

Analyst : Alexandra Côté, Alexis Roy, Angela Paquet-Walsh

Alexandra Côté

Verified By : Alexandra Côté, B.Sc. Biologist

Date: Jun 20, 2018 09:34 AM

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B821844

Client Project Name & Number: DSO4 1A GOODWOOD SED POND (ECOTOX) No. d'échantillon : FJ6803-02

Test Result:

48 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual **Toxic unit:** <1.0

48 hrs EC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual **Comment:** non-toxique

Sample Name : DSO4-GW-SP-OUT-1 Sample Matrix : SURFACE WATER

Description: opaque, orangé, inodore, particules fines en suspension Sample Prior to Analysis:

Sample Collected:	Jun 06, 2018 08:45 AM	Sampling Method :	Grab	pH:	5.7
Sample Collected By:	J.F.DION	Site Collection:	N/A	Temperature :	20 °C
Sample Received:	Jun 08, 2018 08:30 AM	Volume Received:	1L	Dissolved Oxygen:	8.2 mg/L
Analysis Start :	Jun 11, 2018 12:45 PM	Temp.Upon Arrival:	18 °C	Sample Conductance:	22 µS/cm
End :	Jun 13, 2018 02:40 PM	Storage:	2-6°C	Hardness:	4 mg $CaCO_3$/L

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Immobility (#)	Immobility (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	48 hrs	48 hr	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
0	18	7.5	459	9.0	20	7.4	8.7	0	0	0	0
6.25	19	7.5	452	8.7	20	7.5	8.6	0	0	1	10.0
12.5	19	7.5	428	9.0	19	7.5	8.8	0	0	0	0
25	19	7.4	384	8.9	20	7.5	8.6	0	0	0	0
50	19	7.3	293	8.9	20	7.5	8.6	1	10.0	1	10.0
100	20	7.1	93	8.8	20	7.5	8.7	0	0	1	10.0

Comments :

Culture/Control/Dilution Water: Reconstitued water for Daphnia

Hardness: 170 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Pre-aeration Time :	30 min	Rate of Pre-aeration :	40±5 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	Yes, 30 mg $CaCO_3$/L
Test Volume :	150 mL	Vessel Volume :	270 ml	Test pH Adjusted:	No
Loading Density :	15.0 mL/Daphnia	Photoperiod :	16 hours of of light; 8 hours of darkness		

Test Organism : *Daphnia magna* Source : Maxxam Lab Culture

Age at Test Initiation :	<24 hres	Average Brood Size :	25.6
Culture Photoperiod :	16 hours of of light; 8 hours of darkness	% Mortality within 7 days :	2.0
Culture Temperature :	20 ± 2 °C	Time To First Brood :	8 Days
Culture Diet	Fed once a day.		

Reference chemical: Potassium Dichromate Test Date: Jun 11, 2018

Test Endpoint 48 hrs LC50 (95% confidence interval) :	0.20 (0.13, 0.50)mg/L	Statistical Method :	Binomial
Historical Mean LC50 (warning limits) :	0.18 (0.098, 0.32) mg/L	Concentration :	0,0.0625,0.125,0.25,0.5,1 mg/L

Test Method QUE SOP-00406. Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. EPS1/RM/14 - Second Edition. Environment Canada. 2000.

This is essentially a 48H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations: Aucune

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B821844

Client Project Name & Number: DSO4 1A GOODWOOD SED POND (ECOTOX) No. d'échantillon : FJ6803-02

Analyst : Alexandra Côté, Angela Paquet-Walsh, Maude Marcoux

Verified By : Alexandra Côté, B.Sc. Biologist Date: Jun 20, 2018 09:19 AM

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/11
Report #: R2375312
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B821700
Received: 2018/06/08, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Petroleum Hydrocarbons (C10-C50)	1	2018/06/08	2018/06/08	QUE SOP-00209	MA400–HYD 1.1 R3 m
Conductivity	1	N/A	2018/06/08	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Suspended Solids	1	2018/06/08	2018/06/08	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/06/11	2018/06/11	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
pH	1	N/A	2018/06/08	QUE SOP-00142	MA.303-TitrAuto 2.1m

Remarks:

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Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

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MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/11
Report #: R2375312
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B821700
Received: 2018/06/08, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B821700
Report Date: 2018/06/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FJ6159		
Sampling Date		2018/06/07		
COC Number		157354-13-01		
	Units	**DSO4-GW-SP-OUT-1**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1905221
Surrogate Recovery (%)				
1-Chlorooctadecane	%	101	N/A	1905221

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

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B821700
Report Date: 2018/06/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FJ6159		
Sampling Date		2018/06/07		
COC Number		157354-13-01		
	Units	**DSO4-GW-SP-OUT-1**	**RDL**	**QC Batch**
METALS ICP-MS				
Arsenic (As)	ug/L	1.3	1.0	1905848
Copper (Cu)	ug/L	1.7	1.0	1905848
Iron (Fe)	ug/L	3400	60	1905848
Nickel (Ni)	ug/L	<2.0	2.0	1905848
Lead (Pb)	ug/L	0.75	0.50	1905848
Zinc (Zn)	ug/L	7.2	7.0	1905848

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B821700
Report Date: 2018/06/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FJ6159		
Sampling Date		2018/06/07		
COC Number		157354-13-01		
	Units	**DSO4-GW-SP-OUT-1**	**RDL**	**QC Batch**
CONVENTIONALS				
Conductivity	mS/cm	0.014	0.0010	1905235
pH	pH	6.38	N/A	1905231
Total suspended solids (TSS)	mg/L	19	2.0	1905181

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

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B821700
Report Date: 2018/06/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Insufficient preservative, pH adjusted upon receipt at the laboratory.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B821700
Report Date: 2018/06/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1905181	FRB	Spiked Blank	Total suspended solids (TSS)	2018/06/08		106	%
1905181	FRB	Method Blank	Total suspended solids (TSS)	2018/06/08	<2.0		mg/L
1905221	ADE	Spiked Blank	1-Chlorooctadecane	2018/06/08		94	%
			Petroleum Hydrocarbons (C10-C50)	2018/06/08		85	%
1905221	ADE	Method Blank	1-Chlorooctadecane	2018/06/08		99	%
			Petroleum Hydrocarbons (C10-C50)	2018/06/08	<100		ug/L
1905231	LAR	QC Standard	pH	2018/06/08		100	%
1905235	LAR	QC Standard	Conductivity	2018/06/08		98	%
1905235	LAR	Method Blank	Conductivity	2018/06/08	<0.0010		mS/cm
1905848	JRC	QC Standard	Arsenic (As)	2018/06/11		102	%
			Copper (Cu)	2018/06/11		103	%
			Iron (Fe)	2018/06/11		115	%
			Nickel (Ni)	2018/06/11		100	%
			Lead (Pb)	2018/06/11		100	%
			Zinc (Zn)	2018/06/11		101	%
1905848	JRC	Spiked Blank	Arsenic (As)	2018/06/11		101	%
			Copper (Cu)	2018/06/11		98	%
			Iron (Fe)	2018/06/11		102	%
			Nickel (Ni)	2018/06/11		99	%
			Lead (Pb)	2018/06/11		100	%
			Zinc (Zn)	2018/06/11		97	%
1905848	JRC	Method Blank	Arsenic (As)	2018/06/11	<1.0		ug/L
			Copper (Cu)	2018/06/11	<1.0		ug/L
			Iron (Fe)	2018/06/11	<60		ug/L
			Nickel (Ni)	2018/06/11	<2.0		ug/L
			Lead (Pb)	2018/06/11	<0.50		ug/L
			Zinc (Zn)	2018/06/11	<7.0		ug/L

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Maxxam Job #: B821700
Report Date: 2018/06/11

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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B. Water Quality

2018 - Spill

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your P.O. #: 2200002147
Your Project #: QUARTERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 180930

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/10/30
Report #: R2408164
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B844036
Received: 2018/10/03, 09:36

Sample Matrix: SURFACE WATER
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)	1	N/A	2018/10/03	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions	1	N/A	2018/10/03	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (2)	1	2018/10/03	2018/10/08	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)	1	2018/10/05	2018/10/09	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide	1	2018/10/03	2018/10/03	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand	1	2018/10/04	2018/10/04	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms	1	N/A	2018/10/03	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms	1	N/A	2018/10/03	QUE SOP-00304	MA.700-Col 1.0
Conductivity	1	N/A	2018/10/03	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)	1	N/A	2018/10/06	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)	1	2018/10/05	2018/10/05	STL SOP-00243	SM 23 5310-B m
Fluoride	1	N/A	2018/10/03	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Suspended Solids	1	2018/10/03	2018/10/03	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/10/03	2018/10/05	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Total Extractible Trace Metals by ICP-MS (1)	2	2018/10/05	2018/10/09	STL SOP-00006	MA203–Mét Tra1.1 R1m
Total Extractible Trace Metals by ICP-MS (1)	2	2018/10/05	2018/10/10	STL SOP-00006	MA203–Mét Tra1.1 R1m
Ammonia Nitrogen	1	N/A	2018/10/04	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite	1	N/A	2018/10/03	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen	1	N/A	2018/10/11	SM 421 F	MA315-DBO 1.1 R3 m
pH	1	N/A	2018/10/03	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP (1)	1	2018/10/05	2018/10/05	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Total Phosphorus	1	N/A	2018/10/03	QUE SOP-00132	MA.200-Mét. 1.2 R5m
Sulfides (S2-)	1	2018/10/04	2018/10/04	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2)	1	N/A	2018/10/05	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids	1	2018/10/03	2018/10/03	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN)	1	2018/10/05	2018/10/09	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 4)	1	N/A	2018/10/04	STL SOP-00243	SM 23 5310-B m

Remarks:

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Your P.O. #: 2200002147
Your Project #: QUARTERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 180930

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/10/30
Report #: R2408164
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B844036
Received: 2018/10/03, 09:36

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B844036
Report Date: 2018/10/30

TATA STEEL MINERALS CANADA
Client Project #: QUARTERLY SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FV3714		
Sampling Date		2018/10/01 10:24		
COC Number		180930		
	Units	**DSO4-ER-GW-Q3-2018**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1941334
Surrogate Recovery (%)				
1-Chlorooctadecane	%	84	N/A	1941334

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

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Maxxam Job #: B844036
Report Date: 2018/10/30

TATA STEEL MINERALS CANADA
Client Project #: QUARTERLY SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FV3714	FV3730		FV3731	FV3732		
Sampling Date		2018/10/01 10:24	2018/10/01 08:42		2018/10/01	2018/10/01		
COC Number		180930	180930		180930	180930		
	Units	DSO4-ER-GW-Q3-2018	DSO4-EE-GW-ULL-2018	QC Batch	FIELD BLANK	TRIP BLANK	RDL	QC Batch
METALS								
Aluminum (Al) †	ug/L	11	14	1941236	<5.0	<5.0	5.0	1941261
Antimony (Sb) †	ug/L	0.0070	<0.0050	1941236	<0.0050	0.0050	0.0050	1941261
Silver (Ag) †	ug/L	<0.0030	<0.0030	1941236	<0.0030	<0.0030	0.0030	1941261
Arsenic (As) †	ug/L	<0.080	<0.080	1941236	<0.080	<0.080	0.080	1941261
Barium (Ba) †	ug/L	0.49	1.3	1941236	<0.030	<0.030	0.030	1941261
Boron (B) †	ug/L	0.41	3.1	1941236	<0.30	<0.30	0.30	1941261
Cadmium (Cd) †	ug/L	<0.0060	<0.0060	1941236	<0.0060	<0.0060	0.0060	1941261
Calcium (Ca) †	ug/L	91	200	1941236	<20	<20	20	1941261
Chromium (Cr) †	ug/L	<0.040	<0.040	1941236	<0.040	<0.040	0.040	1941261
Cobalt (Co) †	ug/L	0.011	0.010	1941236	<0.0080	<0.0080	0.0080	1941261
Copper (Cu) †	ug/L	0.11	0.31	1941236	<0.050	<0.050	0.050	1941261
Tin (Sn) †	ug/L	<0.050	<0.050	1941236	<0.050	<0.050	0.050	1941261
Iron (Fe) †	ug/L	33	33	1941236	0.60	<0.50	0.50	1941261
Magnesium (Mg) †	ug/L	64	120	1941236	<10	<10	10	1941261
Manganese (Mn) †	ug/L	10	10	1941236	<0.030	<0.030	0.030	1941261
Mercury (Hg) †	ug/L	<0.0020	<0.0020	1941236	<0.0020	<0.0020	0.0020	1941261
Molybdenum (Mo) †	ug/L	0.013	<0.010	1941236	<0.010	<0.010	0.010	1941261
Nickel (Ni) †	ug/L	0.074	0.11	1941236	<0.030	<0.030	0.030	1941261
Lead (Pb) †	ug/L	0.016	<0.010	1941236	<0.010	<0.010	0.010	1941261
Potassium (K) †	ug/L	51	81	1941236	<10	<10	10	1941261
Selenium (Se) †	ug/L	<0.050	<0.050	1941236	<0.050	<0.050	0.050	1941261
Sodium (Na) †	ug/L	79	260	1941236	<10	<10	10	1941261
Thallium (Tl) †	ug/L	<0.010	<0.010	1941236	<0.010	<0.010	0.010	1941261
Titanium (Ti) †	ug/L	<0.40	<0.40	1941236	<0.40	<0.40	0.40	1941261
Uranium (U) †	ug/L	0.0024	0.0036	1941236	<0.0010	<0.0010	0.0010	1941261
Vanadium (V) †	ug/L	<0.050	<0.050	1941236	<0.050	<0.050	0.050	1941261
Zinc (Zn) †	ug/L	0.59	1.2	1941236	<0.50	<0.50	0.50	1941261
Total Hardness (CaCO3) †	ug/L	N/A	1000	1941236	<40	<40	40	1941261
METALS ICP-MS								
Total Hardness (CaCO3) †	ug/L	<1000	N/A	1940352	N/A	N/A	1000	N/A
Total phosphorous	ug/L	<10	N/A	1940352	N/A	N/A	10	N/A

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable
N/A = Not Applicable

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Maxxam Job #: B844036
Report Date: 2018/10/30

TATA STEEL MINERALS CANADA
Client Project #: QUARTERLY SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FV3714	FV3714		
Sampling Date		2018/10/01 10:24	2018/10/01 10:24		
COC Number		180930	180930		
	Units	**DSO4-ER-GW-Q3-2018**	**DSO4-ER-GW-Q3-2018 Lab-Dup**	**RDL**	**QC Batch**
CONVENTIONALS					
BOD5	mg/L	<4.0	N/A	4.0	1940300
COD	mg/L	<10	N/A	10	1940806
Conductivity	mS/cm	0.0021	0.0019	0.0010	1940462
Dissolved organic carbon †	mg/L	1.1	N/A	0.20	1941291
Dissolved oxygen †	mg/L	10	N/A	1.0	1940477
Fluoride (F)	mg/L	<0.10	<0.10	0.10	1940463
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	N/A	0.0080	1941257
Nitrates (N-NO3-)	mg/L	<0.020	N/A	0.020	1940355
Nitrites (N-NO2-)	mg/L	<0.020	N/A	0.020	1940355
Nitrogen ammonia (N-NH3)	mg/L	0.31	N/A	0.020	1940512
pH	pH	5.48	5.26	N/A	1940460
Phenols-4AAP	mg/L	<0.0020	<0.0020	0.0020	1940987
Reactive silica (SiO2) †	mg/L	0.26	N/A	0.10	1941254
Sulfides (S2-)	mg/L	<0.020	N/A	0.020	1940537
TKN Total Kjeldahl Nitrogen	mg/L	0.49	N/A	0.40	1940991
Total Cyanide (CN)	mg/L	<0.010	N/A	0.010	1940321
Total Organic Carbon	mg/L	1.6	N/A	0.20	1940664
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	<1.0	<1.0	1.0	1940461
Chloride (Cl)	mg/L	0.082	N/A	0.050	1940357
Sulfates (SO4)	mg/L	<0.50	N/A	0.50	1940357
Total Dissolved Solids	mg/L	<10	N/A	10	1940372
Total suspended solids (TSS)	mg/L	<2.0	N/A	2.0	1940221

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
† Parameter is not accreditable

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Maxxam Job #: B844036
Report Date: 2018/10/30

TATA STEEL MINERALS CANADA
Client Project #: QUARTERLY SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FV3714		
Sampling Date		2018/10/01 10:24		
COC Number		180930		
	Units	**DSO4-ER-GW-Q3-2018**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	210	10	1940088
Non-typical bacteria	UFC/100ml	1580	10	1940088
Fecal coliforms	UFC/100ml	0	N/A	1940093

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

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Maxxam Job #: B844036
Report Date: 2018/10/30

TATA STEEL MINERALS CANADA
Client Project #: QUARTERLY SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Dissolve organic carbon: Please note that the above results have been corrected for the method blank.

Results relate only to the items tested.

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Maxxam Job #: B844036
Report Date: 2018/10/30

TATA STEEL MINERALS CANADA
Client Project #: QUARTERLY SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1940221	SKA	Spiked Blank	Total suspended solids (TSS)	2018/10/03		95	%
1940221	SKA	Method Blank	Total suspended solids (TSS)	2018/10/03	<2.0		mg/L
1940300	AG5	Spiked Blank	BOD5	2018/10/08		104	%
1940300	AG5	Spiked Blank DUP	BOD5	2018/10/08		104	%
1940300	AG5	Method Blank	BOD5	2018/10/08	<4.0		mg/L
1940300	AG5	Method Blank DUP	BOD5	2018/10/08	<4.0		mg/L
1940321	CB8	QC Standard	Total Cyanide (CN)	2018/10/03		92	%
1940321	CB8	Method Blank	Total Cyanide (CN)	2018/10/03	<0.010		mg/L
1940352	DRL	QC Standard	Total phosphorous	2018/10/05		93	%
1940352	DRL	Spiked Blank	Total phosphorous	2018/10/05		94	%
1940352	DRL	Method Blank	Total Hardness (CaCO3)	2018/10/06	<1000		ug/L
			Total phosphorous	2018/10/06	<10		ug/L
1940355	MCC	QC Standard	Nitrates (N-NO3-)	2018/10/03		100	%
1940355	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/10/03		101	%
1940355	MCC	Method Blank	Nitrates (N-NO3-)	2018/10/03	<0.020		mg/L
			Nitrites (N-NO2-)	2018/10/03	<0.020		mg/L
1940357	MCC	QC Standard	Chloride (Cl)	2018/10/03		97	%
			Sulfates (SO4)	2018/10/03		101	%
1940357	MCC	Method Blank	Chloride (Cl)	2018/10/03	<0.050		mg/L
			Sulfates (SO4)	2018/10/03	<0.50		mg/L
1940372	SKA	Spiked Blank	Total Dissolved Solids	2018/10/03		101	%
1940372	SKA	Method Blank	Total Dissolved Solids	2018/10/03	<10		mg/L
1940460	LAR	QC Standard	pH	2018/10/03		100	%
1940460	LAR	QC Standard DUP	pH	2018/10/03		100	%
1940461	LAR	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/10/03		99	%
1940461	LAR	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/10/03	<1.0		mg/L
1940462	LAR	QC Standard	Conductivity	2018/10/03		101	%
1940462	LAR	QC Standard DUP	Conductivity	2018/10/03		101	%
1940462	LAR	Method Blank	Conductivity	2018/10/03	<0.0010		mS/cm
1940462	LAR	Method Blank DUP	Conductivity	2018/10/03	<0.0010		mS/cm
1940463	LAR	QC Standard	Fluoride (F)	2018/10/03		104	%
1940463	LAR	Method Blank	Fluoride (F)	2018/10/03	<0.10		mg/L
1940512	CB8	QC Standard	Nitrogen ammonia (N-NH3)	2018/10/04		106	%
1940512	CB8	QC Standard DUP	Nitrogen ammonia (N-NH3)	2018/10/04		104	%
1940512	CB8	Method Blank	Nitrogen ammonia (N-NH3)	2018/10/04	<0.020		mg/L
1940512	CB8	Method Blank DUP	Nitrogen ammonia (N-NH3)	2018/10/04	<0.020		mg/L
1940537	AG5	QC Standard	Sulfides (S2-)	2018/10/04		97	%
1940537	AG5	QC Standard DUP	Sulfides (S2-)	2018/10/04		90	%
1940537	AG5	Method Blank	Sulfides (S2-)	2018/10/04	<0.020		mg/L
1940537	AG5	Method Blank DUP	Sulfides (S2-)	2018/10/04	<0.020		mg/L
1940664	MR4	Spiked Blank	Total Organic Carbon	2018/10/04		103	%
1940664	MR4	Method Blank	Total Organic Carbon	2018/10/04	<0.20		mg/L
1940806	LAR	QC Standard	COD	2018/10/04		99	%
1940806	LAR	QC Standard DUP	COD	2018/10/04		100	%
1940806	LAR	Method Blank	COD	2018/10/04	<10		mg/L
1940987	GGC	Spiked Blank	Phenols-4AAP	2018/10/05		99	%
1940987	GGC	Method Blank	Phenols-4AAP	2018/10/05	<0.0020		mg/L
1940991	CB8	QC Standard	TKN Total Kjeldahl Nitrogen	2018/10/09		100	%
1940991	CB8	Method Blank	TKN Total Kjeldahl Nitrogen	2018/10/09	<0.40		mg/L
1941236	EHA	Spiked Blank	Aluminum (Al)	2018/10/09		115	%

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Maxxam Job #: B844036
Report Date: 2018/10/30

TATA STEEL MINERALS CANADA
Client Project #: QUARTERLY SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Antimony (Sb)	2018/10/09		114	%
			Silver (Ag)	2018/10/09		107	%
			Arsenic (As)	2018/10/09		101	%
			Barium (Ba)	2018/10/09		104	%
			Boron (B)	2018/10/09		104	%
			Cadmium (Cd)	2018/10/09		101	%
			Calcium (Ca)	2018/10/09		117	%
			Chromium (Cr)	2018/10/09		106	%
			Cobalt (Co)	2018/10/09		111	%
			Copper (Cu)	2018/10/09		117	%
			Tin (Sn)	2018/10/09		120	%
			Iron (Fe)	2018/10/09		119	%
			Magnesium (Mg)	2018/10/09		119	%
			Manganese (Mn)	2018/10/09		109	%
			Mercury (Hg)	2018/10/09		150 (1)	%
			Molybdenum (Mo)	2018/10/09		115	%
			Nickel (Ni)	2018/10/09		103	%
			Lead (Pb)	2018/10/09		104	%
			Potassium (K)	2018/10/09		118	%
			Selenium (Se)	2018/10/09		99	%
			Sodium (Na)	2018/10/09		122 (1)	%
			Thallium (Tl)	2018/10/09		114	%
			Titanium (Ti)	2018/10/09		109	%
			Uranium (U)	2018/10/09		104	%
			Vanadium (V)	2018/10/09		115	%
			Zinc (Zn)	2018/10/09		96	%
1941236	EHA	Method Blank	Aluminum (Al)	2018/10/09	<5.0		ug/L
			Antimony (Sb)	2018/10/09	<0.0050		ug/L
			Silver (Ag)	2018/10/09	<0.0030		ug/L
			Arsenic (As)	2018/10/09	<0.080		ug/L
			Barium (Ba)	2018/10/09	<0.030		ug/L
			Boron (B)	2018/10/09	<0.30		ug/L
			Cadmium (Cd)	2018/10/09	<0.0060		ug/L
			Calcium (Ca)	2018/10/09	<20		ug/L
			Chromium (Cr)	2018/10/09	<0.040		ug/L
			Cobalt (Co)	2018/10/09	<0.0080		ug/L
			Copper (Cu)	2018/10/09	<0.050		ug/L
			Tin (Sn)	2018/10/09	<0.050		ug/L
			Iron (Fe)	2018/10/09	<0.50		ug/L
			Magnesium (Mg)	2018/10/09	<10		ug/L
			Manganese (Mn)	2018/10/09	<0.030		ug/L
			Mercury (Hg)	2018/10/09	<0.0020		ug/L
			Molybdenum (Mo)	2018/10/09	<0.010		ug/L
			Nickel (Ni)	2018/10/09	<0.030		ug/L
			Lead (Pb)	2018/10/09	<0.010		ug/L
			Potassium (K)	2018/10/09	<10		ug/L
			Selenium (Se)	2018/10/09	<0.050		ug/L
			Sodium (Na)	2018/10/09	<10		ug/L
			Thallium (Tl)	2018/10/09	<0.010		ug/L
			Titanium (Ti)	2018/10/09	<0.40		ug/L

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B844036
Report Date: 2018/10/30

TATA STEEL MINERALS CANADA
Client Project #: QUARTERLY SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Uranium (U)	2018/10/09	<0.0010		ug/L
			Vanadium (V)	2018/10/09	<0.050		ug/L
			Zinc (Zn)	2018/10/09	<0.50		ug/L
			Total Hardness (CaCO3)	2018/10/09	<40		ug/L
1941254	GG1	QC Standard	Reactive silica (SiO2)	2018/10/05		83	%
1941254	GG1	Method Blank	Reactive silica (SiO2)	2018/10/05	<0.10		mg/L
1941257	JGZ	QC Standard	Hexavalent Chromium (Cr 6+)	2018/10/05		102	%
1941257	JGZ	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/10/06		104	%
1941257	JGZ	Method Blank	Hexavalent Chromium (Cr 6+)	2018/10/06	<0.0080		mg/L
1941261	EHA	Spiked Blank	Aluminum (Al)	2018/10/09		104	%
			Antimony (Sb)	2018/10/09		110	%
			Silver (Ag)	2018/10/09		98	%
			Arsenic (As)	2018/10/09		94	%
			Barium (Ba)	2018/10/09		92	%
			Boron (B)	2018/10/09		100	%
			Cadmium (Cd)	2018/10/09		93	%
			Calcium (Ca)	2018/10/09		109	%
			Chromium (Cr)	2018/10/09		96	%
			Cobalt (Co)	2018/10/09		96	%
			Copper (Cu)	2018/10/09		98	%
			Tin (Sn)	2018/10/09		108	%
			Iron (Fe)	2018/10/09		106	%
			Magnesium (Mg)	2018/10/09		106	%
			Manganese (Mn)	2018/10/09		98	%
			Mercury (Hg)	2018/10/09		137 (1)	%
			Molybdenum (Mo)	2018/10/09		107	%
			Nickel (Ni)	2018/10/09		95	%
			Lead (Pb)	2018/10/09		94	%
			Potassium (K)	2018/10/09		105	%
			Selenium (Se)	2018/10/09		95	%
			Sodium (Na)	2018/10/09		107	%
			Thallium (Tl)	2018/10/09		102	%
			Titanium (Ti)	2018/10/09		103	%
			Uranium (U)	2018/10/09		92	%
			Vanadium (V)	2018/10/09		101	%
			Zinc (Zn)	2018/10/09		97	%
1941261	EHA	Method Blank	Aluminum (Al)	2018/10/09	<5.0		ug/L
			Antimony (Sb)	2018/10/09	<0.0050		ug/L
			Silver (Ag)	2018/10/09	<0.0030		ug/L
			Arsenic (As)	2018/10/09	<0.080		ug/L
			Barium (Ba)	2018/10/09	<0.030		ug/L
			Boron (B)	2018/10/09	<0.30		ug/L
			Cadmium (Cd)	2018/10/09	<0.0060		ug/L
			Calcium (Ca)	2018/10/09	<20		ug/L
			Chromium (Cr)	2018/10/09	<0.040		ug/L
			Cobalt (Co)	2018/10/09	<0.0080		ug/L
			Copper (Cu)	2018/10/09	<0.050		ug/L
			Tin (Sn)	2018/10/09	<0.050		ug/L
			Iron (Fe)	2018/10/09	<0.50		ug/L
			Magnesium (Mg)	2018/10/09	<10		ug/L

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Maxxam Job #: B844036
Report Date: 2018/10/30

TATA STEEL MINERALS CANADA
Client Project #: QUARTERLY SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Manganese (Mn)	2018/10/09	<0.030		ug/L
			Mercury (Hg)	2018/10/09	<0.0020		ug/L
			Molybdenum (Mo)	2018/10/09	<0.010		ug/L
			Nickel (Ni)	2018/10/09	<0.030		ug/L
			Lead (Pb)	2018/10/09	<0.010		ug/L
			Potassium (K)	2018/10/09	<10		ug/L
			Selenium (Se)	2018/10/09	<0.050		ug/L
			Sodium (Na)	2018/10/09	<10		ug/L
			Thallium (Tl)	2018/10/09	<0.010		ug/L
			Titanium (Ti)	2018/10/09	<0.40		ug/L
			Uranium (U)	2018/10/09	<0.0010		ug/L
			Vanadium (V)	2018/10/09	<0.050		ug/L
			Zinc (Zn)	2018/10/09	<0.50		ug/L
			Total Hardness (CaCO3)	2018/10/09	<40		ug/L
1941291	JL1	Spiked Blank	Dissolved organic carbon	2018/10/05		105	%
1941291	JL1	Method Blank	Dissolved organic carbon	2018/10/05	1.2, RDL=0.20		mg/L
1941334	MEP	Spiked Blank	1-Chlorooctadecane	2018/10/09		91	%
			Petroleum Hydrocarbons (C10-C50)	2018/10/09		79	%
1941334	MEP	Method Blank	1-Chlorooctadecane	2018/10/09		99	%
			Petroleum Hydrocarbons (C10-C50)	2018/10/09	<100		ug/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

(1) Recovery or relative percent difference (RPD) for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria

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Maxxam Job #: B844036
Report Date: 2018/10/30

TATA STEEL MINERALS CANADA
Client Project #: QUARTERLY SURFACE WATER
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

Caroline Bougie, B.Sc. Chemist

Dochka Koleva Hristova, B.Sc., Chemist

David Provencher, B.Sc., Chemist, Senior Analyst

Faouzi Sarsi, B.Sc. Chemist

Kassy Blais, B.Sc.,Microbiologist

Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Le succès par la science®

Votre # du projet: B831347

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/08
Rapport: R5347581
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8J2804
Reçu: 2018/07/31, 08:44

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/08/05	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont certifiés ISO/IEC 17025:2005 pour certains paramètres précis des portées d'accréditation. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tels que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliqués par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères de CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire. Le cas échéant, sauf indication contraire, l'incertitude de mesure n'a pas été prise en considération lors de la déclaration de la conformité à la norme de référence.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit. Maxxam ne peut pas garantir l'exactitude des résultats qui dépendent des renseignements fournis par le client ou son représentant.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés. Si l'échantillonnage n'est pas effectué par Maxxam, les résultats se rapportent aux échantillons fournis pour analyse.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B831347

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/08
Rapport: R5347581
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8J2804
Reçu: 2018/07/31, 08:44

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8J2804
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B831347

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HIW399		
Date d'échantillonnage		2018/07/26 07:45		
	Unités	**FO7146-01R\DSO4-GW-SP-OUT-13**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5656489

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8J2804
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B831347

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8J2804
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B831347

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5656489	RK6	Blanc fortifié	Radium-226	2018/08/04		87	%	85 - 115
5656489	RK6	Blanc de méthode	Radium-226	2018/08/04	<0.0050		Bq/L	
5656489	RK6	RPD	Radium-226	2018/08/04	20		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération

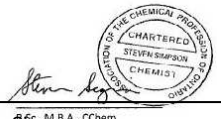
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Dossier Maxxam: B8J2804
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B831347

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-03-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/15
Report #: R2390078
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B831347
Received: 2018/07/27, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-03-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/15
Report #: R2390078
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B831347
Received: 2018/07/27, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B831347
Report Date: 2018/08/15

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

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.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-03-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/07
Report #: R2388301
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B831335
Received: 2018/07/27, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)	1	N/A	2018/07/27	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions	1	N/A	2018/07/27	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (2)	1	2018/07/27	2018/08/01	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)	1	2018/07/31	2018/08/01	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide	1	2018/08/01	2018/08/01	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand	1	2018/07/30	2018/07/30	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms	1	N/A	2018/07/28	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms	1	N/A	2018/07/28	QUE SOP-00304	MA.700-Col 1.0
Conductivity	1	N/A	2018/07/27	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)	1	N/A	2018/07/31	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)	1	2018/07/28	2018/07/28	STL SOP-00243	SM 23 5310-B m
Fluoride	1	N/A	2018/07/27	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)	1	2018/08/03	2018/08/03	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids	1	2018/07/27	2018/07/27	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/07/30	2018/07/30	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen	1	N/A	2018/07/30	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite	1	N/A	2018/07/27	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen	1	N/A	2018/07/27	SM 421 F	MA315-DBO 1.1 R3 m
pH	1	N/A	2018/07/27	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP (1)	1	2018/08/02	2018/08/02	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-)	1	2018/08/02	2018/08/02	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2)	1	N/A	2018/07/27	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids	1	2018/07/30	2018/07/30	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN)	1	2018/07/31	2018/08/01	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 4)	1	N/A	2018/07/30	STL SOP-00243	SM 23 5310-B m
Uranium by ICP-MS	1	2018/07/27	2018/07/27	QUE SOP-00132	MA.200-Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-03-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/07
Report #: R2388301
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B831335
Received: 2018/07/27, 08:30

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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 #: B831335
Report Date: 2018/08/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FO7123		
Sampling Date		2018/07/26 07:45		
COC Number		178611-03-01		
	Units	**DS04-GW-SP-OUT-13**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1921280
Surrogate Recovery (%)				
1-Chlorooctadecane	%	79	N/A	1921280

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

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B831335
Report Date: 2018/08/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FO7123		
Sampling Date		2018/07/26 07:45		
COC Number		178611-03-01		
	Units	DS04-GW-SP-OUT-13	RDL	QC Batch
METALS				
Mercury (Hg) ††	mg/L	<0.000010	0.000010	1922103
METALS ICP-MS				
Aluminum (Al)	ug/L	580	10	1920729
Antimony (Sb) †	ug/L	1.2	1.0	1920729
Silver (Ag)	ug/L	<1.0	1.0	1920729
Arsenic (As)	ug/L	1.2	1.0	1920729
Barium (Ba) †	ug/L	6.8	2.0	1920729
Boron (B) †	ug/L	<50	50	1920729
Cadmium (Cd)	ug/L	<0.20	0.20	1920729
Calcium (Ca) †	ug/L	1400	500	1920729
Chromium (Cr)	ug/L	<5.0	5.0	1920729
Cobalt (Co) †	ug/L	<1.0	1.0	1920729
Copper (Cu)	ug/L	2.0	1.0	1920729
Total Hardness (CaCO3) ††	ug/L	11000	1000	1920729
Tin (Sn) †	ug/L	<2.0	2.0	1920729
Iron (Fe)	ug/L	2100	60	1920729
Magnesium (Mg) †	ug/L	1800	100	1920729
Manganese (Mn)	ug/L	240	1.0	1920729
Molybdenum (Mo) †	ug/L	<1.0	1.0	1920729
Nickel (Ni)	ug/L	<2.0	2.0	1920729
Total phosphorous	ug/L	24	10	1920729
Lead (Pb)	ug/L	0.70	0.50	1920729
Potassium (K) †	ug/L	870	500	1920729
Selenium (Se)	ug/L	<3.0	3.0	1920729
Sodium (Na)	ug/L	700	500	1920729
Thallium (Tl) †	ug/L	<2.0	2.0	1920729
Titanium (Ti) ††	ug/L	35	10	1920729
Uranium (U) ††	ug/L	<1.0	1.0	1920729
Vanadium (V)	ug/L	2.1	2.0	1920729
Zinc (Zn)	ug/L	9.2	7.0	1920729

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B831335
Report Date: 2018/08/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FO7123		
Sampling Date		2018/07/26 07:45		
COC Number		178611-03-01		
	Units	DS04-GW-SP-OUT-13	RDL	QC Batch
CONVENTIONALS				
BOD5	mg/L	<4.0	4.0	1920489
COD	mg/L	<10	10	1920735
Conductivity	mS/cm	0.030	0.0010	1920592
Dissolved organic carbon †	mg/L	0.47	0.20	1920654
Dissolved oxygen †	mg/L	8.7	1.0	1920574
Fluoride (F)	mg/L	<0.10	0.10	1920594
Hexavalent Chromium (Cr 6+)	mg/L	<0.040	0.040	1921019
Nitrates (N-NO3-)	mg/L	3.3	0.020	1920449
Nitrites (N-NO2-)	mg/L	<0.020	0.020	1920449
Nitrogen ammonia (N-NH3)	mg/L	0.26	0.020	1920901
pH	pH	6.02	N/A	1920591
Phenols-4AAP	mg/L	<0.0020	0.0020	1921941
Reactive silica (SiO2) †	mg/L	6.0	1.0	1920532
Sulfides (S2-)	mg/L	<0.020	0.020	1921707
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	0.40	1921131
Total Cyanide (CN)	mg/L	<0.010	0.010	1921479
Total Organic Carbon	mg/L	0.66	0.20	1920740
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	<1.0	1.0	1920593
Chloride (Cl)	mg/L	0.42	0.050	1920447
Sulfates (SO4)	mg/L	<0.50	0.50	1920447
Total Dissolved Solids	mg/L	45	10	1920694
Total suspended solids (TSS)	mg/L	<2.0	2.0	1920479

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable
N/A = Not Applicable

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FO7123		
Sampling Date		2018/07/26 07:45		
COC Number		178611-03-01		
	Units	**DS04-GW-SP-OUT-13**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	30	10	1920613
Non-typical bacteria	UFC/100ml	80	10	1920613
Fecal coliforms	UFC/100ml	0	N/A	1920612

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

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Reported detection limits are multiplied by dilution factors used for sample analysis.

Hexavalent Chromium (Cr 6+): Detection limit raised due to matrix interference.

Results relate only to the items tested.

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Report Date: 2018/08/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1920447	MCC	QC Standard	Chloride (Cl)	2018/07/27		102	%
			Sulfates (SO4)	2018/07/27		100	%
1920447	MCC	Method Blank	Chloride (Cl)	2018/07/27	<0.050		mg/L
			Sulfates (SO4)	2018/07/27	<0.50		mg/L
1920449	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/27		98	%
1920449	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/27		107	%
1920449	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/27	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/27	<0.020		mg/L
1920479	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/27		89	%
1920479	SSK	Method Blank	Total suspended solids (TSS)	2018/07/27	<2.0		mg/L
1920489	AG5	Spiked Blank	BOD5	2018/08/01		103	%
1920489	AG5	Spiked Blank DUP	BOD5	2018/08/01		100	%
1920489	AG5	Method Blank	BOD5	2018/08/01	<4.0		mg/L
1920489	AG5	Method Blank DUP	BOD5	2018/08/01	<4.0		mg/L
1920532	GG1	QC Standard	Reactive silica (SiO2)	2018/07/27		90	%
1920532	GG1	Method Blank	Reactive silica (SiO2)	2018/07/27	<0.10		mg/L
1920591	CB8	QC Standard	pH	2018/07/27		100	%
1920592	CB8	QC Standard	Conductivity	2018/07/27		97	%
1920592	CB8	Method Blank	Conductivity	2018/07/27	<0.0010		mS/cm
1920593	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/27		82	%
1920593	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/27	<1.0		mg/L
1920594	CB8	QC Standard	Fluoride (F)	2018/07/27		99	%
1920594	CB8	Method Blank	Fluoride (F)	2018/07/27	<0.10		mg/L
1920654	JL1	Spiked Blank	Dissolved organic carbon	2018/07/28		100	%
1920654	JL1	Method Blank	Dissolved organic carbon	2018/07/28	2.3, RDL=0.20		mg/L
1920694	FRB	Spiked Blank	Total Dissolved Solids	2018/07/30		104	%
1920694	FRB	Method Blank	Total Dissolved Solids	2018/07/30	<10		mg/L
1920729	JRC	QC Standard	Aluminum (Al)	2018/07/30		119	%
			Antimony (Sb)	2018/07/30		108	%
			Arsenic (As)	2018/07/30		104	%
			Barium (Ba)	2018/07/30		99	%
			Boron (B)	2018/07/30		114	%
			Cadmium (Cd)	2018/07/30		101	%
			Calcium (Ca)	2018/07/30		107	%
			Chromium (Cr)	2018/07/30		103	%
			Cobalt (Co)	2018/07/30		107	%
			Copper (Cu)	2018/07/30		104	%
			Iron (Fe)	2018/07/30		113	%
			Magnesium (Mg)	2018/07/30		110	%
			Manganese (Mn)	2018/07/30		104	%
			Molybdenum (Mo)	2018/07/30		107	%
			Nickel (Ni)	2018/07/30		104	%
			Total phosphorous	2018/07/30		103	%
			Lead (Pb)	2018/07/30		98	%
			Potassium (K)	2018/07/30		108	%
			Selenium (Se)	2018/07/30		102	%
			Sodium (Na)	2018/07/30		106	%
			Thallium (Tl)	2018/07/30		96	%
			Uranium (U)	2018/07/30		98	%

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Maxxam Job #: B831335
Report Date: 2018/08/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Vanadium (V)	2018/07/30		103	%
			Zinc (Zn)	2018/07/30		101	%
1920729	JRC	Spiked Blank	Aluminum (Al)	2018/07/30		105	%
			Antimony (Sb)	2018/07/30		113	%
			Silver (Ag)	2018/07/30		104	%
			Arsenic (As)	2018/07/30		107	%
			Barium (Ba)	2018/07/30		100	%
			Boron (B)	2018/07/30		110	%
			Cadmium (Cd)	2018/07/30		104	%
			Calcium (Ca)	2018/07/30		102	%
			Chromium (Cr)	2018/07/30		102	%
			Cobalt (Co)	2018/07/30		105	%
			Copper (Cu)	2018/07/30		104	%
			Tin (Sn)	2018/07/30		114	%
			Iron (Fe)	2018/07/30		108	%
			Magnesium (Mg)	2018/07/30		110	%
			Manganese (Mn)	2018/07/30		107	%
			Molybdenum (Mo)	2018/07/30		109	%
			Nickel (Ni)	2018/07/30		103	%
			Total phosphorous	2018/07/30		106	%
			Lead (Pb)	2018/07/30		101	%
			Potassium (K)	2018/07/30		109	%
			Selenium (Se)	2018/07/30		108	%
			Sodium (Na)	2018/07/30		104	%
			Thallium (Tl)	2018/07/30		100	%
			Titanium (Ti)	2018/07/30		107	%
			Uranium (U)	2018/07/30		98	%
			Vanadium (V)	2018/07/30		104	%
			Zinc (Zn)	2018/07/30		99	%
1920729	JRC	Method Blank	Aluminum (Al)	2018/07/30	<10		ug/L
			Antimony (Sb)	2018/07/30	<1.0		ug/L
			Silver (Ag)	2018/07/30	<1.0		ug/L
			Arsenic (As)	2018/07/30	<1.0		ug/L
			Barium (Ba)	2018/07/30	<2.0		ug/L
			Boron (B)	2018/07/30	<50		ug/L
			Cadmium (Cd)	2018/07/30	<0.20		ug/L
			Calcium (Ca)	2018/07/30	<500		ug/L
			Chromium (Cr)	2018/07/30	<5.0		ug/L
			Cobalt (Co)	2018/07/30	<1.0		ug/L
			Copper (Cu)	2018/07/30	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/30	<1000		ug/L
			Tin (Sn)	2018/07/30	<2.0		ug/L
			Iron (Fe)	2018/07/30	<60		ug/L
			Magnesium (Mg)	2018/07/30	<100		ug/L
			Manganese (Mn)	2018/07/30	<1.0		ug/L
			Molybdenum (Mo)	2018/07/30	<1.0		ug/L
			Nickel (Ni)	2018/07/30	<2.0		ug/L
			Total phosphorous	2018/07/30	<10		ug/L
			Lead (Pb)	2018/07/30	<0.50		ug/L
			Potassium (K)	2018/07/30	<500		ug/L

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Maxxam Job #: B831335
Report Date: 2018/08/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Selenium (Se)	2018/07/30	<3.0		ug/L
			Sodium (Na)	2018/07/30	<500		ug/L
			Thallium (Tl)	2018/07/30	<2.0		ug/L
			Titanium (Ti)	2018/07/30	<10		ug/L
			Uranium (U)	2018/07/30	<1.0		ug/L
			Vanadium (V)	2018/07/30	<2.0		ug/L
			Zinc (Zn)	2018/07/30	<7.0		ug/L
1920735	SSK	QC Standard	COD	2018/07/30		108	%
1920735	SSK	QC Standard DUP	COD	2018/07/30		93	%
1920735	SSK	Method Blank	COD	2018/07/30	<10		mg/L
1920740	JL1	Spiked Blank	Total Organic Carbon	2018/07/30		100	%
1920740	JL1	Method Blank	Total Organic Carbon	2018/07/30	1.6, RDL=0.20		mg/L
1920901	CB8	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/30		108	%
1920901	CB8	QC Standard DUP	Nitrogen ammonia (N-NH3)	2018/07/30		106	%
1920901	CB8	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/30	<0.020		mg/L
1920901	CB8	Method Blank DUP	Nitrogen ammonia (N-NH3)	2018/07/30	<0.020		mg/L
1921019	ECA	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/31		103	%
1921019	ECA	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/31		108	%
1921019	ECA	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/31	<0.0080		mg/L
1921131	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/08/01		103	%
1921131	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/08/01	<0.40		mg/L
1921280	MEP	Spiked Blank	1-Chlorooctadecane	2018/08/01		88	%
			Petroleum Hydrocarbons (C10-C50)	2018/08/01		95	%
1921280	MEP	Method Blank	1-Chlorooctadecane	2018/08/02		82	%
			Petroleum Hydrocarbons (C10-C50)	2018/08/02	<100		ug/L
1921479	CB8	QC Standard	Total Cyanide (CN)	2018/08/01		90	%
1921479	CB8	Method Blank	Total Cyanide (CN)	2018/08/01	<0.010		mg/L
1921707	GG1	QC Standard	Sulfides (S2-)	2018/08/02		97	%
1921707	GG1	Method Blank	Sulfides (S2-)	2018/08/02	<0.020		mg/L
1921941	JL1	Spiked Blank	Phenols-4AAP	2018/08/02		91	%
1921941	JL1	Method Blank	Phenols-4AAP	2018/08/02	<0.0020		mg/L
1922103	RNP	QC Standard	Mercury (Hg)	2018/08/03		91	%
1922103	RNP	Spiked Blank	Mercury (Hg)	2018/08/03		92	%
1922103	RNP	Method Blank	Mercury (Hg)	2018/08/03	<0.000010		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Maxxam Job #: B831335
Report Date: 2018/08/07

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

Caroline Bougie, B.Sc. Chemist

David Provencher, B.Sc., Chemist, Senior Analyst

Erum Mansuri, Chemist in Training

Kassy Blais, B.Sc.,Microbiologist

Miryam Assayag

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Maxxam
Une société du Groupe Bureau Veritas

Le succès par la science®

Votre # du projet: B830825

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/07
Rapport: R5344367
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I8431
Reçu: 2018/07/26, 08:44

Matrice: Eau
Nombre d'échantillons reçus: 2

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	2	N/A	2018/08/02	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont certifiés ISO/IEC 17025:2005 pour certains paramètres précis des portées d'accréditation. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tels que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliqués par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères de CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire. Le cas échéant, sauf indication contraire, l'incertitude de mesure n'a pas été prise en considération lors de la déclaration de la conformité à la norme de référence.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit. Maxxam ne peut pas garantir l'exactitude des résultats qui dépendent des renseignements fournis par le client ou son représentant.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés. Si l'échantillonnage n'est pas effectué par Maxxam, les résultats se rapportent aux échantillons fournis pour analyse.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B830825

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/07
Rapport: R5344367
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I8431
Reçu: 2018/07/26, 08:44

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Dossier Maxxam: B8I8431
Date du rapport: 2018/08/07

Maxxam Analytique
Votre # du projet: B830825

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HHY330	HHY331		
Date d'échantillonnage		2018/07/24 07:35	2018/07/24 08:05		
	Unités	**FO4226-01R\DS04-GW-SP-OUT-12**	**FO4227-01R\DS04-EE-GW-03**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	<0.0050	0.0050	5651559

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

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Dossier Maxxam: B8I8431
Date du rapport: 2018/08/07

Maxxam Analytique
Votre # du projet: B830825

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8I8431
Date du rapport: 2018/08/07

Maxxam Analytique
Votre # du projet: B830825

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5651559	RK6	Blanc fortifié	Radium-226	2018/08/01		91	%	85 - 115
5651559	RK6	Blanc de méthode	Radium-226	2018/08/01	<0.0050		Bq/L	
5651559	RK6	RPD	Radium-226	2018/08/01	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

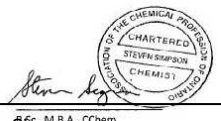
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Dossier Maxxam: B8I8431
Date du rapport: 2018/08/07

Maxxam Analytique
Votre # du projet: B830825

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-02-02

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/08
Report #: R2388524
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830825
Received: 2018/07/25, 11:00

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	2	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-02-02

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/08
Report #: R2388524
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830825
Received: 2018/07/25, 11:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B830825
Report Date: 2018/08/08

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-02-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388851
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830810
Received: 2018/07/25, 11:00

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)	2	N/A	2018/07/25	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions	2	N/A	2018/07/25	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (2)	2	2018/07/25	2018/07/30	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)	2	2018/07/27	2018/07/27	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide	2	2018/07/27	2018/07/27	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand	2	2018/07/26	2018/07/26	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms	2	N/A	2018/07/26	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms	2	N/A	2018/07/26	QUE SOP-00304	MA.700-Col 1.0
Conductivity	2	N/A	2018/07/25	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)	2	N/A	2018/07/27	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)	2	2018/07/27	2018/07/27	STL SOP-00243	SM 23 5310-B m
Fluoride	2	N/A	2018/07/27	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)	2	2018/08/03	2018/08/03	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids	2	2018/07/26	2018/07/26	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	2	2018/07/25	2018/07/26	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen	2	N/A	2018/07/27	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite	2	N/A	2018/07/25	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen	2	N/A	2018/07/25	SM 421 F	MA315-DBO 1.1 R3 m
pH	2	N/A	2018/07/25	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP (1)	2	2018/07/30	2018/07/30	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-)	1	2018/07/30	2018/07/31	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Sulfides (S2-)	1	2018/07/31	2018/07/31	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2)	2	N/A	2018/07/27	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids	2	2018/07/26	2018/07/26	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN)	2	2018/07/26	2018/07/27	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 4)	2	N/A	2018/07/26	STL SOP-00243	SM 23 5310-B m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-02-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388851
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830810
Received: 2018/07/25, 11:00

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B830810
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FO4086	FO4140		
Sampling Date		2018/07/24 07:35	2018/07/24 08:05		
COC Number		178611-02-01	178611-02-01		
	Units	DS04-GW-SP-OUT-12	DS04-EE-GW-03	RDL	QC Batch
PETROLEUM HYDROCARBONS					
Petroleum Hydrocarbons (C10-C50)	ug/L	140	150	100	1920231
Surrogate Recovery (%)					
1-Chlorooctadecane	%	82	86	N/A	1920231

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

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Maxxam Job #: B830810
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FO4086	FO4140		
Sampling Date		2018/07/24 07:35	2018/07/24 08:05		
COC Number		178611-02-01	178611-02-01		
	Units	DS04-GW-SP-OUT-12	DS04-EE-GW-03	RDL	QC Batch
METALS					
Mercury (Hg) ††	mg/L	<0.000010	<0.000010	0.000010	1922103
METALS ICP-MS					
Antimony (Sb) †	ug/L	<1.0	<1.0	1.0	1919717
Silver (Ag)	ug/L	<1.0	<1.0	1.0	1919717
Arsenic (As)	ug/L	<1.0	<1.0	1.0	1919717
Barium (Ba) †	ug/L	5.4	<2.0	2.0	1919717
Boron (B) †	ug/L	<50	<50	50	1919717
Cadmium (Cd)	ug/L	<0.20	<0.20	0.20	1919717
Calcium (Ca) †	ug/L	2500	<500	500	1919717
Chromium (Cr)	ug/L	<5.0	<5.0	5.0	1919717
Cobalt (Co) †	ug/L	<1.0	<1.0	1.0	1919717
Copper (Cu)	ug/L	1.6	<1.0	1.0	1919717
Total Hardness (CaCO3) ††	ug/L	18000	1300	1000	1919717
Tin (Sn) †	ug/L	<2.0	<2.0	2.0	1919717
Iron (Fe)	ug/L	170	190	60	1919717
Magnesium (Mg) †	ug/L	3000	120	100	1919717
Manganese (Mn)	ug/L	310	23	1.0	1919717
Molybdenum (Mo) †	ug/L	<1.0	<1.0	1.0	1919717
Mercury (Hg)	ug/L	<0.10	<0.10	0.10	1919717
Nickel (Ni)	ug/L	<2.0	<2.0	2.0	1919717
Total phosphorous	ug/L	<10	15	10	1919717
Lead (Pb)	ug/L	<0.50	<0.50	0.50	1919717
Potassium (K) †	ug/L	950	<500	500	1919717
Selenium (Se)	ug/L	<3.0	<3.0	3.0	1919717
Sodium (Na)	ug/L	840	<500	500	1919717
Thallium (Tl) †	ug/L	<2.0	<2.0	2.0	1919717
Titanium (Ti) ††	ug/L	<10	<10	10	1919717
Uranium (U) ††	ug/L	<1.0	<1.0	1.0	1919717
Vanadium (V)	ug/L	<2.0	<2.0	2.0	1919717
Zinc (Zn)	ug/L	8.7	<7.0	7.0	1919717

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B830810
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FO4086	FO4086		FO4140		
Sampling Date		2018/07/24 07:35	2018/07/24 07:35		2018/07/24 08:05		
COC Number		178611-02-01	178611-02-01		178611-02-01		
	Units	DS04-GW-SP-OUT-12	DS04-GW-SP-OUT-12 Lab-Dup	QC Batch	DS04-EE-GW-03	RDL	QC Batch
CONVENTIONALS							
BOD5	mg/L	<4.0	N/A	1919708	<4.0	4.0	1919708
COD	mg/L	<10	N/A	1919879	<10	10	1919879
Conductivity	mS/cm	0.050	N/A	1919791	0.0022	0.0010	1919791
Dissolved organic carbon †	mg/L	<0.20	N/A	1920416	1.0	0.20	1920416
Dissolved oxygen †	mg/L	8.6	N/A	1919740	8.5	1.0	1919740
Fluoride (F)	mg/L	<0.10	<0.10	1920510	<0.10	0.10	1920510
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	N/A	1920225	<0.0080	0.0080	1920225
Nitrates (N-NO3-)	mg/L	5.5	N/A	1919432	0.027	0.020	1919432
Nitrites (N-NO2-)	mg/L	<0.020	N/A	1919432	<0.020	0.020	1919432
Nitrogen ammonia (N-NH3)	mg/L	0.040	N/A	1920460	<0.020	0.020	1920460
pH	pH	5.83	N/A	1919782	5.75	N/A	1919782
Phenols-4AAP	mg/L	<0.0020	N/A	1920765	<0.0020	0.0020	1920765
Reactive silica (SiO2) †	mg/L	6.2	N/A	1920532	2.3	0.50	1920532
Sulfides (S2-)	mg/L	<0.020	N/A	1920889	<0.020	0.020	1921165
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	N/A	1919880	<0.40	0.40	1919880
Total Cyanide (CN)	mg/L	<0.010	N/A	1920431	<0.010	0.010	1920431
Total Organic Carbon	mg/L	0.66	N/A	1919939	3.5	0.20	1919939
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	<1.0	N/A	1919789	<1.0	1.0	1919789
Chloride (Cl)	mg/L	0.54	N/A	1919433	0.11	0.050	1919433
Sulfates (SO4)	mg/L	<0.50	N/A	1919433	<0.50	0.50	1919433
Total Dissolved Solids	mg/L	66	N/A	1919865	21	10	1919865
Total suspended solids (TSS)	mg/L	<2.0	N/A	1919856	2.1	2.0	1919856

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
† Parameter is not accreditable

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FO4086		FO4140		
Sampling Date		2018/07/24 07:35		2018/07/24 08:05		
COC Number		178611-02-01		178611-02-01		
	Units	DS04-GW-SP-OUT-12	RDL	DS04-EE-GW-03	RDL	QC Batch
MICROBIOLGICAL TESTS						
Total coliforms	UFC/100ml	11	1	100	100	1919890
Non-typical bacteria	UFC/100ml	58	1	3000	100	1919890
Fecal coliforms	UFC/100ml	0	N/A	2	1	1919889

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

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
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GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Reported detection limits are multiplied by dilution factors used for sample analysis.
Please note that dissolved organic carbon results have been corrected for the method blank.

Results relate only to the items tested.

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1919432	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/25		97	%
1919432	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/25		104	%
1919432	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/25	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/25	<0.020		mg/L
1919433	MCC	QC Standard	Chloride (Cl)	2018/07/25		100	%
			Sulfates (SO4)	2018/07/25		99	%
1919433	MCC	Method Blank	Chloride (Cl)	2018/07/25	<0.050		mg/L
			Sulfates (SO4)	2018/07/25	<0.50		mg/L
1919708	AG5	Spiked Blank	BOD5	2018/07/30		106	%
1919708	AG5	Spiked Blank DUP	BOD5	2018/07/30		102	%
1919708	AG5	Method Blank	BOD5	2018/07/30	<4.0		mg/L
1919708	AG5	Method Blank DUP	BOD5	2018/07/30	<4.0		mg/L
1919717	JRC	QC Standard	Antimony (Sb)	2018/07/26		104	%
			Arsenic (As)	2018/07/26		105	%
			Barium (Ba)	2018/07/26		97	%
			Boron (B)	2018/07/26		105	%
			Cadmium (Cd)	2018/07/26		99	%
			Calcium (Ca)	2018/07/26		97	%
			Chromium (Cr)	2018/07/26		103	%
			Cobalt (Co)	2018/07/26		107	%
			Copper (Cu)	2018/07/26		103	%
			Iron (Fe)	2018/07/26		116	%
			Magnesium (Mg)	2018/07/26		106	%
			Manganese (Mn)	2018/07/26		103	%
			Molybdenum (Mo)	2018/07/26		105	%
			Mercury (Hg)	2018/07/26		107	%
			Nickel (Ni)	2018/07/26		106	%
			Total phosphorous	2018/07/26		96	%
			Lead (Pb)	2018/07/26		96	%
			Potassium (K)	2018/07/26		104	%
			Selenium (Se)	2018/07/26		99	%
			Sodium (Na)	2018/07/26		102	%
			Thallium (Tl)	2018/07/26		104	%
			Uranium (U)	2018/07/26		98	%
			Vanadium (V)	2018/07/26		102	%
			Zinc (Zn)	2018/07/26		96	%
1919717	JRC	Spiked Blank	Antimony (Sb)	2018/07/26		106	%
			Silver (Ag)	2018/07/26		96	%
			Arsenic (As)	2018/07/26		104	%
			Barium (Ba)	2018/07/26		100	%
			Boron (B)	2018/07/26		104	%
			Cadmium (Cd)	2018/07/26		98	%
			Calcium (Ca)	2018/07/26		94	%
			Chromium (Cr)	2018/07/26		102	%
			Cobalt (Co)	2018/07/26		102	%
			Copper (Cu)	2018/07/26		101	%
			Tin (Sn)	2018/07/26		110	%
			Iron (Fe)	2018/07/26		103	%
			Magnesium (Mg)	2018/07/26		103	%
			Manganese (Mn)	2018/07/26		107	%

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Maxxam Job #: B830810
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Molybdenum (Mo)	2018/07/26		103	%
			Mercury (Hg)	2018/07/26		100	%
			Nickel (Ni)	2018/07/26		99	%
			Total phosphorous	2018/07/26		97	%
			Lead (Pb)	2018/07/26		99	%
			Potassium (K)	2018/07/26		103	%
			Selenium (Se)	2018/07/26		102	%
			Sodium (Na)	2018/07/26		92	%
			Thallium (Tl)	2018/07/26		108	%
			Titanium (Ti)	2018/07/26		99	%
			Uranium (U)	2018/07/26		101	%
			Vanadium (V)	2018/07/26		100	%
			Zinc (Zn)	2018/07/26		95	%
1919717	JRC	Method Blank	Antimony (Sb)	2018/07/26	<1.0		ug/L
			Silver (Ag)	2018/07/26	<1.0		ug/L
			Arsenic (As)	2018/07/26	<1.0		ug/L
			Barium (Ba)	2018/07/26	<2.0		ug/L
			Boron (B)	2018/07/26	<50		ug/L
			Cadmium (Cd)	2018/07/26	<0.20		ug/L
			Calcium (Ca)	2018/07/26	<500		ug/L
			Chromium (Cr)	2018/07/26	<5.0		ug/L
			Cobalt (Co)	2018/07/26	<1.0		ug/L
			Copper (Cu)	2018/07/26	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/26	<1000		ug/L
			Tin (Sn)	2018/07/26	<2.0		ug/L
			Iron (Fe)	2018/07/26	<60		ug/L
			Magnesium (Mg)	2018/07/26	<100		ug/L
			Manganese (Mn)	2018/07/26	<1.0		ug/L
			Molybdenum (Mo)	2018/07/26	<1.0		ug/L
			Mercury (Hg)	2018/07/26	<0.10		ug/L
			Nickel (Ni)	2018/07/26	<2.0		ug/L
			Total phosphorous	2018/07/26	<10		ug/L
			Lead (Pb)	2018/07/26	<0.50		ug/L
			Potassium (K)	2018/07/26	<500		ug/L
			Selenium (Se)	2018/07/26	<3.0		ug/L
			Sodium (Na)	2018/07/26	<500		ug/L
			Thallium (Tl)	2018/07/26	<2.0		ug/L
			Titanium (Ti)	2018/07/26	<10		ug/L
			Uranium (U)	2018/07/26	<1.0		ug/L
			Vanadium (V)	2018/07/26	<2.0		ug/L
			Zinc (Zn)	2018/07/26	<7.0		ug/L
1919782	CB8	QC Standard	pH	2018/07/25		100	%
1919789	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/25		95	%
1919789	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/25	<1.0		mg/L
1919791	CB8	QC Standard	Conductivity	2018/07/25		99	%
1919791	CB8	Method Blank	Conductivity	2018/07/25	<0.0010		mS/cm
1919856	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/26		98	%
1919856	SSK	Method Blank	Total suspended solids (TSS)	2018/07/26	<2.0		mg/L
1919865	FRB	Spiked Blank	Total Dissolved Solids	2018/07/26		109	%
1919865	FRB	Method Blank	Total Dissolved Solids	2018/07/26	<10		mg/L

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Maxxam Job #: B830810
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1919879	SSK	QC Standard	COD	2018/07/26		106	%
1919879	SSK	QC Standard DUP	COD	2018/07/26		110	%
1919879	SSK	QC Standard DUP 2	COD	2018/07/26		92	%
1919879	SSK	Method Blank	COD	2018/07/26	<10		mg/L
1919879	SSK	Method Blank DUP	COD	2018/07/26	<10		mg/L
1919880	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/27		100	%
1919880	MCC	QC Standard DUP	TKN Total Kjeldahl Nitrogen	2018/07/27		92	%
1919880	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/27	<0.40		mg/L
1919880	MCC	Method Blank DUP	TKN Total Kjeldahl Nitrogen	2018/07/27	<0.40		mg/L
1919939	MR4	Spiked Blank	Total Organic Carbon	2018/07/26		98	%
1919939	MR4	Method Blank	Total Organic Carbon	2018/07/26	<0.20		mg/L
1920225	ECA	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/27		98	%
1920225	ECA	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/27		102	%
1920225	ECA	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/27	<0.0080		mg/L
1920231	SBF	Spiked Blank	1-Chlorooctadecane	2018/07/27		88	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/27		99	%
1920231	SBF	Spiked Blank DUP	1-Chlorooctadecane	2018/07/27		79	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/27		98	%
1920231	SBF	Method Blank	1-Chlorooctadecane	2018/07/30		83	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/30	<100		ug/L
1920416	MR4	Spiked Blank	Dissolved organic carbon	2018/07/27		98	%
1920416	MR4	Method Blank	Dissolved organic carbon	2018/07/27	2.2, RDL=0.20		mg/L
1920431	CB8	QC Standard	Total Cyanide (CN)	2018/07/27		92	%
1920431	CB8	Method Blank	Total Cyanide (CN)	2018/07/27	<0.010		mg/L
1920460	CB8	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/27		104	%
1920460	CB8	QC Standard DUP	Nitrogen ammonia (N-NH3)	2018/07/27		103	%
1920460	CB8	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/27	<0.020		mg/L
1920460	CB8	Method Blank DUP	Nitrogen ammonia (N-NH3)	2018/07/27	<0.020		mg/L
1920510	GG1	QC Standard	Fluoride (F)	2018/07/27		99	%
1920510	GG1	QC Standard DUP	Fluoride (F)	2018/07/27		97	%
1920510	GG1	Method Blank	Fluoride (F)	2018/07/27	<0.10		mg/L
1920510	GG1	Method Blank DUP	Fluoride (F)	2018/07/27	<0.10		mg/L
1920532	GG1	QC Standard	Reactive silica (SiO2)	2018/07/27		90	%
1920532	GG1	Method Blank	Reactive silica (SiO2)	2018/07/27	<0.10		mg/L
1920765	MR4	Spiked Blank	Phenols-4AAP	2018/07/30		92	%
1920765	MR4	Method Blank	Phenols-4AAP	2018/07/30	<0.0020		mg/L
1920889	GG1	QC Standard	Sulfides (S2-)	2018/07/31		91	%
1920889	GG1	Method Blank	Sulfides (S2-)	2018/07/31	<0.020		mg/L
1921165	GG1	QC Standard	Sulfides (S2-)	2018/07/31		92	%
1921165	GG1	Method Blank	Sulfides (S2-)	2018/07/31	<0.020		mg/L
1922103	RNP	QC Standard	Mercury (Hg)	2018/08/03		91	%
1922103	RNP	Spiked Blank	Mercury (Hg)	2018/08/03		92	%

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1922103	RNP	Method Blank	Mercury (Hg)	2018/08/03	<0.000010		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

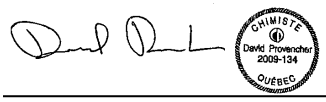
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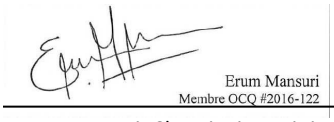
TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
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VALIDATION SIGNATURE PAGE

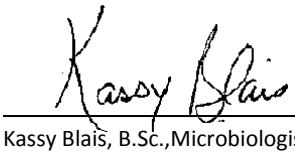
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



David Provencher, B.Sc., Chemist, Senior Analyst



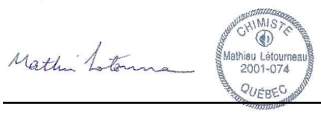
Erum Mansuri, Chemist in Training



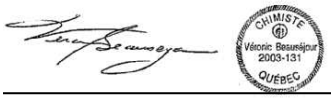
Kassy Blais, B.Sc.,Microbiologist



Miryam Assayag



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist



Veronic Beausejour, B.Sc., Chemist, Supervisor

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B830724

Client Project Name & Number: GOODWOOD GOODWOOD SED POND

Test Result:

96 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual

Toxic unit: <1

Comment: Non-toxic

Sample Name : DSO4-GW-SP-OUT-12

Sample Matrix : SURFACE WATER

Description: Beige, translucent, few solids

Sample Number: FO3729-01

Sample Collected: Jul 24, 2018 07:35 AM Sampling Method : Grab

Site Collection: GoodWood

Sample Collected By: PALLAV SINHA Volume Received: 40 L

Temp.Upon Arrival: 26 °C Storage: 2-6°C

Sample Received: Jul 25, 2018 11:00 AM pH: 5.7

Dissolved Oxygen: 9.3 mg/L

Analysis Start : Jul 26, 2018 02:40 PM Temperature : 16 °C

Sample Conductance: 53 µS/cm

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	96 hrs	96 hr	96 hrs	24 hrs	24 hrs	24 hrs	24 hrs
0	15	7.5	278	9.7	15	7.7	10.1	0	0	0	0
6.25	15	7.6	267	9.7	15	7.7	10.0	0	0	0	0
12.5	15	7.6	237	9.8	15	7.7	10.1	0	0	0	0
25	15	7.6	227	9.7	15	7.7	10.1	0	0	0	0
50	15	7.4	176	9.7	15	7.5	10.1	0	0	0	0
100	15	6.0	53	9.5	15	6.4	9.9	0	0	0	0

Concentration	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	48 hrs	48 hrs	48 hrs	48 hrs	72 hrs	72 hrs	72 hrs	72 hrs	96 hrs	96 hrs	96 hrs	96 hrs
0	0	0	0	0	0	0	0	0	0	0	0	0
6.25	0	0	0	0	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0

Comments : No discrepancies observed during the test.

Culture/Control/Dilution Water Dechlorinated municipal tap water

Hardness: 114 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	35 cm
Total # of Organisms Used :	60	Pre-aeration Time :	30 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	16 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.4 g/L	Photoperiod :	16 hours of of light; 8 hours of darkness		
Test vessel:	20L glass aquarium with polyethylene bag.				

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client :	4526	TATA STEEL MINERALS CANADA		Job Number:	B830724
Client Project Name & Number:		GOODWOOD GOODWOOD SED POND		Sample Number:	FO3729-01

Test Organism :	Rainbow Trout *(Oncorhynchus mykiss)*		Source :	Piscicultures Les Arpents Verts	
Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.6 ± 0.1 g	Length (Mean) +- SD :	3.99 ± 0.19 cm
Culture Water Renewal :	2 liters/min	Weight (Range) :	0.4 – 0.7 g	Length (Range) :	3.60 – 4.30 cm
Culture Photoperiod :	16 hours of of light; 8 hours of darkness			% Mortality within 7 days :	0%
Feeding rate and frequency :	1-2x a day; 1-5% of the body weights.			Acclimation Time:	>14 days

Reference chemical:	Phenol	Test Date:	Jul 19, 2018
Test Endpoint 96 hrs LC50 (95% confidence interval) :	10.8 (9.00, 13.0)mg/L	Statistical Method :	Binomial
Historical Mean LC50 (warning limits) :	9.85 (7.82, 12.4) mg/L	Concentration :	0,4,6,9,13,18 mg/L

Test Method

QUE SOP - 00408. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS1/RM/13 - Second Edition. Environment Canada. 2000. (Including Amendments: May 2007).

This is essentially a 96H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations : No change was made to the method.

Analyst : Alexis Roy, Olivier Roberge

Verified By : Angela Paquet-Walsh, Analyst 2

Date: Aug 06, 2018 04:51 PM

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B830724

Client Project Name & Number: GOODWOOD GOODWOOD SED POND No. d'échantillon : FO3729-02

Test Result:

48 hrs LC50 %v/v (95% CL): 70.7 (50.0-100) Statistical Method: Binomial **Toxic unit:** 1.41

48 hrs EC50 %v/v (95% CL): 70.7 (50.0-100) Statistical Method: Binomial **Comment:** Toxic

Sample Name : DSO4-GW-SP-OUT-12 Sample Matrix : SURFACE WATER

Description: Incolore, translucent, no odors, no solids Sample Prior to Analysis:

Sample Collected: Jul 24, 2018 07:35 AM Sampling Method : Grab pH: 5.6

Sample Collected By: PALLAV SINHA Site Collection: GoodWood Temperature : 18 °C

Sample Received: Jul 25, 2018 11:00 AM Volume Received: 1 L Dissolved Oxygen: 8.8 mg/L

Analysis Start : Jul 26, 2018 11:55 AM Temp.Upon Arrival: 26 °C Sample Conductance: 53 µS/cm

End : Jul 28, 2018 11:05 AM Storage: 2-6°C Hardness: 18 mg $CaCO_3$/L

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Immobility (#)	Immobility (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	48 hrs	48 hr	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
0	20	7.7	479	8.5	19	7.5	9.5	0	0	0	0
6.25	20	7.7	455	8.5	19	7.5	9.5	0	0	0	0
12.5	20	7.6	434	8.6	19	7.5	9.5	0	0	0	0
25	20	7.5	386	8.6	19	7.4	9.5	0	0	0	0
50	20	7.3	283	8.7	19	7.3	9.5	0	0	0	0
100	19	5.7	86	8.9	19	5.9	9.5	0	0	10	100

Comments :

Culture/Control/Dilution Water: Reconstitued water for Daphnia

Hardness: 170 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Pre-aeration Time :	0 min	Rate of Pre-aeration :	40±5 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	Yes, 31 mg $CaCO_3$/L
Test Volume :	150 mL	Vessel Volume :	270 ml	Test pH Adjusted:	No
Loading Density :	15.0 mL/Daphnia	Photoperiod :	16 hours of of light; 8 hours of darkness		

Test Organism : *Daphnia magna* Source : Maxxam Lab Culture

Age at Test Initiation : <24 hres Average Brood Size : 32.6

Culture Photoperiod : 16 hours of of light; 8 hours of darkness % Mortality within 7 days : 0

Culture Temperature : 20 ± 2 °C Time To First Brood : 8 Days

Culture Diet Fed once a day.

Reference chemical: Potassium Dichromate Test Date: Jul 31, 2018

Test Endpoint 48 hrs LC50 (95% confidence interval) : 0.16 (0.063, 0.25)mg/L Statistical Method : Binomial

Historical Mean LC50 (warning limits) : 0.17 (0.10, 0.30) mg/L Concentration : 0,0.0625,0.125,0.25,0.5,1 mg/L

Test Method QUE SOP-00406. Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. EPS1/RM/14 - Second Edition. Environment Canada. 2000.

This is essentially a 48H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations: Aucune

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B830724

Client Project Name & Number: GOODWOOD GOODWOOD SED POND No. d'échantillon : FO3729-02

Analyst : Alexandra Côté, Félicia Anctil, Roxane Champagne



Verified By : Angela Paquet-Walsh, Analyst 2 Date: Aug 06, 2018 03:29 PM

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-02-03

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/06
Report #: R2388061
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830724
Received: 2018/07/25, 11:00

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Daphnia - LC50 (acute-48h)-Federal	1	N/A	2018/07/26	QUE SOP-00406	EPS1/RM/14
Hardness by ICP-MS	1	2018/07/25	2018/07/25	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Hardness by ICP-MS	1	2018/07/26	2018/07/26	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Rainbow Trout - LC50 (acute-96h)	1	N/A	2018/07/26	QUE SOP - 00408	EPS1/RM/13

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-02-03

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/06
Report #: R2388061
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830724
Received: 2018/07/25, 11:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B830724
Report Date: 2018/08/06

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

ECOTOXICOLOGY (SURFACE WATER)

Maxxam ID		FO3729	
Sampling Date		2018/07/24 07:35	
COC Number		178611-02-03	
	Units	**DSO4-GW-SP-OUT-12**	**QC Batch**
Daphnia Magna - Can			
LC50	%v/v	ATTACHED	1919905
Rainbow Trout			
LC50	%v/v	ATTACHED	1919807

QC Batch = Quality Control Batch

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Maxxam Job #: B830724
Report Date: 2018/08/06

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B830724
Report Date: 2018/08/06

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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



Angela Paquet-Walsh, M.Sc. Biologist, Analyst 2

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Votre # du projet: B830671

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/07
Rapport: R5344366
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I8408
Reçu: 2018/07/26, 08:44

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/08/02	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont certifiés ISO/IEC 17025:2005 pour certains paramètres précis des portées d'accréditation. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tels que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliqués par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères de CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire. Le cas échéant, sauf indication contraire, l'incertitude de mesure n'a pas été prise en considération lors de la déclaration de la conformité à la norme de référence.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit. Maxxam ne peut pas garantir l'exactitude des résultats qui dépendent des renseignements fournis par le client ou son représentant.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés. Si l'échantillonnage n'est pas effectué par Maxxam, les résultats se rapportent aux échantillons fournis pour analyse.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B830671

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/07
Rapport: R5344366
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I8408
Reçu: 2018/07/26, 08:44

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

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Dossier Maxxam: B8I8408
Date du rapport: 2018/08/07

Maxxam Analytique
Votre # du projet: B830671

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HHY169		
Date d'échantillonnage		2018/07/22 10:00		
	Unités	**FO3445-01R\DS04-GW-SP-OUT-11**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5651559

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8I8408
Date du rapport: 2018/08/07

Maxxam Analytique
Votre # du projet: B830671

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8I8408
Date du rapport: 2018/08/07

Maxxam Analytique
Votre # du projet: B830671

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5651559	RK6	Blanc fortifié	Radium-226	2018/08/01		91	%	85 - 115
5651559	RK6	Blanc de méthode	Radium-226	2018/08/01	<0.0050		Bq/L	
5651559	RK6	RPD	Radium-226	2018/08/01	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

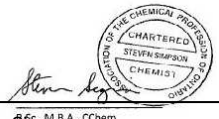
Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8I8408
Date du rapport: 2018/08/07

Maxxam Analytique
Votre # du projet: B830671

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-01-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/08
Report #: R2388522
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830671
Received: 2018/07/24, 10:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-01-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/08
Report #: R2388522
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830671
Received: 2018/07/24, 10:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B830671
Report Date: 2018/08/08

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

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Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-01-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388854
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830493
Received: 2018/07/24, 10:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)	1	N/A	2018/07/24	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions	1	N/A	2018/07/24	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (2)	1	2018/07/25	2018/07/30	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50) (1)	1	2018/07/26	2018/07/27	STL SOP-00173	MA.400–HYD. 1.1 R3 m
Total Cyanide	1	2018/07/24	2018/07/24	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand	1	2018/07/25	2018/07/25	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms	1	N/A	2018/07/24	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms	1	N/A	2018/07/24	QUE SOP-00304	MA.700-Col 1.0
Conductivity	1	N/A	2018/07/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)	1	N/A	2018/07/26	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)	1	2018/07/25	2018/07/25	STL SOP-00243	SM 23 5310-B m
Fluoride	1	N/A	2018/07/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)	1	2018/07/30	2018/07/30	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids	1	2018/07/24	2018/07/24	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/07/25	2018/07/26	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen	1	N/A	2018/07/26	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite	1	N/A	2018/07/24	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen	1	N/A	2018/07/24	SM 421 F	MA315-DBO 1.1 R3 m
pH	1	N/A	2018/07/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP (1)	1	2018/07/30	2018/07/30	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-)	1	2018/07/26	2018/07/26	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2)	1	N/A	2018/07/27	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids	1	2018/07/25	2018/07/25	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN)	1	2018/07/26	2018/07/27	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 4)	1	N/A	2018/07/27	STL SOP-00243	SM 23 5310-B m
Uranium by ICP-MS	1	2018/07/24	2018/07/24	QUE SOP-00132	MA.200-Mét. 1.2 R5 m

Remarks:

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 178611-01-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388854
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830493
Received: 2018/07/24, 10:00

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

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Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B830493
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FO2933		
Sampling Date		2018/07/22 10:00		
COC Number		178611-01-01		
	Units	**DS04-GW-SP-OUT-11**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1919917
Surrogate Recovery (%)				
1-Chlorooctadecane	%	61	N/A	1919917

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

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Maxxam Job #: B830493
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FO2933		
Sampling Date		2018/07/22 10:00		
COC Number		178611-01-01		
	Units	DS04-GW-SP-OUT-11	RDL	QC Batch
METALS				
Mercury (Hg) ††	mg/L	<0.000010	0.000010	1920711
METALS ICP-MS				
Aluminum (Al)	ug/L	<10	10	1919717
Antimony (Sb) †	ug/L	<1.0	1.0	1919717
Silver (Ag)	ug/L	<1.0	1.0	1919717
Arsenic (As)	ug/L	<1.0	1.0	1919717
Barium (Ba) †	ug/L	4.5	2.0	1919717
Boron (B) †	ug/L	<50	50	1919717
Cadmium (Cd)	ug/L	<0.20	0.20	1919717
Calcium (Ca) †	ug/L	2500	500	1919717
Chromium (Cr)	ug/L	<5.0	5.0	1919717
Cobalt (Co) †	ug/L	<1.0	1.0	1919717
Copper (Cu)	ug/L	<1.0	1.0	1919717
Total Hardness (CaCO3) ††	ug/L	18000	1000	1919717
Tin (Sn) †	ug/L	<2.0	2.0	1919717
Iron (Fe)	ug/L	63	60	1919717
Magnesium (Mg) †	ug/L	2800	100	1919717
Manganese (Mn)	ug/L	210	1.0	1919717
Molybdenum (Mo) †	ug/L	<1.0	1.0	1919717
Nickel (Ni)	ug/L	<2.0	2.0	1919717
Total phosphorous	ug/L	<10	10	1919717
Lead (Pb)	ug/L	<0.50	0.50	1919717
Potassium (K) †	ug/L	920	500	1919717
Selenium (Se)	ug/L	<3.0	3.0	1919717
Sodium (Na)	ug/L	730	500	1919717
Thallium (Tl) †	ug/L	<2.0	2.0	1919717
Titanium (Ti) ††	ug/L	<10	10	1919717
Uranium (U) ††	ug/L	<1.0	1.0	1919717
Vanadium (V)	ug/L	<2.0	2.0	1919717
Zinc (Zn)	ug/L	<7.0	7.0	1919717

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B830493
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FO2933		
Sampling Date		2018/07/22 10:00		
COC Number		178611-01-01		
	Units	DS04-GW-SP-OUT-11	RDL	QC Batch
CONVENTIONALS				
BOD5	mg/L	<4.0	4.0	1919555
COD	mg/L	<10	10	1919530
Conductivity	mS/cm	0.052	0.0010	1919422
Dissolved organic carbon †	mg/L	<0.20	0.20	1919628
Dissolved oxygen †	mg/L	9.1	1.0	1919425
Fluoride (F)	mg/L	<0.10	0.10	1919424
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	0.0080	1919827
Nitrates (N-NO3-)	mg/L	5.2	0.020	1919348
Nitrites (N-NO2-)	mg/L	<0.020	0.020	1919348
Nitrogen ammonia (N-NH3)	mg/L	0.10	0.020	1919801
pH	pH	6.59	N/A	1919417
Phenols-4AAP	mg/L	<0.0020	0.0020	1920715
Reactive silica (SiO2) †	mg/L	5.9	0.50	1920532
Sulfides (S2-)	mg/L	<0.020	0.020	1919824
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	0.40	1919880
Total Cyanide (CN)	mg/L	<0.010	0.010	1919386
Total Organic Carbon	mg/L	0.58	0.20	1920372
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	2.3	1.0	1919419
Chloride (Cl)	mg/L	0.53	0.050	1919346
Sulfates (SO4)	mg/L	<0.50	0.50	1919346
Total Dissolved Solids	mg/L	72	10	1919454
Total suspended solids (TSS)	mg/L	5.3	2.0	1919267

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable
N/A = Not Applicable

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Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FO2933		
Sampling Date		2018/07/22 10:00		
COC Number		178611-01-01		
	Units	**DS04-GW-SP-OUT-11**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	1	1	1919306
Non-typical bacteria	UFC/100ml	3	1	1919306
Fecal coliforms	UFC/100ml	0	N/A	1919282

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

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Maxxam Job #: B830493
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

pH: Analyses requested past holding time: FO2933
Hexavalent Chromium (Cr 6+): Arrived unpreserved, preserved upon reception at the laboratory.: FO2933

CONVENTIONAL PARAMETERS (SURFACE WATER)

Note for pH: Sample received and analyzed after hold time.
Reported detection limits are multiplied by dilution factors used for sample analysis.
Please note that dissolved organic carbon results have been corrected for the method blank.

Results relate only to the items tested.

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Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1919267	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/24		90	%
1919267	SSK	Method Blank	Total suspended solids (TSS)	2018/07/24	<2.0		mg/L
1919346	MCC	QC Standard	Chloride (Cl)	2018/07/24		100	%
			Sulfates (SO4)	2018/07/24		99	%
1919346	MCC	Method Blank	Chloride (Cl)	2018/07/24	<0.050		mg/L
			Sulfates (SO4)	2018/07/24	<0.50		mg/L
1919348	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/24		97	%
1919348	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/24		102	%
1919348	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/24	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/24	<0.020		mg/L
1919386	CB8	QC Standard	Total Cyanide (CN)	2018/07/24		87	%
1919386	CB8	Method Blank	Total Cyanide (CN)	2018/07/24	<0.010		mg/L
1919417	GG1	QC Standard	pH	2018/07/24		100	%
1919419	GG1	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/24		96	%
1919419	GG1	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/24	<1.0		mg/L
1919422	GG1	QC Standard	Conductivity	2018/07/24		99	%
1919422	GG1	Method Blank	Conductivity	2018/07/24	<0.0010		mS/cm
1919424	GG1	QC Standard	Fluoride (F)	2018/07/24		103	%
1919424	GG1	Method Blank	Fluoride (F)	2018/07/24	<0.10		mg/L
1919454	FRB	Spiked Blank	Total Dissolved Solids	2018/07/25		108	%
1919454	FRB	Method Blank	Total Dissolved Solids	2018/07/25	<10		mg/L
1919530	SSK	QC Standard	COD	2018/07/25		105	%
1919530	SSK	QC Standard DUP	COD	2018/07/25		95	%
1919530	SSK	Method Blank	COD	2018/07/25	<10		mg/L
1919555	AG5	Spiked Blank	BOD5	2018/07/30		89	%
1919555	AG5	Spiked Blank DUP	BOD5	2018/07/30		107	%
1919555	AG5	Method Blank	BOD5	2018/07/30	<4.0		mg/L
1919555	AG5	Method Blank DUP	BOD5	2018/07/30	<4.0		mg/L
1919628	MR4	Spiked Blank	Dissolved organic carbon	2018/07/25		99	%
1919628	MR4	Method Blank	Dissolved organic carbon	2018/07/25	2.0, RDL=0.20		mg/L
1919717	JRC	QC Standard	Aluminum (Al)	2018/07/26		89	%
			Antimony (Sb)	2018/07/26		104	%
			Arsenic (As)	2018/07/26		105	%
			Barium (Ba)	2018/07/26		97	%
			Boron (B)	2018/07/26		105	%
			Cadmium (Cd)	2018/07/26		99	%
			Calcium (Ca)	2018/07/26		97	%
			Chromium (Cr)	2018/07/26		103	%
			Cobalt (Co)	2018/07/26		107	%
			Copper (Cu)	2018/07/26		103	%
			Iron (Fe)	2018/07/26		116	%
			Magnesium (Mg)	2018/07/26		106	%
			Manganese (Mn)	2018/07/26		103	%
			Molybdenum (Mo)	2018/07/26		105	%
			Nickel (Ni)	2018/07/26		106	%
			Total phosphorous	2018/07/26		96	%
			Lead (Pb)	2018/07/26		96	%
			Potassium (K)	2018/07/26		104	%
			Selenium (Se)	2018/07/26		99	%

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Maxxam Job #: B830493
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Sodium (Na)	2018/07/26		102	%
			Thallium (Tl)	2018/07/26		104	%
			Uranium (U)	2018/07/26		98	%
			Vanadium (V)	2018/07/26		102	%
			Zinc (Zn)	2018/07/26		96	%
1919717	JRC	Spiked Blank	Aluminum (Al)	2018/07/26		95	%
			Antimony (Sb)	2018/07/26		106	%
			Silver (Ag)	2018/07/26		96	%
			Arsenic (As)	2018/07/26		104	%
			Barium (Ba)	2018/07/26		100	%
			Boron (B)	2018/07/26		104	%
			Cadmium (Cd)	2018/07/26		98	%
			Calcium (Ca)	2018/07/26		94	%
			Chromium (Cr)	2018/07/26		102	%
			Cobalt (Co)	2018/07/26		102	%
			Copper (Cu)	2018/07/26		101	%
			Tin (Sn)	2018/07/26		110	%
			Iron (Fe)	2018/07/26		103	%
			Magnesium (Mg)	2018/07/26		103	%
			Manganese (Mn)	2018/07/26		107	%
			Molybdenum (Mo)	2018/07/26		103	%
			Nickel (Ni)	2018/07/26		99	%
			Total phosphorous	2018/07/26		97	%
			Lead (Pb)	2018/07/26		99	%
			Potassium (K)	2018/07/26		103	%
			Selenium (Se)	2018/07/26		102	%
			Sodium (Na)	2018/07/26		92	%
			Thallium (Tl)	2018/07/26		108	%
			Titanium (Ti)	2018/07/26		99	%
			Uranium (U)	2018/07/26		101	%
			Vanadium (V)	2018/07/26		100	%
			Zinc (Zn)	2018/07/26		95	%
1919717	JRC	Method Blank	Aluminum (Al)	2018/07/26	<10		ug/L
			Antimony (Sb)	2018/07/26	<1.0		ug/L
			Silver (Ag)	2018/07/26	<1.0		ug/L
			Arsenic (As)	2018/07/26	<1.0		ug/L
			Barium (Ba)	2018/07/26	<2.0		ug/L
			Boron (B)	2018/07/26	<50		ug/L
			Cadmium (Cd)	2018/07/26	<0.20		ug/L
			Calcium (Ca)	2018/07/26	<500		ug/L
			Chromium (Cr)	2018/07/26	<5.0		ug/L
			Cobalt (Co)	2018/07/26	<1.0		ug/L
			Copper (Cu)	2018/07/26	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/26	<1000		ug/L
			Tin (Sn)	2018/07/26	<2.0		ug/L
			Iron (Fe)	2018/07/26	<60		ug/L
			Magnesium (Mg)	2018/07/26	<100		ug/L
			Manganese (Mn)	2018/07/26	<1.0		ug/L
			Molybdenum (Mo)	2018/07/26	<1.0		ug/L
			Nickel (Ni)	2018/07/26	<2.0		ug/L

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B830493
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Total phosphorous	2018/07/26	<10		ug/L
			Lead (Pb)	2018/07/26	<0.50		ug/L
			Potassium (K)	2018/07/26	<500		ug/L
			Selenium (Se)	2018/07/26	<3.0		ug/L
			Sodium (Na)	2018/07/26	<500		ug/L
			Thallium (Tl)	2018/07/26	<2.0		ug/L
			Titanium (Ti)	2018/07/26	<10		ug/L
			Uranium (U)	2018/07/26	<1.0		ug/L
			Vanadium (V)	2018/07/26	<2.0		ug/L
			Zinc (Zn)	2018/07/26	<7.0		ug/L
1919801	MCC	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/26		104	%
1919801	MCC	QC Standard DUP	Nitrogen ammonia (N-NH3)	2018/07/26		99	%
1919801	MCC	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/26	<0.020		mg/L
1919801	MCC	Method Blank DUP	Nitrogen ammonia (N-NH3)	2018/07/26	<0.020		mg/L
1919824	AG5	QC Standard	Sulfides (S2-)	2018/07/26		111	%
1919824	AG5	Method Blank	Sulfides (S2-)	2018/07/26	<0.020		mg/L
1919827	ECA	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/26		104	%
1919827	ECA	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/26		108	%
1919827	ECA	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/26	<0.0080		mg/L
1919880	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/27		100	%
1919880	MCC	QC Standard DUP	TKN Total Kjeldahl Nitrogen	2018/07/27		92	%
1919880	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/27	<0.40		mg/L
1919880	MCC	Method Blank DUP	TKN Total Kjeldahl Nitrogen	2018/07/27	<0.40		mg/L
1919917	CT2	Spiked Blank	1-Chlorooctadecane	2018/07/26		68	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/26		80	%
1919917	CT2	Method Blank	1-Chlorooctadecane	2018/07/26		68	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/26	<100		ug/L
1920372	MR4	Spiked Blank	Total Organic Carbon	2018/07/27		100	%
1920372	MR4	Method Blank	Total Organic Carbon	2018/07/27	<0.20		mg/L
1920532	GG1	QC Standard	Reactive silica (SiO2)	2018/07/27		90	%
1920532	GG1	Method Blank	Reactive silica (SiO2)	2018/07/27	<0.10		mg/L
1920711	RNP	QC Standard	Mercury (Hg)	2018/07/30		86	%
1920711	RNP	Spiked Blank	Mercury (Hg)	2018/07/30		95	%
1920711	RNP	Method Blank	Mercury (Hg)	2018/07/30	<0.000010		mg/L
1920715	MR4	Spiked Blank	Phenols-4AAP	2018/07/30		93	%
1920715	MR4	Method Blank	Phenols-4AAP	2018/07/30	<0.0020		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B830493
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

Caroline Bougie, B.Sc. Chemist

David Provencher, B.Sc., Chemist, Senior Analyst

Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics

Kassy Blais, B.Sc.,Microbiologist

Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

Michel Poulin, B.Sc., Chemist

Veronic Beausejour, B.Sc., Chemist, Supervisor

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Maxxam Job #: B830493
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE(CONT'D)

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

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 Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Votre # du projet: B830094

Attention: Maxime Fournier

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/02
Rapport: R5333905
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I5523
Reçu: 2018/07/24, 08:47

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/08/01	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B830094

Attention: Maxime Fournier

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/02
Rapport: R5333905
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I5523
Reçu: 2018/07/24, 08:47

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8I5523
Date du rapport: 2018/08/02

Maxxam Analytique
Votre # du projet: B830094

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HHH557		
Date d'échantillonnage		2018/07/19 10:05		
	Unités	**FO0919-01R\DSO4-GW-SP-OUT-20**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5651559

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8I5523
Date du rapport: 2018/08/02

Maxxam Analytique
Votre # du projet: B830094

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8I5523
Date du rapport: 2018/08/02

Maxxam Analytique
Votre # du projet: B830094

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5651559	RK6	Blanc fortifié	Radium-226	2018/08/01		91	%	85 - 115
5651559	RK6	Blanc de méthode	Radium-226	2018/08/01	<0.0050		Bq/L	
5651559	RK6	RPD	Radium-226	2018/08/01	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

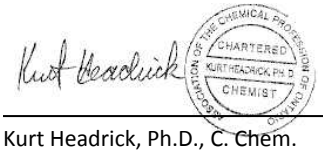
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Dossier Maxxam: B8I5523
Date du rapport: 2018/08/02

Maxxam Analytique
Votre # du projet: B830094

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Maxxam
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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-05-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/06
Report #: R2387845
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830094
Received: 2018/07/20, 10:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-05-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/06
Report #: R2387845
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830094
Received: 2018/07/20, 10:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B830094
Report Date: 2018/08/06

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

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Votre # du projet: B830026

Attention: Maxime Fournier

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/08
Rapport: R5348530
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I5530
Reçu: 2018/07/24, 08:47

Matrice: Eau
Nombre d'échantillons reçus: 2

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/08/01	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/08/02	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont certifiés ISO/IEC 17025:2005 pour certains paramètres précis des portées d'accréditation. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tels que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliqués par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères de CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire. Le cas échéant, sauf indication contraire, l'incertitude de mesure n'a pas été prise en considération lors de la déclaration de la conformité à la norme de référence.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit. Maxxam ne peut pas garantir l'exactitude des résultats qui dépendent des renseignements fournis par le client ou son représentant.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés. Si l'échantillonnage n'est pas effectué par Maxxam, les résultats se rapportent aux échantillons fournis pour analyse.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B830026

Attention: Maxime Fournier

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/08/08
Rapport: R5348530
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I5530
Reçu: 2018/07/24, 08:47

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

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Dossier Maxxam: B8I5530
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B830026

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HHH572	HHH575		
Date d'échantillonnage		2018/07/18 09:50	2018/07/18 09:15		
	Unités	**FO0663-01R\DSO4-GW-SP-OUT-9**	**FO0667-01R\DSO4-EE-GW-2**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	<0.0050	0.0050	5651559

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8I5530
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B830026

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8I5530
Date du rapport: 2018/08/08

Maxxam Analytique
Votre # du projet: B830026

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5651559	RK6	Blanc fortifié	Radium-226	2018/08/01		91	%	85 - 115
5651559	RK6	Blanc de méthode	Radium-226	2018/08/01	<0.0050		Bq/L	
5651559	RK6	RPD	Radium-226	2018/08/01	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

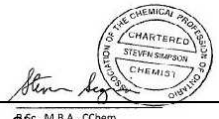
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Dossier Maxxam: B8I5530
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Maxxam Analytique
Votre # du projet: B830026

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SE POND
Site#: TSMC
Your C.O.C. #: 175757-04-02

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388825
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830026
Received: 2018/07/19, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	2	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SE POND
Site#: TSMC
Your C.O.C. #: 175757-04-02

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388825
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B830026
Received: 2018/07/19, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B830026
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SE POND
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-05-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388893
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829969
Received: 2018/07/20, 10:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)	1	N/A	2018/07/20	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions	1	N/A	2018/07/20	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (2)	1	2018/07/20	2018/07/25	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)	1	2018/07/24	2018/07/24	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide	1	2018/07/24	2018/07/24	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand	1	2018/07/23	2018/07/23	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms	1	N/A	2018/07/20	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms	1	N/A	2018/07/21	QUE SOP-00304	MA.700-Col 1.0
Conductivity	1	N/A	2018/07/20	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)	1	N/A	2018/07/24	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)	1	2018/07/21	2018/07/23	STL SOP-00243	SM 23 5310-B m
Fluoride	1	N/A	2018/07/24	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)	1	2018/07/23	2018/07/24	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids	1	2018/07/23	2018/07/23	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/07/23	2018/07/23	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen	1	N/A	2018/07/24	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite	1	N/A	2018/07/20	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen	1	N/A	2018/07/20	SM 421 F	MA315-DBO 1.1 R3 m
pH	1	N/A	2018/07/20	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP (1)	1	2018/07/26	2018/07/26	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-)	1	2018/07/24	2018/07/24	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2)	1	N/A	2018/07/23	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids	1	2018/07/23	2018/07/23	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN)	1	2018/07/24	2018/07/25	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 4)	1	N/A	2018/07/25	STL SOP-00243	SM 23 5310-B m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-05-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388893
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829969
Received: 2018/07/20, 10:30

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FO0390		
Sampling Date		2018/07/19		
COC Number		175757-05-01		
	Units	**DS04-GW-SP-OUT-10**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1919039
Surrogate Recovery (%)				
1-Chlorooctadecane	%	81	N/A	1919039

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

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Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FO0390		
Sampling Date		2018/07/19		
COC Number		175757-05-01		
	Units	DS04-GW-SP-OUT-10	RDL	QC Batch
METALS				
Mercury (Hg) ††	mg/L	<0.000010	0.000010	1918737
METALS ICP-MS				
Aluminum (Al)	ug/L	<10	10	1918942
Antimony (Sb) †	ug/L	<1.0	1.0	1918942
Silver (Ag)	ug/L	<1.0	1.0	1918942
Arsenic (As)	ug/L	<1.0	1.0	1918942
Barium (Ba) †	ug/L	3.3	2.0	1918942
Boron (B) †	ug/L	<50	50	1918942
Cadmium (Cd)	ug/L	<0.20	0.20	1918942
Calcium (Ca) †	ug/L	2100	500	1918942
Chromium (Cr)	ug/L	<5.0	5.0	1918942
Cobalt (Co) †	ug/L	<1.0	1.0	1918942
Copper (Cu)	ug/L	<1.0	1.0	1918942
Total Hardness (CaCO3) ††	ug/L	15000	1000	1918942
Tin (Sn) †	ug/L	<2.0	2.0	1918942
Iron (Fe)	ug/L	<60	60	1918942
Magnesium (Mg) †	ug/L	2300	100	1918942
Manganese (Mn)	ug/L	140	1.0	1918942
Molybdenum (Mo) †	ug/L	<1.0	1.0	1918942
Nickel (Ni)	ug/L	<2.0	2.0	1918942
Total phosphorous	ug/L	<10	10	1918942
Lead (Pb)	ug/L	<0.50	0.50	1918942
Potassium (K) †	ug/L	950	500	1918942
Selenium (Se)	ug/L	<3.0	3.0	1918942
Sodium (Na)	ug/L	950	500	1918942
Thallium (Tl) †	ug/L	<2.0	2.0	1918942
Titanium (Ti) ††	ug/L	<10	10	1918942
Uranium (U) ††	ug/L	<1.0	1.0	1918942
Vanadium (V)	ug/L	<2.0	2.0	1918942
Zinc (Zn)	ug/L	14	7.0	1918942

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FO0390	FO0390		
Sampling Date		2018/07/19	2018/07/19		
COC Number		175757-05-01	175757-05-01		
	Units	DS04-GW-SP-OUT-10	DS04-GW-SP-OUT-10 Lab-Dup	RDL	QC Batch
CONVENTIONALS					
BOD5	mg/L	<4.0	N/A	4.0	1918422
COD	mg/L	<10	N/A	10	1918718
Conductivity	mS/cm	0.042	N/A	0.0010	1918545
Dissolved organic carbon †	mg/L	0.90	N/A	0.20	1923887
Dissolved oxygen †	mg/L	8.5	N/A	1.0	1918527
Fluoride (F)	mg/L	<0.10	<0.10	0.10	1919424
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	N/A	0.0080	1919199
Nitrates (N-NO3-)	mg/L	4.5	N/A	0.020	1918182
Nitrites (N-NO2-)	mg/L	<0.020	N/A	0.020	1918182
Nitrogen ammonia (N-NH3)	mg/L	0.50	N/A	0.020	1919026
pH	pH	6.34	N/A	N/A	1918542
Phenols-4AAP	mg/L	<0.0020	N/A	0.0020	1919874
Reactive silica (SiO2) †	mg/L	5.7	N/A	0.50	1918863
Sulfides (S2-)	mg/L	<0.020	N/A	0.020	1919040
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	<0.40	0.40	1919228
Total Cyanide (CN)	mg/L	<0.010	N/A	0.010	1919386
Total Organic Carbon	mg/L	0.56	N/A	0.20	1919633
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	2.1	N/A	1.0	1918548
Chloride (Cl)	mg/L	0.47	N/A	0.050	1918180
Sulfates (SO4)	mg/L	<0.50	N/A	0.50	1918180
Total Dissolved Solids	mg/L	66	N/A	10	1918681
Total suspended solids (TSS)	mg/L	<2.0	N/A	2.0	1918726

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
† Parameter is not accreditable

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Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FO0390		
Sampling Date		2018/07/19		
COC Number		175757-05-01		
	Units	**DS04-GW-SP-OUT-10**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	4	1	1918603
Non-typical bacteria	UFC/100ml	20	1	1918603
Fecal coliforms	UFC/100ml	0	N/A	1918352

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

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

Results relate only to the items tested.

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Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1918180	MCC	QC Standard	Chloride (Cl)	2018/07/20		102	%
			Sulfates (SO4)	2018/07/20		100	%
1918180	MCC	QC Standard DUP	Chloride (Cl)	2018/07/20		103	%
			Sulfates (SO4)	2018/07/20		101	%
1918180	MCC	Method Blank	Chloride (Cl)	2018/07/20	<0.050		mg/L
			Sulfates (SO4)	2018/07/20	<0.50		mg/L
1918180	MCC	Method Blank DUP	Chloride (Cl)	2018/07/20	<0.050		mg/L
			Sulfates (SO4)	2018/07/20	<0.50		mg/L
1918182	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/20		99	%
1918182	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/20		106	%
1918182	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/20	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/20	<0.020		mg/L
1918422	AG5	Spiked Blank	BOD5	2018/07/25		77	%
1918422	AG5	Spiked Blank DUP	BOD5	2018/07/25		93	%
1918422	AG5	Method Blank	BOD5	2018/07/25	<4.0		mg/L
1918422	AG5	Method Blank DUP	BOD5	2018/07/25	<4.0		mg/L
1918542	LAR	QC Standard	pH	2018/07/20		100	%
1918545	LAR	QC Standard	Conductivity	2018/07/20		97	%
1918545	LAR	Method Blank	Conductivity	2018/07/20	<0.0010		mS/cm
1918548	LAR	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/20		94	%
1918548	LAR	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/20	<1.0		mg/L
1918681	FRB	Spiked Blank	Total Dissolved Solids	2018/07/23		108	%
1918681	FRB	Method Blank	Total Dissolved Solids	2018/07/23	<10		mg/L
1918718	SSK	QC Standard	COD	2018/07/23		108	%
1918718	SSK	QC Standard DUP	COD	2018/07/23		108	%
1918718	SSK	QC Standard DUP 2	COD	2018/07/23		96	%
1918718	SSK	Method Blank	COD	2018/07/23	<10		mg/L
1918718	SSK	Method Blank DUP	COD	2018/07/23	<10		mg/L
1918726	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/23		87	%
1918726	SSK	Method Blank	Total suspended solids (TSS)	2018/07/23	<2.0		mg/L
1918737	EHA	QC Standard	Mercury (Hg)	2018/07/24		88	%
1918737	EHA	Spiked Blank	Mercury (Hg)	2018/07/24		108	%
1918737	EHA	Method Blank	Mercury (Hg)	2018/07/24	<0.000010		mg/L
1918863	GG1	QC Standard	Reactive silica (SiO2)	2018/07/23		81	%
1918863	GG1	Method Blank	Reactive silica (SiO2)	2018/07/23	<0.10		mg/L
1918942	JRC	QC Standard	Aluminum (Al)	2018/07/23		95	%
			Antimony (Sb)	2018/07/23		102	%
			Arsenic (As)	2018/07/23		104	%
			Barium (Ba)	2018/07/23		97	%
			Boron (B)	2018/07/23		97	%
			Cadmium (Cd)	2018/07/23		99	%
			Calcium (Ca)	2018/07/23		103	%
			Chromium (Cr)	2018/07/23		103	%
			Cobalt (Co)	2018/07/23		104	%
			Copper (Cu)	2018/07/23		103	%
			Iron (Fe)	2018/07/23		114	%
			Magnesium (Mg)	2018/07/23		106	%
			Manganese (Mn)	2018/07/23		103	%
			Molybdenum (Mo)	2018/07/23		104	%
			Nickel (Ni)	2018/07/23		104	%

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Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Total phosphorous	2018/07/23		99	%
			Lead (Pb)	2018/07/23		102	%
			Potassium (K)	2018/07/23		105	%
			Selenium (Se)	2018/07/23		97	%
			Sodium (Na)	2018/07/23		105	%
			Thallium (Tl)	2018/07/23		100	%
			Uranium (U)	2018/07/23		103	%
			Vanadium (V)	2018/07/23		101	%
			Zinc (Zn)	2018/07/23		98	%
1918942	JRC	Spiked Blank	Aluminum (Al)	2018/07/23		99	%
			Antimony (Sb)	2018/07/23		102	%
			Silver (Ag)	2018/07/23		98	%
			Arsenic (As)	2018/07/23		106	%
			Barium (Ba)	2018/07/23		96	%
			Boron (B)	2018/07/23		94	%
			Cadmium (Cd)	2018/07/23		101	%
			Calcium (Ca)	2018/07/23		99	%
			Chromium (Cr)	2018/07/23		103	%
			Cobalt (Co)	2018/07/23		98	%
			Copper (Cu)	2018/07/23		99	%
			Tin (Sn)	2018/07/23		105	%
			Iron (Fe)	2018/07/23		105	%
			Magnesium (Mg)	2018/07/23		106	%
			Manganese (Mn)	2018/07/23		105	%
			Molybdenum (Mo)	2018/07/23		106	%
			Nickel (Ni)	2018/07/23		103	%
			Total phosphorous	2018/07/23		100	%
			Lead (Pb)	2018/07/23		97	%
			Potassium (K)	2018/07/23		105	%
			Selenium (Se)	2018/07/23		98	%
			Sodium (Na)	2018/07/23		106	%
			Thallium (Tl)	2018/07/23		94	%
			Titanium (Ti)	2018/07/23		101	%
			Uranium (U)	2018/07/23		98	%
			Vanadium (V)	2018/07/23		102	%
			Zinc (Zn)	2018/07/23		97	%
1918942	JRC	Method Blank	Aluminum (Al)	2018/07/23	<10		ug/L
			Antimony (Sb)	2018/07/23	<1.0		ug/L
			Silver (Ag)	2018/07/23	<1.0		ug/L
			Arsenic (As)	2018/07/23	<1.0		ug/L
			Barium (Ba)	2018/07/23	<2.0		ug/L
			Boron (B)	2018/07/23	<50		ug/L
			Cadmium (Cd)	2018/07/23	<0.20		ug/L
			Calcium (Ca)	2018/07/23	<500		ug/L
			Chromium (Cr)	2018/07/23	<5.0		ug/L
			Cobalt (Co)	2018/07/23	<1.0		ug/L
			Copper (Cu)	2018/07/23	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/23	<1000		ug/L
			Tin (Sn)	2018/07/23	<2.0		ug/L
			Iron (Fe)	2018/07/23	<60		ug/L

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Maxxam Job #: B829969
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Magnesium (Mg)	2018/07/23	<100		ug/L
			Manganese (Mn)	2018/07/23	<1.0		ug/L
			Molybdenum (Mo)	2018/07/23	<1.0		ug/L
			Nickel (Ni)	2018/07/23	<2.0		ug/L
			Total phosphorous	2018/07/23	<10		ug/L
			Lead (Pb)	2018/07/23	<0.50		ug/L
			Potassium (K)	2018/07/23	<500		ug/L
			Selenium (Se)	2018/07/23	<3.0		ug/L
			Sodium (Na)	2018/07/23	<500		ug/L
			Thallium (Tl)	2018/07/23	<2.0		ug/L
			Titanium (Ti)	2018/07/23	<10		ug/L
			Uranium (U)	2018/07/23	<1.0		ug/L
			Vanadium (V)	2018/07/23	<2.0		ug/L
			Zinc (Zn)	2018/07/23	<7.0		ug/L
1919026	MCC	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/24		103	%
1919026	MCC	QC Standard DUP	Nitrogen ammonia (N-NH3)	2018/07/24		99	%
1919026	MCC	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/24	<0.020		mg/L
1919026	MCC	Method Blank DUP	Nitrogen ammonia (N-NH3)	2018/07/24	<0.020		mg/L
1919039	ADE	Spiked Blank	1-Chlorooctadecane	2018/07/24		87	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/24		88	%
1919039	ADE	Spiked Blank DUP	1-Chlorooctadecane	2018/07/24		90	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/24		95	%
1919039	ADE	Method Blank	1-Chlorooctadecane	2018/07/24		89	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/24	<100		ug/L
1919040	MCC	QC Standard	Sulfides (S2-)	2018/07/24		99	%
1919040	MCC	Method Blank	Sulfides (S2-)	2018/07/24	<0.020		mg/L
1919199	JGZ	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/24		96	%
1919199	JGZ	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/24		99	%
1919199	JGZ	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/24	<0.0080		mg/L
1919228	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/25		101	%
1919228	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/25	<0.40		mg/L
1919386	CB8	QC Standard	Total Cyanide (CN)	2018/07/24		87	%
1919386	CB8	Method Blank	Total Cyanide (CN)	2018/07/24	<0.010		mg/L
1919424	GG1	QC Standard	Fluoride (F)	2018/07/24		103	%
1919424	GG1	Method Blank	Fluoride (F)	2018/07/24	<0.10		mg/L
1919633	MR4	Spiked Blank	Total Organic Carbon	2018/07/25		100	%
1919633	MR4	Method Blank	Total Organic Carbon	2018/07/25	<0.20		mg/L
1919874	JL1	Spiked Blank	Phenols-4AAP	2018/07/26		90	%
1919874	JL1	Method Blank	Phenols-4AAP	2018/07/26	<0.0020		mg/L
1923887	MR4	Spiked Blank	Dissolved organic carbon	2018/07/23		101	%
1923887	MR4	Method Blank	Dissolved organic carbon	2018/07/23	1.2, RDL=0.20		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Maxxam Job #: B829969
Report Date: 2018/08/09

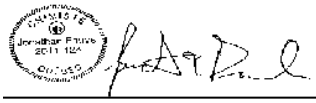
TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

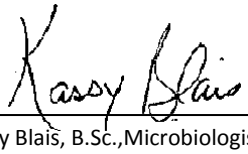
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



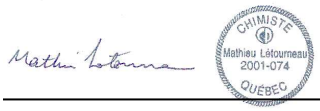
Caroline Bougie, B.Sc. Chemist



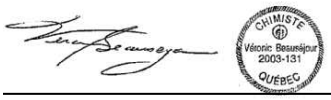
Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics



Kassy Blais, B.Sc.,Microbiologist



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist



Veronic Beausejour, B.Sc., Chemist, Supervisor

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.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-04-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388843
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829821
Received: 2018/07/19, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)	2	N/A	2018/07/20	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions	2	N/A	2018/07/20	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (2)	2	2018/07/20	2018/07/25	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)	2	2018/07/23	2018/07/24	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide	2	2018/07/23	2018/07/24	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand	2	2018/07/20	2018/07/20	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms	2	N/A	2018/07/20	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms	2	N/A	2018/07/20	QUE SOP-00304	MA.700-Col 1.0
Conductivity	2	N/A	2018/07/19	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)	2	N/A	2018/07/24	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 3)	2	2018/07/27	2018/07/27	STL SOP-00243	SM 23 5310-B m
Fluoride	2	N/A	2018/07/19	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)	2	2018/07/23	2018/07/24	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids	2	2018/07/20	2018/07/20	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	2	2018/07/23	2018/07/23	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen	2	N/A	2018/07/26	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite	2	N/A	2018/07/20	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen	2	N/A	2018/07/19	SM 421 F	MA315-DBO 1.1 R3 m
pH	2	N/A	2018/07/20	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP (1)	2	2018/07/24	2018/07/24	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-)	1	2018/07/20	2018/07/20	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Sulfides (S2-)	1	2018/07/23	2018/07/23	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2)	2	N/A	2018/07/23	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids	2	2018/07/23	2018/07/23	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN)	2	2018/07/26	2018/07/27	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 4)	2	N/A	2018/07/27	STL SOP-00243	SM 23 5310-B m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-04-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/09
Report #: R2388843
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829821
Received: 2018/07/19, 08:30

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B829821
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FN9694	FN9775		
Sampling Date		2018/07/18 09:50	2018/07/18 09:15		
COC Number		175757-04-01	175757-04-01		
	Units	**DSO4-GW-SP-OUT-9**	**DSO4-EE-GW-2**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS					
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	<100	100	1918854
Surrogate Recovery (%)					
1-Chlorooctadecane	%	91	94	N/A	1918854

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

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
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Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FN9694	FN9775		
Sampling Date		2018/07/18 09:50	2018/07/18 09:15		
COC Number		175757-04-01	175757-04-01		
	Units	DSO4-GW-SP-OUT-9	DSO4-EE-GW-2	RDL	QC Batch
METALS					
Mercury (Hg) ††	mg/L	<0.000010	<0.000010	0.000010	1918737
METALS ICP-MS					
Aluminum (Al)	ug/L	18	120	10	1918942
Antimony (Sb) †	ug/L	<1.0	<1.0	1.0	1918942
Silver (Ag)	ug/L	<1.0	<1.0	1.0	1918942
Arsenic (As)	ug/L	<1.0	<1.0	1.0	1918942
Barium (Ba) †	ug/L	3.1	2.3	2.0	1918942
Beryllium (Be) †	ug/L	<2.0	<2.0	2.0	1918942
Bismuth (Bi) ††	ug/L	<1.0	<1.0	1.0	1918942
Boron (B) †	ug/L	<50	<50	50	1918942
Cadmium (Cd)	ug/L	<0.20	<0.20	0.20	1918942
Calcium (Ca) †	ug/L	1900	<500	500	1918942
Chromium (Cr)	ug/L	<5.0	<5.0	5.0	1918942
Cobalt (Co) †	ug/L	<1.0	<1.0	1.0	1918942
Copper (Cu)	ug/L	<1.0	<1.0	1.0	1918942
Total Hardness (CaCO3) ††	ug/L	13000	1000	1000	1918942
Tin (Sn) †	ug/L	<2.0	<2.0	2.0	1918942
Iron (Fe)	ug/L	100	320	60	1918942
Magnesium (Mg) †	ug/L	2100	130	100	1918942
Manganese (Mn)	ug/L	130	22	1.0	1918942
Molybdenum (Mo) †	ug/L	<1.0	<1.0	1.0	1918942
Nickel (Ni)	ug/L	<2.0	<2.0	2.0	1918942
Total phosphorous	ug/L	<10	13	10	1918942
Lead (Pb)	ug/L	<0.50	<0.50	0.50	1918942
Potassium (K) †	ug/L	850	<500	500	1918942
Selenium (Se)	ug/L	<3.0	<3.0	3.0	1918942
Sodium (Na)	ug/L	840	<500	500	1918942
Strontium (Sr) †	ug/L	10	<2.0	2.0	1918942
Thallium (Tl) †	ug/L	<2.0	<2.0	2.0	1918942
Titanium (Ti) ††	ug/L	<10	<10	10	1918942
Uranium (U) ††	ug/L	<1.0	<1.0	1.0	1918942

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B829821
Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FN9694	FN9775		
Sampling Date		2018/07/18 09:50	2018/07/18 09:15		
COC Number		175757-04-01	175757-04-01		
	Units	DSO4-GW-SP-OUT-9	DSO4-EE-GW-2	RDL	QC Batch
Vanadium (V)	ug/L	<2.0	<2.0	2.0	1918942
Zinc (Zn)	ug/L	<7.0	<7.0	7.0	1918942

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FN9694			FN9775	FN9775		
Sampling Date		2018/07/18 09:50			2018/07/18 09:15	2018/07/18 09:15		
COC Number		175757-04-01			175757-04-01	175757-04-01		
	Units	DSO4-GW-SP-OUT-9	RDL	QC Batch	DSO4-EE-GW-2	DSO4-EE-GW-2 Lab-Dup	RDL	QC Batch
CONVENTIONALS								
BOD5	mg/L	<4.0	4.0	1918422	<4.0	N/A	4.0	1918422
COD	mg/L	<10	10	1918243	<10	N/A	10	1918243
Conductivity	mS/cm	0.040	0.0010	1918134	0.0024	N/A	0.0010	1918134
Dissolved organic carbon †	mg/L	<0.20	0.20	1923783	1.1	N/A	0.20	1923783
Dissolved oxygen †	mg/L	8.9	1.0	1918144	8.8	N/A	1.0	1918144
Fluoride (F)	mg/L	<0.10	0.10	1918000	<0.10	N/A	0.10	1918000
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	0.0080	1919199	<0.0080	N/A	0.0080	1919199
Nitrates (N-NO3-)	mg/L	4.2	0.020	1918182	0.039	N/A	0.020	1918182
Nitrites (N-NO2-)	mg/L	<0.020	0.020	1918182	<0.020	N/A	0.020	1918182
Nitrogen ammonia (N-NH3)	mg/L	0.69	0.080	1919801	0.11	N/A	0.040	1919801
pH	pH	6.42	N/A	1918131	5.78	N/A	N/A	1918131
Phenols-4AAP	mg/L	<0.0020	0.0020	1919107	<0.0020	<0.0020	0.0020	1919107
Reactive silica (SiO2) †	mg/L	5.7	0.50	1918863	2.1	N/A	0.50	1918863
Sulfides (S2-)	mg/L	<0.020	0.020	1918245	<0.020	N/A	0.020	1918704
TKN Total Kjeldahl Nitrogen	mg/L	0.79	0.40	1919880	<0.40	N/A	0.40	1919880
Total Cyanide (CN)	mg/L	<0.010	0.010	1918937	<0.010	N/A	0.010	1918937
Total Organic Carbon	mg/L	0.57	0.20	1920495	1.7	N/A	0.20	1920495
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	2.0	1.0	1918548	<1.0	N/A	1.0	1918548
Chloride (Cl)	mg/L	0.42	0.050	1918180	0.10	N/A	0.050	1918180
Sulfates (SO4)	mg/L	<0.50	0.50	1918180	<0.50	N/A	0.50	1918180
Total Dissolved Solids	mg/L	60	10	1918681	16	N/A	10	1918681
Total suspended solids (TSS)	mg/L	5.2	2.0	1918438	<2.0	N/A	2.0	1918438

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
† Parameter is not accreditable

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TATA STEEL MINERALS CANADA
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MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FN9694		FN9775		
Sampling Date		2018/07/18 09:50		2018/07/18 09:15		
COC Number		175757-04-01		175757-04-01		
	Units	DSO4-GW-SP-OUT-9	RDL	DSO4-EE-GW-2	RDL	QC Batch
MICROBIOLGICAL TESTS						
Total coliforms	UFC/100ml	<10	10	1400	100	1918186
Non-typical bacteria	UFC/100ml	10	10	700	100	1918186
Fecal coliforms	UFC/100ml	0	N/A	2	1	1918190

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

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TATA STEEL MINERALS CANADA
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GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

pH: analyzed past hold time due to instrumental problems.

Reported detection limits are multiplied by dilution factors used for sample analysis.

ammonia: Due to the sample matrix, a better detection limit cannot be reported.
Please note that dissolved organic carbon results have been corrected for the method blank.

Results relate only to the items tested.

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1918000	LAR	QC Standard	Fluoride (F)	2018/07/19		104	%
1918000	LAR	QC Standard DUP	Fluoride (F)	2018/07/19		104	%
1918000	LAR	Method Blank	Fluoride (F)	2018/07/19	<0.10		mg/L
1918000	LAR	Method Blank DUP	Fluoride (F)	2018/07/19	<0.10		mg/L
1918131	LAR	QC Standard	pH	2018/07/19		100	%
1918134	LAR	QC Standard	Conductivity	2018/07/19		99	%
1918134	LAR	QC Standard DUP	Conductivity	2018/07/19		99	%
1918134	LAR	Method Blank	Conductivity	2018/07/19	<0.0010		mS/cm
1918134	LAR	Method Blank DUP	Conductivity	2018/07/19	<0.0010		mS/cm
1918180	MCC	QC Standard	Chloride (Cl)	2018/07/20		102	%
			Sulfates (SO4)	2018/07/20		100	%
1918180	MCC	QC Standard DUP	Chloride (Cl)	2018/07/20		103	%
			Sulfates (SO4)	2018/07/20		101	%
1918180	MCC	Method Blank	Chloride (Cl)	2018/07/20	<0.050		mg/L
			Sulfates (SO4)	2018/07/20	<0.50		mg/L
1918180	MCC	Method Blank DUP	Chloride (Cl)	2018/07/20	<0.050		mg/L
			Sulfates (SO4)	2018/07/20	<0.50		mg/L
1918182	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/20		99	%
1918182	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/20		106	%
1918182	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/20	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/20	<0.020		mg/L
1918243	SSK	QC Standard	COD	2018/07/20		107	%
1918243	SSK	QC Standard DUP	COD	2018/07/20		106	%
1918243	SSK	QC Standard DUP 2	COD	2018/07/20		96	%
1918243	SSK	Method Blank	COD	2018/07/20	<10		mg/L
1918243	SSK	Method Blank DUP	COD	2018/07/20	<10		mg/L
1918245	AG5	QC Standard	Sulfides (S2-)	2018/07/20		103	%
1918245	AG5	Method Blank	Sulfides (S2-)	2018/07/20	<0.020		mg/L
1918422	AG5	Spiked Blank	BOD5	2018/07/25		77	%
1918422	AG5	Spiked Blank DUP	BOD5	2018/07/25		93	%
1918422	AG5	Method Blank	BOD5	2018/07/25	<4.0		mg/L
1918422	AG5	Method Blank DUP	BOD5	2018/07/25	<4.0		mg/L
1918438	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/20		90	%
1918438	SSK	Method Blank	Total suspended solids (TSS)	2018/07/20	<2.0		mg/L
1918548	LAR	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/20		94	%
1918548	LAR	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/20	<1.0		mg/L
1918681	FRB	Spiked Blank	Total Dissolved Solids	2018/07/23		108	%
1918681	FRB	Method Blank	Total Dissolved Solids	2018/07/23	<10		mg/L
1918704	MCC	QC Standard	Sulfides (S2-)	2018/07/23		107	%
1918704	MCC	Method Blank	Sulfides (S2-)	2018/07/23	<0.020		mg/L
1918737	EHA	QC Standard	Mercury (Hg)	2018/07/24		88	%
1918737	EHA	Spiked Blank	Mercury (Hg)	2018/07/24		108	%
1918737	EHA	Method Blank	Mercury (Hg)	2018/07/24	<0.000010		mg/L
1918854	ADE	Spiked Blank	1-Chlorooctadecane	2018/07/23		94	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/23		90	%
1918854	ADE	Spiked Blank DUP	1-Chlorooctadecane	2018/07/23		110	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/23		102	%
1918854	ADE	Method Blank	1-Chlorooctadecane	2018/07/23		91	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/23	<100		ug/L
1918863	GG1	QC Standard	Reactive silica (SiO2)	2018/07/23		81	%

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Report Date: 2018/08/09

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1918863	GG1	Method Blank	Reactive silica (SiO2)	2018/07/23	<0.10		mg/L
1918937	CB8	QC Standard	Total Cyanide (CN)	2018/07/24		91	%
1918937	CB8	Method Blank	Total Cyanide (CN)	2018/07/24	<0.010		mg/L
1918942	JRC	QC Standard	Aluminum (Al)	2018/07/23		95	%
			Antimony (Sb)	2018/07/23		102	%
			Arsenic (As)	2018/07/23		104	%
			Barium (Ba)	2018/07/23		97	%
			Beryllium (Be)	2018/07/23		104	%
			Boron (B)	2018/07/23		97	%
			Cadmium (Cd)	2018/07/23		99	%
			Calcium (Ca)	2018/07/23		103	%
			Chromium (Cr)	2018/07/23		103	%
			Cobalt (Co)	2018/07/23		104	%
			Copper (Cu)	2018/07/23		103	%
			Iron (Fe)	2018/07/23		114	%
			Magnesium (Mg)	2018/07/23		106	%
			Manganese (Mn)	2018/07/23		103	%
			Molybdenum (Mo)	2018/07/23		104	%
			Nickel (Ni)	2018/07/23		104	%
			Total phosphorous	2018/07/23		99	%
			Lead (Pb)	2018/07/23		102	%
			Potassium (K)	2018/07/23		105	%
			Selenium (Se)	2018/07/23		97	%
			Sodium (Na)	2018/07/23		105	%
			Strontium (Sr)	2018/07/23		100	%
			Thallium (Tl)	2018/07/23		100	%
			Uranium (U)	2018/07/23		103	%
			Vanadium (V)	2018/07/23		101	%
			Zinc (Zn)	2018/07/23		98	%
1918942	JRC	Spiked Blank	Aluminum (Al)	2018/07/23		99	%
			Antimony (Sb)	2018/07/23		102	%
			Silver (Ag)	2018/07/23		98	%
			Arsenic (As)	2018/07/23		106	%
			Barium (Ba)	2018/07/23		96	%
			Beryllium (Be)	2018/07/23		101	%
			Bismuth (Bi)	2018/07/23		101	%
			Boron (B)	2018/07/23		94	%
			Cadmium (Cd)	2018/07/23		101	%
			Calcium (Ca)	2018/07/23		99	%
			Chromium (Cr)	2018/07/23		103	%
			Cobalt (Co)	2018/07/23		98	%
			Copper (Cu)	2018/07/23		99	%
			Tin (Sn)	2018/07/23		105	%
			Iron (Fe)	2018/07/23		105	%
			Magnesium (Mg)	2018/07/23		106	%
			Manganese (Mn)	2018/07/23		105	%
			Molybdenum (Mo)	2018/07/23		106	%
			Nickel (Ni)	2018/07/23		103	%
			Total phosphorous	2018/07/23		100	%
			Lead (Pb)	2018/07/23		97	%

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TATA STEEL MINERALS CANADA
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Potassium (K)	2018/07/23		105	%
			Selenium (Se)	2018/07/23		98	%
			Sodium (Na)	2018/07/23		106	%
			Strontium (Sr)	2018/07/23		101	%
			Thallium (Tl)	2018/07/23		94	%
			Titanium (Ti)	2018/07/23		101	%
			Uranium (U)	2018/07/23		98	%
			Vanadium (V)	2018/07/23		102	%
			Zinc (Zn)	2018/07/23		97	%
1918942	JRC	Method Blank	Aluminum (Al)	2018/07/23	<10		ug/L
			Antimony (Sb)	2018/07/23	<1.0		ug/L
			Silver (Ag)	2018/07/23	<1.0		ug/L
			Arsenic (As)	2018/07/23	<1.0		ug/L
			Barium (Ba)	2018/07/23	<2.0		ug/L
			Beryllium (Be)	2018/07/23	<2.0		ug/L
			Bismuth (Bi)	2018/07/23	<1.0		ug/L
			Boron (B)	2018/07/23	<50		ug/L
			Cadmium (Cd)	2018/07/23	<0.20		ug/L
			Calcium (Ca)	2018/07/23	<500		ug/L
			Chromium (Cr)	2018/07/23	<5.0		ug/L
			Cobalt (Co)	2018/07/23	<1.0		ug/L
			Copper (Cu)	2018/07/23	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/23	<1000		ug/L
			Tin (Sn)	2018/07/23	<2.0		ug/L
			Iron (Fe)	2018/07/23	<60		ug/L
			Magnesium (Mg)	2018/07/23	<100		ug/L
			Manganese (Mn)	2018/07/23	<1.0		ug/L
			Molybdenum (Mo)	2018/07/23	<1.0		ug/L
			Nickel (Ni)	2018/07/23	<2.0		ug/L
			Total phosphorous	2018/07/23	<10		ug/L
			Lead (Pb)	2018/07/23	<0.50		ug/L
			Potassium (K)	2018/07/23	<500		ug/L
			Selenium (Se)	2018/07/23	<3.0		ug/L
			Sodium (Na)	2018/07/23	<500		ug/L
			Strontium (Sr)	2018/07/23	<2.0		ug/L
			Thallium (Tl)	2018/07/23	<2.0		ug/L
			Titanium (Ti)	2018/07/23	<10		ug/L
			Uranium (U)	2018/07/23	<1.0		ug/L
			Vanadium (V)	2018/07/23	<2.0		ug/L
			Zinc (Zn)	2018/07/23	<7.0		ug/L
1919107	JL1	Spiked Blank	Phenols-4AAP	2018/07/24		98	%
1919107	JL1	Method Blank	Phenols-4AAP	2018/07/24	<0.0020		mg/L
1919199	JGZ	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/24		96	%
1919199	JGZ	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/24		99	%
1919199	JGZ	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/24	<0.0080		mg/L
1919801	MCC	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/26		104	%
1919801	MCC	QC Standard DUP	Nitrogen ammonia (N-NH3)	2018/07/26		99	%
1919801	MCC	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/26	<0.020		mg/L
1919801	MCC	Method Blank DUP	Nitrogen ammonia (N-NH3)	2018/07/26	<0.020		mg/L
1919880	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/27		100	%

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1919880	MCC	QC Standard DUP	TKN Total Kjeldahl Nitrogen	2018/07/27		92	%
1919880	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/27	<0.40		mg/L
1919880	MCC	Method Blank DUP	TKN Total Kjeldahl Nitrogen	2018/07/27	<0.40		mg/L
1920495	MR4	Spiked Blank	Total Organic Carbon	2018/07/27		100	%
1920495	MR4	Method Blank	Total Organic Carbon	2018/07/27	<0.20		mg/L
1923783	MR4	Spiked Blank	Dissolved organic carbon	2018/07/27		98	%
1923783	MR4	Method Blank	Dissolved organic carbon	2018/07/27	1.5, RDL=0.20		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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TATA STEEL MINERALS CANADA
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VALIDATION SIGNATURE PAGE

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

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B829776

Client Project Name & Number: GOODWOOD SED POND QC Quarterly Surface Water No. d'échantillon : FN9450-01

Test Result:

48 hrs LC50 %v/v (95% CL): 17.8 (9.98-28.1) Statistical Method: Probit **Toxic unit:** 5.62

48 hrs EC50 %v/v (95% CL): 17.8 (9.98-28.1) Statistical Method: Probit **Comment:** Toxique

Sample Name : DS04-GW-SP-OUT-9 Sample Matrix : SURFACE WATER

Description: Incolore, translucide, inodore, aucun solide décantable

Sample Prior to Analysis:

Sample Collected:	Jul 18, 2018 09:50 AM	Sampling Method :	Grab	pH:	6.0
Sample Collected By:	PS	Site Collection:	N/A	Temperature :	19 °C
Sample Received:	Jul 19, 2018 08:30 AM	Volume Received:	1 L	Dissolved Oxygen:	9.9 mg/L
Analysis Start :	Jul 22, 2018 11:40 AM	Temp.Upon Arrival:	21 °C	Sample Conductance:	42 µS/cm
End :	Jul 24, 2018 11:30 AM	Storage:	2-6°C	Hardness:	163 mg $CaCO_3$/L

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Immobility (#)	Immobility (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	48 hrs	48 hr	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
0	20	7.8	473	8.5	21	7.6	8.2	0	0	1	10.0
6.25	21	7.5	445	8.6	21	7.5	8.3	0	0	3	30.0
12.5	21	7.5	426	8.6	21	7.5	8.4	0	0	3	30.0
25	21	7.5	372	8.7	21	7.5	8.3	0	0	4	40.0
50	20	7.3	266	9.0	21	7.4	8.3	0	0	9	90.0
100	19	6.0	43	9.7	21	6.2	8.4	0	0	10	100

Comments : Conc. 100% (v/v): O2 sursaturée après aération 30 min.

Culture/Control/Dilution Water: Reconstitued water for Daphnia

Hardness: 170 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Pre-aeration Time :	30 min	Rate of Pre-aeration :	40±5 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	No
Test Volume :	150 mL	Vessel Volume :	270 ml	Test pH Adjusted:	No
Loading Density :	15.0 mL/Daphnia	Photoperiod :	16 hours of of light; 8 hours of darkness		

Test Organism : *Daphnia magna* Source : Maxxam Lab Culture

Age at Test Initiation :	<24 hres	Average Brood Size :	32.6
Culture Photoperiod :	16 hours of of light; 8 hours of darkness	% Mortality within 7 days :	0
Culture Temperature :	20 ± 2 °C	Time To First Brood :	8 Days
Culture Diet	Fed once a day.		

Reference chemical: Potassium Dichromate Test Date: Jul 15, 2018

Test Endpoint 48 hrs LC50 (95% confidence interval) :	0.16 (N/A, 0.25)mg/L	Statistical Method :	Binomial
Historical Mean LC50 (warning limits) :	0.17 (0.10, 0.30) mg/L	Concentration :	0,0.0625,0.125,0.25,0.5,1 mg/L

Test Method QUE SOP-00406. Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. EPS1/RM/14 - Second Edition. Environment Canada. 2000.

This is essentially a 48H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations: Aucune

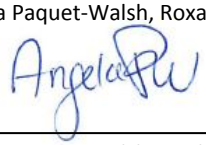
The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B829776

Client Project Name & Number: GOODWOOD SED POND QC Quarterly Surface Water No. d'échantillon : FN9450-01

Analyst : Angela Paquet-Walsh, Roxane Champagne



Verified By : Angela Paquet-Walsh, Analyst 2 Date: Aug 03, 2018 08:16 AM

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B829776

Client Project Name & Number: GOODWOOD SED POND QC Quarterly Surface Water

Test Result:

96 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual

Toxic unit: <1

Comment: Non-toxique

Sample Name : DS04-GW-SP-OUT-9

Sample Matrix : SURFACE WATER

Description: Beige rose, translucide et peu de solides

Sample Number: FN9450-02

Sample Collected: Jul 18, 2018 09:15 AM Sampling Method : Grab

Site Collection: N/A

Sample Collected By: PS Volume Received: 38 L

Temp.Upon Arrival: 21 °C Storage: 2-6°C

Sample Received: Jul 19, 2018 08:30 AM pH: 5.8

Dissolved Oxygen: 9.7 mg/L

Analysis Start : Jul 20, 2018 10:55 AM Temperature : 16 °C

Sample Conductance: 41 µS/cm

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	96 hrs	96 hr	96 hrs	24 hrs	24 hrs	24 hrs	24 hrs
0	16	7.6	274	9.6	15	7.7	9.8	0	0	0	0
6.25	16	7.6	261	9.7	15	7.4	7.4	0	0	0	0
12.5	16	7.6	247	9.8	15	7.6	9.8	0	0	0	0
25	16	7.5	224	9.7	15	7.6	9.8	0	0	0	0
50	16	7.4	167	9.9	15	7.5	10.0	0	0	0	0
100	16	5.9	42	9.9	15	6.3	9.9	0	0	0	0

Concentration	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	48 hrs	48 hrs	48 hrs	48 hrs	72 hrs	72 hrs	72 hrs	72 hrs	96 hrs	96 hrs	96 hrs	96 hrs
0	0	0	0	0	0	0	0	0	0	0	0	0
6.25	0	0	0	0	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	2	20.0	0	0	4	40.0	0	0	4	40.0

Comments :

Culture/Control/Dilution Water Dechlorinated municipal tap water

Hardness: 101 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	35 cm
Total # of Organisms Used :	60	Pre-aeration Time :	30 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	16 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.3 g/L	Photoperiod :	16 hours of of light; 8 hours of darkness		
Test vessel:	20L glass aquarium with polyethylene bag.				

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client :	4526	TATA STEEL MINERALS CANADA		Job Number:	B829776
Client Project Name & Number:		GOODWOOD SED POND QC Quarterly Surface Water		Sample Number:	FN9450-02

Test Organism :	Rainbow Trout *(Oncorhynchus mykiss)*	Source :	Piscicultures Les Arpents Verts		
Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.5 ± 0.1 g	Length (Mean) +- SD :	3.75 ± 0.22 cm
Culture Water Renewal :	2 liters/min	Weight (Range) :	0.4 – 0.6 g	Length (Range) :	3.40 – 4.10 cm
Culture Photoperiod :	16 hours of of light; 8 hours of darkness			% Mortality within 7 days :	0%
Feeding rate and frequency :	1-2x a day; 1-5% of the body weights.			Acclimation Time:	>14 days

Reference chemical:	Phenol	Test Date:	Jul 19, 2018
Test Endpoint 96 hrs LC50 (95% confidence interval) :	10.8 (9.00, 13.0)mg/L	Statistical Method :	Binomial
Historical Mean LC50 (warning limits) :	9.85 (7.82, 12.4) mg/L	Concentration :	0,4,6,9,13,18 mg/L

Test Method

QUE SOP - 00408. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS1/RM/13 - Second Edition. Environment Canada. 2000. (Including Amendments: May 2007).

This is essentially a 96H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations : Aucune

Analyst : Alexis Roy, Olivier Roberge

Verified By : Angela Paquet-Walsh, Analyst 2

Date: Aug 01, 2018 04:23 PM

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Success Through Science®

Your P.O. #: 2200002147
Your Project #: QC Quarterly Surface Water
Site Location: GOODWOOD SED POND
Your C.O.C. #: 175757-03-03

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/03
Report #: R2387566
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829776
Received: 2018/07/19, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Daphnia - LC50 (acute-48h)-Federal	1	N/A	2018/07/22	QUE SOP-00406	EPS1/RM/14
Hardness by ICP-MS	1	2018/07/19	2018/07/20	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Rainbow Trout - LC50 (acute-96h)	1	N/A	2018/07/20	QUE SOP - 00408	EPS1/RM/13

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: QC Quarterly Surface Water
Site Location: GOODWOOD SED POND
Your C.O.C. #: 175757-03-03

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/03
Report #: R2387566
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829776
Received: 2018/07/19, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B829776
Report Date: 2018/08/03

TATA STEEL MINERALS CANADA
Client Project #: QC Quarterly Surface Water
Site Location: GOODWOOD SED POND
Your P.O. #: 2200002147
Sampler Initials: PS

ECOTOXICOLOGY (SURFACE WATER)

Maxxam ID		FN9450	
Sampling Date		2018/07/18 09:50	
COC Number		175757-03-03	
	Units	**DS04-GW-SP-OUT-9**	**QC Batch**
Daphnia Magna - Can			
LC50	%v/v	ATTACHED	1918672
Rainbow Trout			
LC50	%v/v	ATTACHED	1918151
QC Batch = Quality Control Batch			

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Maxxam Job #: B829776
Report Date: 2018/08/03

TATA STEEL MINERALS CANADA
Client Project #: QC Quarterly Surface Water
Site Location: GOODWOOD SED POND
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B829776
Report Date: 2018/08/03

TATA STEEL MINERALS CANADA
Client Project #: QC Quarterly Surface Water
Site Location: GOODWOOD SED POND
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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



Angela Paquet-Walsh, M.Sc. Biologist, Analyst 2

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Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Votre # du projet: B829058

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/26
Rapport: R5318992
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I0224
Reçu: 2018/07/18, 11:18

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/07/24	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B829058

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/26
Rapport: R5318992
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8I0224
Reçu: 2018/07/18, 11:18

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

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Dossier Maxxam: B8I0224
Date du rapport: 2018/07/26

Maxxam Analytique
Votre # du projet: B829058

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HGD451		
Date d'échantillonnage		2018/07/15 18:02		
	Unités	**FN6360-01R\DSO4-GW-SP-OUT-8**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5639492

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8I0224
Date du rapport: 2018/07/26

Maxxam Analytique
Votre # du projet: B829058

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8I0224
Date du rapport: 2018/07/26

Maxxam Analytique
Votre # du projet: B829058

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5639492	RK6	Blanc fortifié	Radium-226	2018/07/24		89	%	85 - 115
5639492	RK6	Blanc de méthode	Radium-226	2018/07/24	<0.0050		Bq/L	
5639492	RK6	RPD	Radium-226	2018/07/25	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

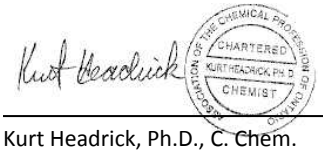
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Dossier Maxxam: B8I0224
Date du rapport: 2018/07/26

Maxxam Analytique
Votre # du projet: B829058

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-03-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/27
Report #: R2386105
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829058
Received: 2018/07/17, 10:00

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5)	1	N/A	2018/07/17	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions	1	N/A	2018/07/17	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (3)	1	2018/07/18	2018/07/23	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50)	1	2018/07/19	2018/07/20	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide	1	2018/07/18	2018/07/18	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand	1	2018/07/18	2018/07/18	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms	1	N/A	2018/07/17	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms	1	N/A	2018/07/17	QUE SOP-00304	MA.700-Col 1.0
Conductivity	1	N/A	2018/07/17	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+) (1)	1	N/A	2018/07/20	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (1, 4)	1	2018/07/18	2018/07/20	STL SOP-00243	SM 23 5310-B m
Fluoride	1	N/A	2018/07/19	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour (1)	1	2018/07/23	2018/07/24	STL SOP-00042	MA.200–Hg 1.1 R1 m
Radium 226 (MMER LOW LEVEL) (2)	1	N/A	N/A		
Total Suspended Solids	1	2018/07/18	2018/07/18	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/07/18	2018/07/19	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen	1	N/A	2018/07/18	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite	1	N/A	2018/07/17	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen	1	N/A	2018/07/17	SM 421 F	MA315-DBO 1.1 R3 m
pH	1	N/A	2018/07/17	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP (1)	1	2018/07/20	2018/07/20	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-)	1	2018/07/18	2018/07/18	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2)	1	N/A	2018/07/17	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids	1	2018/07/18	2018/07/18	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN)	1	2018/07/19	2018/07/20	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (1, 5)	1	N/A	2018/07/20	STL SOP-00243	SM 23 5310-B m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: GOODWOOD
Your C.O.C. #: 175757-03-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/27
Report #: R2386105
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829058
Received: 2018/07/17, 10:00

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent
(2) This test was performed by Maxxam-Radiological Lab
(3) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(4) DOC present in the sample should be considered as non-purgeable DOC
(5) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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 #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FN6360		
Sampling Date		2018/07/15 18:02		
COC Number		175757-03-01		
	Units	**DS04-GW-SP-OUT-8**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	100	1917959
Surrogate Recovery (%)				
1-Chlorooctadecane	%	85	N/A	1917959

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

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Maxxam Job #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FN6360		
Sampling Date		2018/07/15 18:02		
COC Number		175757-03-01		
	Units	**DS04-GW-SP-OUT-8**	**RDL**	**QC Batch**
METALS				
Mercury (Hg) ††	mg/L	<0.000010	0.000010	1918737
METALS ICP-MS				
Aluminum (Al)	ug/L	56	10	1917117
Antimony (Sb) †	ug/L	<1.0	1.0	1917117
Silver (Ag)	ug/L	<1.0	1.0	1917117
Arsenic (As)	ug/L	<1.0	1.0	1917117
Barium (Ba) †	ug/L	2.7	2.0	1917117
Boron (B) †	ug/L	<50	50	1917117
Cadmium (Cd)	ug/L	<0.20	0.20	1917117
Calcium (Ca) †	ug/L	1500	500	1917117
Chromium (Cr)	ug/L	<5.0	5.0	1917117
Cobalt (Co) †	ug/L	<1.0	1.0	1917117
Copper (Cu)	ug/L	<1.0	1.0	1917117
Total Hardness (CaCO3) ††	ug/L	11000	1000	1917117
Tin (Sn) †	ug/L	<2.0	2.0	1917117
Iron (Fe)	ug/L	120	60	1917117
Magnesium (Mg) †	ug/L	1700	100	1917117
Manganese (Mn)	ug/L	100	1.0	1917117
Molybdenum (Mo) †	ug/L	<1.0	1.0	1917117
Nickel (Ni)	ug/L	<2.0	2.0	1917117
Total phosphorous	ug/L	<10	10	1917117
Lead (Pb)	ug/L	<0.50	0.50	1917117
Potassium (K) †	ug/L	870	500	1917117
Selenium (Se)	ug/L	<3.0	3.0	1917117
Sodium (Na)	ug/L	590	500	1917117
Thallium (Tl) †	ug/L	<2.0	2.0	1917117
Titanium (Ti) ††	ug/L	<10	10	1917117
Uranium (U) ††	ug/L	<1.0	1.0	1917117
Vanadium (V)	ug/L	<2.0	2.0	1917117
Zinc (Zn)	ug/L	<7.0	7.0	1917117

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FN6360		
Sampling Date		2018/07/15 18:02		
COC Number		175757-03-01		
	Units	**DS04-GW-SP-OUT-8**	**RDL**	**QC Batch**
CONVENTIONALS				
BOD5	mg/L	<4.0	4.0	1917296
COD	mg/L	<10	10	1917333
Conductivity	mS/cm	0.034	0.0010	1917186
Dissolved organic carbon †	mg/L	2.8	0.20	1917644
Dissolved oxygen †	mg/L	9.3	1.0	1917216
Fluoride (F)	mg/L	<0.10	0.10	1918000
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	0.0080	1918214
Nitrates (N-NO3-)	mg/L	3.6	0.020	1917240
Nitrites (N-NO2-)	mg/L	<0.020	0.020	1917240
Nitrogen ammonia (N-NH3)	mg/L	0.88	0.020	1917251
pH	pH	6.12	N/A	1917183
Phenols-4AAP	mg/L	<0.0020	0.0020	1918284
Reactive silica (SiO2) †	mg/L	4.7	0.50	1917138
Sulfides (S2-)	mg/L	<0.020	0.020	1917676
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	0.40	1917710
Total Cyanide (CN)	mg/L	<0.010	0.010	1917558
Total Organic Carbon	mg/L	0.61	0.20	1918499
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	<1.0	1.0	1917185
Chloride (Cl)	mg/L	0.41	0.050	1917241
Sulfates (SO4)	mg/L	<0.50	0.50	1917241
Total Dissolved Solids	mg/L	36	10	1917341
Total suspended solids (TSS)	mg/L	<2.0	2.0	1917278

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable
N/A = Not Applicable

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TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FN6360		
Sampling Date		2018/07/15 18:02		
COC Number		175757-03-01		
	Units	**DS04-GW-SP-OUT-8**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	1	1	1917166
Non-typical bacteria	UFC/100ml	72	1	1917166
Fecal coliforms	UFC/100ml	0	N/A	1917167

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

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Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

Results relate only to the items tested.

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Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1917117	JRC	QC Standard	Aluminum (Al)	2018/07/18		96	%
			Antimony (Sb)	2018/07/18		99	%
			Arsenic (As)	2018/07/18		104	%
			Barium (Ba)	2018/07/18		94	%
			Boron (B)	2018/07/18		102	%
			Cadmium (Cd)	2018/07/18		100	%
			Calcium (Ca)	2018/07/18		97	%
			Chromium (Cr)	2018/07/18		102	%
			Cobalt (Co)	2018/07/18		104	%
			Copper (Cu)	2018/07/18		103	%
			Iron (Fe)	2018/07/18		114	%
			Magnesium (Mg)	2018/07/18		105	%
			Manganese (Mn)	2018/07/18		102	%
			Molybdenum (Mo)	2018/07/18		99	%
			Nickel (Ni)	2018/07/18		103	%
			Total phosphorous	2018/07/18		101	%
			Lead (Pb)	2018/07/18		94	%
			Potassium (K)	2018/07/18		104	%
			Selenium (Se)	2018/07/18		99	%
			Sodium (Na)	2018/07/18		101	%
			Thallium (Tl)	2018/07/18		97	%
			Uranium (U)	2018/07/18		99	%
			Vanadium (V)	2018/07/18		100	%
			Zinc (Zn)	2018/07/18		101	%
1917117	JRC	Spiked Blank	Aluminum (Al)	2018/07/19		113	%
			Antimony (Sb)	2018/07/19		100	%
			Silver (Ag)	2018/07/19		98	%
			Arsenic (As)	2018/07/19		105	%
			Barium (Ba)	2018/07/19		99	%
			Boron (B)	2018/07/19		104	%
			Cadmium (Cd)	2018/07/19		102	%
			Calcium (Ca)	2018/07/19		97	%
			Chromium (Cr)	2018/07/19		102	%
			Cobalt (Co)	2018/07/19		101	%
			Copper (Cu)	2018/07/19		101	%
			Tin (Sn)	2018/07/19		102	%
			Iron (Fe)	2018/07/19		102	%
			Magnesium (Mg)	2018/07/19		106	%
			Manganese (Mn)	2018/07/19		105	%
			Molybdenum (Mo)	2018/07/19		104	%
			Nickel (Ni)	2018/07/19		103	%
			Total phosphorous	2018/07/19		104	%
			Lead (Pb)	2018/07/19		96	%
			Potassium (K)	2018/07/19		103	%
			Selenium (Se)	2018/07/19		104	%
			Sodium (Na)	2018/07/19		98	%
			Thallium (Tl)	2018/07/19		100	%
			Titanium (Ti)	2018/07/19		106	%
			Uranium (U)	2018/07/19		101	%
			Vanadium (V)	2018/07/19		101	%

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Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Zinc (Zn)	2018/07/19		103	%
1917117	JRC	Method Blank	Aluminum (Al)	2018/07/19	<10		ug/L
			Antimony (Sb)	2018/07/19	<1.0		ug/L
			Silver (Ag)	2018/07/19	<1.0		ug/L
			Arsenic (As)	2018/07/19	<1.0		ug/L
			Barium (Ba)	2018/07/19	<2.0		ug/L
			Boron (B)	2018/07/19	<50		ug/L
			Cadmium (Cd)	2018/07/19	<0.20		ug/L
			Calcium (Ca)	2018/07/19	<500		ug/L
			Chromium (Cr)	2018/07/19	<5.0		ug/L
			Cobalt (Co)	2018/07/19	<1.0		ug/L
			Copper (Cu)	2018/07/19	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/19	<1000		ug/L
			Tin (Sn)	2018/07/19	<2.0		ug/L
			Iron (Fe)	2018/07/19	<60		ug/L
			Magnesium (Mg)	2018/07/19	<100		ug/L
			Manganese (Mn)	2018/07/19	<1.0		ug/L
			Molybdenum (Mo)	2018/07/19	<1.0		ug/L
			Nickel (Ni)	2018/07/19	<2.0		ug/L
			Total phosphorous	2018/07/19	<10		ug/L
			Lead (Pb)	2018/07/19	<0.50		ug/L
			Potassium (K)	2018/07/19	<500		ug/L
			Selenium (Se)	2018/07/19	<3.0		ug/L
			Sodium (Na)	2018/07/19	<500		ug/L
			Thallium (Tl)	2018/07/19	<2.0		ug/L
			Titanium (Ti)	2018/07/19	<10		ug/L
			Uranium (U)	2018/07/19	<1.0		ug/L
			Vanadium (V)	2018/07/19	<2.0		ug/L
			Zinc (Zn)	2018/07/19	<7.0		ug/L
1917138	GG1	QC Standard	Reactive silica (SiO2)	2018/07/17		90	%
1917138	GG1	Method Blank	Reactive silica (SiO2)	2018/07/17	<0.10		mg/L
1917183	LAR	QC Standard	pH	2018/07/17		100	%
1917185	LAR	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/17		86	%
1917185	LAR	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/17	<1.0		mg/L
1917186	LAR	QC Standard	Conductivity	2018/07/17		98	%
1917186	LAR	Method Blank	Conductivity	2018/07/17	<0.0010		mS/cm
1917240	LAR	QC Standard	Nitrates (N-NO3-)	2018/07/17		98	%
1917240	LAR	Spiked Blank	Nitrites (N-NO2-)	2018/07/17		104	%
1917240	LAR	Method Blank	Nitrates (N-NO3-)	2018/07/17	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/17	<0.020		mg/L
1917241	LAR	QC Standard	Chloride (Cl)	2018/07/17		103	%
			Sulfates (SO4)	2018/07/17		102	%
1917241	LAR	Method Blank	Chloride (Cl)	2018/07/17	<0.050		mg/L
			Sulfates (SO4)	2018/07/17	<0.50		mg/L
1917251	MCC	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/18		100	%
1917251	MCC	QC Standard DUP	Nitrogen ammonia (N-NH3)	2018/07/18		99	%
1917251	MCC	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/18	<0.020		mg/L
1917251	MCC	Method Blank DUP	Nitrogen ammonia (N-NH3)	2018/07/18	<0.020		mg/L
1917278	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/18		95	%
1917278	SSK	Method Blank	Total suspended solids (TSS)	2018/07/18	<2.0		mg/L

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Maxxam Job #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1917296	AG5	Spiked Blank	BOD5	2018/07/23		85	%
1917296	AG5	Spiked Blank DUP	BOD5	2018/07/23		92	%
1917296	AG5	Method Blank	BOD5	2018/07/23	<4.0		mg/L
1917296	AG5	Method Blank DUP	BOD5	2018/07/23	<4.0		mg/L
1917333	SSK	QC Standard	COD	2018/07/18		107	%
1917333	SSK	QC Standard DUP	COD	2018/07/18		104	%
1917333	SSK	QC Standard DUP 2	COD	2018/07/18		91	%
1917333	SSK	Method Blank	COD	2018/07/18	<10		mg/L
1917333	SSK	Method Blank DUP	COD	2018/07/18	<10		mg/L
1917341	FRB	Spiked Blank	Total Dissolved Solids	2018/07/18		103	%
1917341	FRB	Method Blank	Total Dissolved Solids	2018/07/18	<10		mg/L
1917558	GG1	QC Standard	Total Cyanide (CN)	2018/07/18		96	%
1917558	GG1	Method Blank	Total Cyanide (CN)	2018/07/18	<0.010		mg/L
1917644	MR4	Spiked Blank	Dissolved organic carbon	2018/07/20		100	%
1917644	MR4	Method Blank	Dissolved organic carbon	2018/07/20	1.5, RDL=0.20		mg/L
1917676	GG1	QC Standard	Sulfides (S2-)	2018/07/18		97	%
1917676	GG1	Method Blank	Sulfides (S2-)	2018/07/18	<0.020		mg/L
1917710	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/20		98	%
1917710	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/20	<0.40		mg/L
1917959	DF4	Spiked Blank	1-Chlorooctadecane	2018/07/20		90	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/20		81	%
1917959	DF4	Method Blank	1-Chlorooctadecane	2018/07/20		82	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/20	<100		ug/L
1918000	LAR	QC Standard	Fluoride (F)	2018/07/19		104	%
1918000	LAR	QC Standard DUP	Fluoride (F)	2018/07/19		104	%
1918000	LAR	Method Blank	Fluoride (F)	2018/07/19	<0.10		mg/L
1918000	LAR	Method Blank DUP	Fluoride (F)	2018/07/19	<0.10		mg/L
1918214	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/20		98	%
1918214	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/20		101	%
1918214	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/20	<0.0080		mg/L
1918284	MR4	Spiked Blank	Phenols-4AAP	2018/07/20		90	%
1918284	MR4	Method Blank	Phenols-4AAP	2018/07/20	<0.0020		mg/L
1918499	MR4	Spiked Blank	Total Organic Carbon	2018/07/20		100	%
1918499	MR4	Method Blank	Total Organic Carbon	2018/07/20	<0.20		mg/L
1918737	EHA	QC Standard	Mercury (Hg)	2018/07/24		88	%
1918737	EHA	Spiked Blank	Mercury (Hg)	2018/07/24		108	%
1918737	EHA	Method Blank	Mercury (Hg)	2018/07/24	<0.000010		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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Maxxam Job #: B829058
Report Date: 2018/07/27

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: GOODWOOD
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics

Kassy Blais, B.Sc.,Microbiologist

Miryam Assayag

Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POUD
Site#: TSMC
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/13
Report #: R2382696
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B828352
Received: 2018/07/12, 09:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Suspended Solids	1	2018/07/12	2018/07/12	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/07/13	2018/07/13	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
pH	1	N/A	2018/07/12	QUE SOP-00142	MA.303-TitrAuto 2.1m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POUD
Site#: TSMC
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/13
Report #: R2382696
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B828352
Received: 2018/07/12, 09:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B828352
Report Date: 2018/07/13

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POUD
Your P.O. #: 2200002147
Sampler Initials: TFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FN2117		
Sampling Date		2018/07/11 09:11		
COC Number		157354-13-01		
	Units	**DS04-GW-SP-OUT-7**	**RDL**	**QC Batch**
METALS ICP-MS				
Arsenic (As)	ug/L	<1.0	1.0	1915964
Copper (Cu)	ug/L	1.2	1.0	1915964
Iron (Fe)	ug/L	960	60	1915964
Nickel (Ni)	ug/L	<2.0	2.0	1915964
Lead (Pb)	ug/L	<0.50	0.50	1915964
Zinc (Zn)	ug/L	<7.0	7.0	1915964

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B828352
Report Date: 2018/07/13

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POUD
Your P.O. #: 2200002147
Sampler Initials: TFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FN2117		
Sampling Date		2018/07/11 09:11		
COC Number		157354-13-01		
	Units	**DS04-GW-SP-OUT-7**	**RDL**	**QC Batch**
CONVENTIONALS				
pH	pH	6.14	N/A	1915854
Total suspended solids (TSS)	mg/L	2.2	2.0	1915857

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

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Maxxam Job #: B828352
Report Date: 2018/07/13

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POUD
Your P.O. #: 2200002147
Sampler Initials: TFD

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B828352
Report Date: 2018/07/13

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POUD
Your P.O. #: 2200002147
Sampler Initials: TFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1915854	LAR	QC Standard	pH	2018/07/12		100	%
1915857	LAR	Spiked Blank	Total suspended solids (TSS)	2018/07/12		94	%
1915857	LAR	Method Blank	Total suspended solids (TSS)	2018/07/12	<2.0		mg/L
1915964	JRC	QC Standard	Arsenic (As)	2018/07/13		99	%
			Copper (Cu)	2018/07/13		99	%
			Iron (Fe)	2018/07/13		110	%
			Nickel (Ni)	2018/07/13		98	%
			Lead (Pb)	2018/07/13		100	%
			Zinc (Zn)	2018/07/13		97	%
1915964	JRC	Spiked Blank	Arsenic (As)	2018/07/13		102	%
			Copper (Cu)	2018/07/13		102	%
			Iron (Fe)	2018/07/13		100	%
			Nickel (Ni)	2018/07/13		97	%
			Lead (Pb)	2018/07/13		103	%
			Zinc (Zn)	2018/07/13		101	%
1915964	JRC	Method Blank	Arsenic (As)	2018/07/13	<1.0		ug/L
			Copper (Cu)	2018/07/13	<1.0		ug/L
			Iron (Fe)	2018/07/13	<60		ug/L
			Nickel (Ni)	2018/07/13	<2.0		ug/L
			Lead (Pb)	2018/07/13	<0.50		ug/L
			Zinc (Zn)	2018/07/13	<7.0		ug/L

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

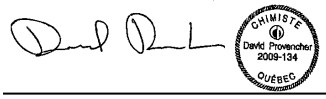
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Maxxam Job #: B828352
Report Date: 2018/07/13

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POUD
Your P.O. #: 2200002147
Sampler Initials: TFD

VALIDATION SIGNATURE PAGE

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



David Provencher, B.Sc., Chemist, Senior Analyst

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RESULTS OF TROUT - MORTALITY % (SINGLE CONC.)

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Client : 4526 TATA STEEL MINERALS CANADA Job Number: B828250

Client Project Name & Number:

Test Result:

96 hrs Mortality % 0 Statistical Method: **Pass/Fail:** pass

Sample Name : DS04-GW-SP-OUT-7 Sample Matrix : SURFACE WATER

Description: Pink, trouble and few solids present Sample Number: FN1816-02

Sample Collected: Jul 11, 2018 09:11 AM Sampling Method : Grab Site Collection: N/A

Sample Collected By: TFD Volume Received: 16 L Temp.Upon Arrival: 21 °C Storage: 2-6°C

Sample Received: Jul 12, 2018 09:30 AM pH: 5.5 Dissolved Oxygen: 9.9 mg/L

Analysis Start : Jul 16, 2018 03:05 PM Temperature : 15 °C Sample Conductance: 29 µS/cm

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	96 hrs	96 hr	96 hrs	24 hrs	24 hrs	24 hrs	24 hrs
0	15	7.4	276	10.1	15	7.6	10.0	0	0	0	0
100	15	5.6	29	10.2	15	5.9	9.9	0	0	0	0

Concentration	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	48 hrs	48 hrs	48 hrs	48 hrs	72 hrs	72 hrs	72 hrs	72 hrs	96 hrs	96 hrs	96 hrs	96 hrs
0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0

Comments : No discrepancies observed during the test.

Culture/Control/Dilution Water Dechlorinated municipal tap water

Hardness: 101 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,100 (%v/v)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	35 cm
Total # of Organisms Used :	20	Pre-aeration Time :	30 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	16 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.4 g/L	Photoperiod :	16 hours of of light; 8 hours of darkness		
Test vessel:	Plastic container with polyethylene bag.				

Test Organism : Rainbow Trout *(Oncorhynchus mykiss)* Source : Piscicultures Les Arpents Verts

Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.6 ± 0.1 g	Length (Mean) +- SD :	3.91 ± 0.33 cm
Culture Water Renewal :	2 liters/min	Weight (Range) :	0.3 – 0.8 g	Length (Range) :	3.30 – 4.40 cm
Culture Photoperiod :	16 hours of of light; 8 hours of darkness			% Mortality within 7 days :	0.1%
Feeding rate and frequency :	1-2x a day; 1-5% of the body weights.			Acclimation Time:	>14 days

Reference chemical: Phenol Test Date: Jul 12, 2018

Test Endpoint 96 hrs LC50 (95% confidence interval) : 11.2 (9.00, 18.0)mg/L Statistical Method : Binomial

Historical Mean LC50 (warning limits) : 9.80 (7.77, 12.4) mg/L Concentration : 0,4,6,9,13,18 mg/L

Test Method QUE SOP - 00408. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS1/RM/13 - Second Edition. Environment Canada. 2000. (Including Amendments: May 2007).

This is essentially a 96H static test. Ten individuals are submitted to one effluent concentration in order to measure the mortality rate in controlled temperature, light intensity and loading density.

Method Deviations : No change was made to the method.

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

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RESULTS OF TROUT - MORTALITY % (SINGLE CONC.)

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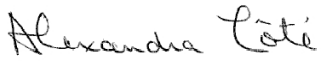
Client : 4526 TATA STEEL MINERALS CANADA

Job Number: B828250

Client Project Name & Number:

Sample Number: FN1816-02

Analyst : Alexis Roy, Olivier Roberge



Verified By : Alexandra Côté, B.Sc. Biologist

Date: Jul 24, 2018 02:51 PM

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA

Job Number: B828250

Client Project Name & Number:

No. d'échantillon : FN1816-01

Test Result:

48 hrs LC50 %v/v (95% CL): 70.7 (6.25-100) Statistical Method: Binomial

Toxic unit: 1.41

48 hrs EC50 %v/v (95% CL): 70.7 (6.25-100) Statistical Method: Binomial

Comment: toxique

Sample Name : DS04-GW-SP-OUT-7

Sample Matrix : SURFACE WATER

Description: orange pâle, semi-opaque, inodore.

Sample Prior to Analysis:

Sample Collected:	Jul 11, 2018 09:11 AM	Sampling Method :	Grab	pH:	6.9
Sample Collected By:	TFD	Site Collection:	N/A	Temperature :	20 °C
Sample Received:	Jul 12, 2018 09:30 AM	Volume Received:	1L	Dissolved Oxygen:	9.7 mg/L
Analysis Start :	Jul 15, 2018 12:00 PM	Temp.Upon Arrival:	21 °C	Sample Conductance:	29 µS/cm
End :	Jul 17, 2018 12:30 PM	Storage:	2-6°C	Hardness:	8 mg $CaCO_3$/L

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Immobility (#)	Immobility (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	48 hrs	48 hr	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
0	19	7.3	466	8.9	19	7.0	8.9	0	0	0	0
6.25	21	7.5	455	8.8	19	7.0	8.9	0	0	0	0
12.5	21	7.5	437	8.8	19	7.1	8.8	0	0	2	20.0
25	20	7.5	389	9.0	19	7.1	9.0	0	0	2	20.0
50	20	7.4	297	9.0	19	7.2	9.0	0	0	0	0
100	19	7.2	88	9.4	19	7.3	8.9	0	0	10	100

Comments :

Culture/Control/Dilution Water: Reconstitued water for Daphnia

Hardness: 170 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Pre-aeration Time :	30 min	Rate of Pre-aeration :	40±5 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	Yes, 29 mg $CaCO_3$/L
Test Volume :	150 mL	Vessel Volume :	270 ml	Test pH Adjusted:	No
Loading Density :	15.0 mL/Daphnia	Photoperiod :	16 hours of of light; 8 hours of darkness		

Test Organism : *Daphnia magna* Source : Maxxam Lab Culture

Age at Test Initiation :	<24 hres	Average Brood Size :	32.6
Culture Photoperiod :	16 hours of of light; 8 hours of darkness	% Mortality within 7 days :	2.0
Culture Temperature :	20 ± 2 °C	Time To First Brood :	8 Days
Culture Diet	Fed once a day.		

Reference chemical: Potassium Dichromate Test Date: Jul 15, 2018

Test Endpoint 48 hrs LC50 (95% confidence interval) :	0.16 (N/A, 0.25)mg/L	Statistical Method :	Binomial
Historical Mean LC50 (warning limits) :	0.17 (0.10, 0.30) mg/L	Concentration :	0,0.0625,0.125,0.25,0.5,1 mg/L

Test Method QUE SOP-00406. Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. EPS1/RM/14 - Second Edition. Environment Canada. 2000.

This is essentially a 48H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations: Aucune

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

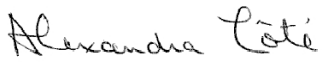
Client : 4526 TATA STEEL MINERALS CANADA

Job Number: B828250

Client Project Name & Number:

No. d'échantillon : FN1816-01

Analyst : Alexandra Côté, Roxane Champagne



Verified By : Alexandra Côté, B.Sc. Biologist

Date: Jul 24, 2018 02:48 PM

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Your P.O. #: 2200002147
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/24
Report #: R2385158
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B828250
Received: 2018/07/12, 09:30

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Daphnia - LC50 (acute-48h)-Federal	1	N/A	2018/07/15	QUE SOP-00406	EPS1/RM/14
Hardness by ICP-MS	1	2018/07/12	2018/07/13	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Hardness by ICP-MS	1	2018/07/17	2018/07/18	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Trout - Mortality % (single conc.)	1	N/A	2018/07/16	QUE SOP - 00408	EPS1/RM/13

Remarks:

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All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/24
Report #: R2385158
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B828250
Received: 2018/07/12, 09:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B828250
Report Date: 2018/07/24

TATA STEEL MINERALS CANADA
Your P.O. #: 2200002147
Sampler Initials: TFD

ECOTOXICOLOGY (SURFACE WATER)

Maxxam ID		FN1816	
Sampling Date		2018/07/11 09:11	
COC Number		157354-13-01	
	Units	**DS04-GW-SP-OUT-7**	**QC Batch**
Daphnia Magna - Can			
LC50	%v/v	ATTACHED	1916436
Rainbow Trout			
Mortality	%	ATTACHED	1916682
QC Batch = Quality Control Batch			

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B828250
Report Date: 2018/07/24

TATA STEEL MINERALS CANADA
Your P.O. #: 2200002147
Sampler Initials: TFD

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B828250
Report Date: 2018/07/24

TATA STEEL MINERALS CANADA
Your P.O. #: 2200002147
Sampler Initials: TFD

VALIDATION SIGNATURE PAGE

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

Alexandra Côté, B.Sc. Biologist

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Votre # du projet: B827734

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/25
Rapport: R5317258
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8H3891
Reçu: 2018/07/12, 09:40

Matrice: Eau
Nombre d'échantillons reçus: 3

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	3	N/A	2018/07/24	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B827734

Attention: Martine Lepage

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2690 Avenue Dalton
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Canada G1P 3S4

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Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8H3891
Reçu: 2018/07/12, 09:40

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8H3891
Date du rapport: 2018/07/25

Maxxam Analytique
Votre # du projet: B827734

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HEU799	HEU800	HEU801		
Date d'échantillonnage		2018/07/09	2018/07/09	2018/07/09		
	Unités	**FM9344-01R\DSO4-GW-SP-OUT-6**	**FM9345-01R\DSO4-EE-GW-Q1-2018**	**FM9346-01R\DSO4-ER-GW-Q1-2018**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	<0.0050	<0.0050	0.0050	5631188

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8H3891
Date du rapport: 2018/07/25

Maxxam Analytique
Votre # du projet: B827734

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Date du rapport: 2018/07/25

Maxxam Analytique
Votre # du projet: B827734

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5631188	RK6	Blanc fortifié	Radium-226	2018/07/24		97	%	85 - 115
5631188	RK6	Blanc de méthode	Radium-226	2018/07/24	<0.0050		Bq/L	
5631188	RK6	RPD	Radium-226	2018/07/24	3.1		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération

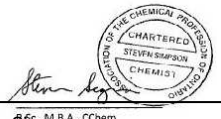
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Dossier Maxxam: B8H3891
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Maxxam Analytique
Votre # du projet: B827734

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Your P.O. #: 2200002147
Your Project #: QC QUATERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/26
Report #: R2385684
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827734
Received: 2018/07/11, 09:23

Sample Matrix: SURFACE WATER
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	3	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: QC QUATERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/26
Report #: R2385684
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827734
Received: 2018/07/11, 09:23

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B827734
Report Date: 2018/07/26

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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Maxxam
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Your P.O. #: 2200002147
Your Project #: QC QUTERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/19
Report #: R2384013
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827623
Received: 2018/07/10, 16:44

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5) (1)	2	N/A	2018/07/10	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions (1)	2	N/A	2018/07/11	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (1, 2)	2	2018/07/11	2018/07/16	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50) (1)	2	2018/07/17	2018/07/18	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide (1)	2	2018/07/11	2018/07/11	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand (1)	2	2018/07/11	2018/07/11	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms (1)	2	N/A	2018/07/11	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms (1)	2	N/A	2018/07/11	QUE SOP-00304	MA.700-Col 1.0
Conductivity (1)	2	N/A	2018/07/10	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+)	2	N/A	2018/07/17	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (3)	2	2018/07/13	2018/07/13	STL SOP-00243	SM 23 5310-B m
Fluoride (1)	2	N/A	2018/07/12	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour	2	2018/07/16	2018/07/17	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids (1)	2	2018/07/11	2018/07/11	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	2	2018/07/13	2018/07/14	STL SOP-00006	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen (1)	2	N/A	2018/07/11	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite (1)	2	N/A	2018/07/11	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen (1)	2	N/A	2018/07/10	SM 421 F	MA315-DBO 1.1 R3 m
pH (1)	2	N/A	2018/07/10	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP	2	2018/07/17	2018/07/17	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-) (1)	2	2018/07/12	2018/07/12	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2) (1)	2	N/A	2018/07/11	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids (1)	2	2018/07/12	2018/07/13	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN) (1)	2	2018/07/11	2018/07/12	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (4)	2	N/A	2018/07/16	STL SOP-00243	SM 23 5310-B m
Uranium by ICP-MS	2	2018/07/10	N/A	STL SOP-00006	MA.200–Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

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Your P.O. #: 2200002147
Your Project #: QC QUTERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/19
Report #: R2384013
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827623
Received: 2018/07/10, 16:44

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam - Québec
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FM8809	FM8833		
Sampling Date		2018/07/09	2018/07/09		
COC Number		175757	175757		
	Units	**DSO4-EE-GW-11-2018**	**DSO4-ER-GW-Q1-2018**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS					
Petroleum Hydrocarbons (C10-C50)	ug/L	<100	<100	100	1917137
Surrogate Recovery (%)					
1-Chlorooctadecane	%	104	94	N/A	1917137

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

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FM8809	FM8833		
Sampling Date		2018/07/09	2018/07/09		
COC Number		175757	175757		
	Units	DSO4-EE-GW-11-2018	DSO4-ER-GW-Q1-2018	RDL	QC Batch
METALS					
Mercury (Hg) ††	mg/L	<0.000010	<0.000010	0.000010	1916495
METALS ICP-MS					
Aluminum (Al)	ug/L	120	21	10	1916132
Antimony (Sb)	ug/L	<1.0	<1.0	1.0	1916132
Silver (Ag)	ug/L	<1.0	<1.0	1.0	1916132
Arsenic (As)	ug/L	<1.0	<1.0	1.0	1916132
Barium (Ba)	ug/L	2.6	<2.0	2.0	1916132
Boron (B) †	ug/L	<50	<50	50	1916132
Cadmium (Cd)	ug/L	<0.20	<0.20	0.20	1916132
Calcium (Ca) †	ug/L	<500	<500	500	1916132
Chromium (Cr)	ug/L	<5.0	<5.0	5.0	1916132
Cobalt (Co)	ug/L	<1.0	<1.0	1.0	1916132
Copper (Cu)	ug/L	<1.0	<1.0	1.0	1916132
Total Hardness (CaCO3) ††	ug/L	<1000	<1000	1000	1916132
Tin (Sn)	ug/L	<2.0	<2.0	2.0	1916132
Iron (Fe)	ug/L	280	<60	60	1916132
Magnesium (Mg) †	ug/L	130	<100	100	1916132
Manganese (Mn)	ug/L	28	21	1.0	1916132
Molybdenum (Mo)	ug/L	<1.0	<1.0	1.0	1916132
Nickel (Ni)	ug/L	<2.0	<2.0	2.0	1916132
Total phosphorous	ug/L	<10	<10	10	1916132
Lead (Pb)	ug/L	<0.50	<0.50	0.50	1916132
Potassium (K) †	ug/L	<500	<500	500	1916132
Selenium (Se)	ug/L	<3.0	<3.0	3.0	1916132
Sodium (Na)	ug/L	<500	<500	500	1916132
Thallium (Tl)	ug/L	<2.0	<2.0	2.0	1916132
Titanium (Ti) ††	ug/L	<10	<10	10	1916132
Uranium (U) ††	ug/L	<1.0	<1.0	1.0	1916132
Vanadium (V)	ug/L	<2.0	<2.0	2.0	1916132
Zinc (Zn)	ug/L	<7.0	<7.0	7.0	1916132

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FM8809	FM8809		FM8833		
Sampling Date		2018/07/09	2018/07/09		2018/07/09		
COC Number		175757	175757		175757		
	Units	DSO4-EE-GW-11-2018	DSO4-EE-GW-11-2018 Lab-Dup	RDL	DSO4-ER-GW-Q1-2018	RDL	QC Batch
CONVENTIONALS							
BOD5	mg/L	<4.0	N/A	4.0	<4.0	4.0	1915344
COD	mg/L	<10	N/A	10	<10	10	1914946
Conductivity	mS/cm	0.0040	N/A	0.0010	0.0020	0.0010	1914893
Dissolved organic carbon †	mg/L	1.5	N/A	0.20	1.6	0.20	1916224
Dissolved oxygen †	mg/L	9.7	N/A	1.0	9.4	1.0	1914863
Fluoride (F)	mg/L	<0.10	N/A	0.10	<0.10	0.10	1915358
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	<0.0080	0.0080	<0.0080	0.0080	1916981
Nitrates (N-NO3-)	mg/L	0.096	N/A	0.020	<0.020	0.020	1915073
Nitrites (N-NO2-)	mg/L	<0.020	N/A	0.020	<0.020	0.020	1915073
Nitrogen ammonia (N-NH3)	mg/L	1.4	N/A	0.020	0.060	0.020	1915076
pH	pH	5.65	N/A	N/A	5.41	N/A	1914879
Phenols-4AAP	mg/L	<0.0020	N/A	0.0020	<0.0020	0.0020	1916852
Reactive silica (SiO2) †	mg/L	1.8	N/A	0.50	0.20	0.10	1914943
Sulfides (S2-)	mg/L	<0.020	N/A	0.020	<0.020	0.020	1915696
TKN Total Kjeldahl Nitrogen	mg/L	<0.40	N/A	0.40	<0.40	0.40	1914956
Total Cyanide (CN)	mg/L	<0.010	N/A	0.010	<0.010	0.010	1915292
Total Organic Carbon	mg/L	1.8	N/A	0.20	2.0	0.20	1916640
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	<1.0	N/A	1.0	<1.0	1.0	1914891
Chloride (Cl)	mg/L	0.10	N/A	0.050	0.079	0.050	1915075
Sulfates (SO4)	mg/L	<0.50	N/A	0.50	<0.50	0.50	1915075
Total Dissolved Solids	mg/L	15	N/A	10	14	10	1915400
Total suspended solids (TSS)	mg/L	2.0	N/A	2.0	2.0	2.0	1914977

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
† Parameter is not accreditable

Maxxam ID		FM8833		
Sampling Date		2018/07/09		
COC Number		175757		
	Units	DSO4-ER-GW-Q1-2018 Lab-Dup	RDL	QC Batch
CONVENTIONALS				
Total Organic Carbon	mg/L	2.0	0.20	1916640

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FM8809		FM8833		
Sampling Date		2018/07/09		2018/07/09		
COC Number		175757		175757		
	Units	DSO4-EE-GW-11-2018	RDL	DSO4-ER-GW-Q1-2018	RDL	QC Batch
MICROBIOLGICAL TESTS						
Total coliforms	UFC/100ml	850	10	1600	100	1915045
Non-typical bacteria	UFC/100ml	<10	10	4200	100	1915045
Fecal coliforms	UFC/100ml	0	N/A	0	N/A	1915041

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

2018/07/19 10:45

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Maxxam Job #: B827623
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TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

GENERAL COMMENTS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Reported detection limits are multiplied by dilution factors used for sample analysis.

CONVENTIONAL PARAMETERS (SURFACE WATER)

Reported detection limits are multiplied by dilution factors used for sample analysis.

Results relate only to the items tested.

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1914879	CB8	QC Standard	pH	2018/07/10		100	%
1914891	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/10		96	%
1914891	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/10	<1.0		mg/L
1914893	CB8	QC Standard	Conductivity	2018/07/10		98	%
1914893	CB8	Method Blank	Conductivity	2018/07/10	<0.0010		mS/cm
1914943	AG5	QC Standard	Reactive silica (SiO2)	2018/07/11		87	%
1914943	AG5	Method Blank	Reactive silica (SiO2)	2018/07/11	<0.10		mg/L
1914946	SSK	QC Standard	COD	2018/07/11		104	%
1914946	SSK	QC Standard DUP	COD	2018/07/11		93	%
1914946	SSK	Method Blank	COD	2018/07/11	<10		mg/L
1914956	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/12		100	%
1914956	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/12	<0.40		mg/L
1914977	SSK	Spiked Blank	Total suspended solids (TSS)	2018/07/11		96	%
1914977	SSK	Method Blank	Total suspended solids (TSS)	2018/07/11	<2.0		mg/L
1915073	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/11		99	%
1915073	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/11		107	%
1915073	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/11	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/11	<0.020		mg/L
1915075	MCC	QC Standard	Chloride (Cl)	2018/07/11		105	%
			Sulfates (SO4)	2018/07/11		102	%
1915075	MCC	Method Blank	Chloride (Cl)	2018/07/11	<0.050		mg/L
			Sulfates (SO4)	2018/07/11	<0.50		mg/L
1915076	CB8	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/11		106	%
1915076	CB8	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/11	<0.020		mg/L
1915292	CB8	QC Standard	Total Cyanide (CN)	2018/07/11		88	%
1915292	CB8	Method Blank	Total Cyanide (CN)	2018/07/11	<0.010		mg/L
1915344	AG5	Spiked Blank	BOD5	2018/07/16		103	%
1915344	AG5	Spiked Blank DUP	BOD5	2018/07/16		102	%
1915344	AG5	Method Blank	BOD5	2018/07/16	<4.0		mg/L
1915344	AG5	Method Blank DUP	BOD5	2018/07/16	<4.0		mg/L
1915358	LAR	QC Standard	Fluoride (F)	2018/07/11		106	%
1915358	LAR	Method Blank	Fluoride (F)	2018/07/11	<0.10		mg/L
1915400	FRB	Spiked Blank	Total Dissolved Solids	2018/07/13		105	%
1915400	FRB	Method Blank	Total Dissolved Solids	2018/07/13	<10		mg/L
1915696	LAR	QC Standard	Sulfides (S2-)	2018/07/12		87	%
1915696	LAR	Method Blank	Sulfides (S2-)	2018/07/12	<0.020		mg/L
1916132	RNP	Spiked Blank	Aluminum (Al)	2018/07/14		99	%
			Antimony (Sb)	2018/07/14		112	%
			Silver (Ag)	2018/07/14		105	%
			Arsenic (As)	2018/07/14		102	%
			Barium (Ba)	2018/07/14		104	%
			Boron (B)	2018/07/14		105	%
			Cadmium (Cd)	2018/07/14		106	%
			Calcium (Ca)	2018/07/14		99	%
			Chromium (Cr)	2018/07/14		98	%
			Cobalt (Co)	2018/07/14		97	%
			Copper (Cu)	2018/07/14		98	%
			Tin (Sn)	2018/07/14		113	%
			Iron (Fe)	2018/07/14		99	%
			Magnesium (Mg)	2018/07/14		101	%
			Manganese (Mn)	2018/07/14		112	%

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Molybdenum (Mo)	2018/07/14		109	%
			Nickel (Ni)	2018/07/14		98	%
			Total phosphorous	2018/07/14		93	%
			Lead (Pb)	2018/07/14		107	%
			Potassium (K)	2018/07/14		102	%
			Selenium (Se)	2018/07/14		114	%
			Sodium (Na)	2018/07/14		95	%
			Thallium (Tl)	2018/07/14		101	%
			Titanium (Ti)	2018/07/14		97	%
			Uranium (U)	2018/07/14		102	%
			Vanadium (V)	2018/07/14		97	%
			Zinc (Zn)	2018/07/14		98	%
1916132	RNP	Method Blank	Aluminum (Al)	2018/07/14	<10		ug/L
			Antimony (Sb)	2018/07/14	<1.0		ug/L
			Silver (Ag)	2018/07/14	<1.0		ug/L
			Arsenic (As)	2018/07/14	<1.0		ug/L
			Barium (Ba)	2018/07/14	<2.0		ug/L
			Boron (B)	2018/07/14	<50		ug/L
			Cadmium (Cd)	2018/07/14	<0.20		ug/L
			Calcium (Ca)	2018/07/14	<500		ug/L
			Chromium (Cr)	2018/07/14	<5.0		ug/L
			Cobalt (Co)	2018/07/14	<1.0		ug/L
			Copper (Cu)	2018/07/14	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/14	<1000		ug/L
			Tin (Sn)	2018/07/14	<2.0		ug/L
			Iron (Fe)	2018/07/14	<60		ug/L
			Magnesium (Mg)	2018/07/14	<100		ug/L
			Manganese (Mn)	2018/07/14	<1.0		ug/L
			Molybdenum (Mo)	2018/07/14	<1.0		ug/L
			Nickel (Ni)	2018/07/14	<2.0		ug/L
			Total phosphorous	2018/07/14	<10		ug/L
			Lead (Pb)	2018/07/14	<0.50		ug/L
			Potassium (K)	2018/07/14	<500		ug/L
			Selenium (Se)	2018/07/14	<3.0		ug/L
			Sodium (Na)	2018/07/14	<500		ug/L
			Thallium (Tl)	2018/07/14	<2.0		ug/L
			Titanium (Ti)	2018/07/14	<10		ug/L
			Uranium (U)	2018/07/14	<1.0		ug/L
			Vanadium (V)	2018/07/14	<2.0		ug/L
			Zinc (Zn)	2018/07/14	<7.0		ug/L
1916224	MR4	Spiked Blank	Dissolved organic carbon	2018/07/13		98	%
1916224	MR4	Method Blank	Dissolved organic carbon	2018/07/13	0.37, RDL=0.20		mg/L
1916495	SD2	Spiked Blank	Mercury (Hg)	2018/07/17		105	%
1916495	SD2	Method Blank	Mercury (Hg)	2018/07/17	<0.000010		mg/L
1916640	HMS	Spiked Blank	Total Organic Carbon	2018/07/16		98	%
1916640	HMS	Method Blank	Total Organic Carbon	2018/07/16	<0.20		mg/L
1916852	MR4	Spiked Blank	Phenols-4AAP	2018/07/17		89	%
1916852	MR4	Method Blank	Phenols-4AAP	2018/07/17	<0.0020		mg/L
1916981	ECA	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/17		102	%
1916981	ECA	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/17		97	%

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Maxxam Job #: B827623
Report Date: 2018/07/19

TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1916981	ECA	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/17	<0.0080		mg/L
1917137	VLP	Spiked Blank	1-Chlorooctadecane	2018/07/17		103	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/17		87	%
1917137	VLP	Spiked Blank DUP	1-Chlorooctadecane	2018/07/17		98	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/17		84	%
1917137	VLP	Method Blank	1-Chlorooctadecane	2018/07/17		101	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/17	<100		ug/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

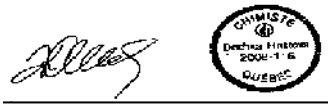
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Maxxam Job #: B827623
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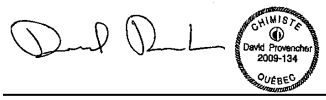
TATA STEEL MINERALS CANADA
Client Project #: QC QUTERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
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VALIDATION SIGNATURE PAGE

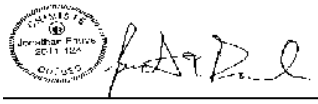
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



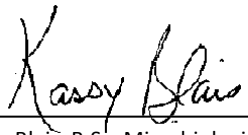
Dochka Koleva Hristova, B.Sc., Chemist



David Provencher, B.Sc., Chemist, Senior Analyst



Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics



Kassy Blais, B.Sc.,Microbiologist, Ste-Foy



Miryam Assayag



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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.

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Your P.O. #: 2200002147
Your Project #: QC QUATERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/17
Report #: R2383464
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827486
Received: 2018/07/10, 12:58

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Alkalinity (pH end point 4.5) (1)	1	N/A	2018/07/10	QUE SOP-00142	MA.315-Alc-Aci1.0R2m
Anions (1)	1	N/A	2018/07/10	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Biochemical Oxygen Demand (5 days) (1, 2)	1	2018/07/11	2018/07/16	QUE SOP-00100	MA315-DBO 1.1 R3 m
Petroleum Hydrocarbons (C10-C50) (1)	1	2018/07/10	2018/07/11	QUE SOP-00209	MA400–HYD 1.1 R3 m
Total Cyanide (1)	1	2018/07/11	2018/07/11	QUE SOP-00143	MA 300-CN 1.2 R4 m
Chemical Oxygen Demand (1)	1	2018/07/11	2018/07/11	QUE SOP-00140	HACH DR/890-8000m
Fecal coliforms (1)	1	N/A	2018/07/11	QUE SOP-00303	MA.700-Fec.Ec 1.0
Total coliforms (1)	1	N/A	2018/07/11	QUE SOP-00304	MA.700-Col 1.0
Conductivity (1)	1	N/A	2018/07/10	QUE SOP-00142	MA.303-TitrAuto 2.1m
Hexavalent Chromium (Cr 6+)	1	N/A	2018/07/11	STL SOP-00037	MA200-CrHex 1.1 R1 m
Dissolved Organic Carbon (3)	1	2018/07/14	2018/07/14	STL SOP-00243	SM 23 5310-B m
Fluoride (1)	1	N/A	2018/07/12	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Extractable Mercury - Cold Vapour	1	2018/07/16	2018/07/17	STL SOP-00042	MA.200–Hg 1.1 R1 m
Total Suspended Solids (1)	1	2018/07/10	2018/07/10	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level)	1	2018/07/11	2018/07/12	STL SOP-00006	MA.200–Mét. 1.2 R5 m
Ammonia Nitrogen (1)	1	N/A	2018/07/11	QUE SOP-00126	MA.300–N 2.0 R2 m
Nitrate and/or Nitrite (1)	1	N/A	2018/07/10	QUE SOP-00141	MA.300–Ions 1.3 R3 m
Dissolved Oxygen (1)	1	N/A	2018/07/10	SM 421 F	MA315-DBO 1.1 R3 m
pH (1)	1	N/A	2018/07/10	QUE SOP-00142	MA.303-TitrAuto 2.1m
Total Phenols by 4-AAP	1	2018/07/12	2018/07/12	STL SOP-00033	MA404–I.Phé 2.2 R2 m
Sulfides (S2-) (1)	1	2018/07/10	2018/07/10	QUE SOP-00107	MA. 300 – S 1.2 R3 m
Reactive Silica (SiO2) (1)	1	N/A	2018/07/11	QUE SOP-00150	HACH DR/890-8186m
Total Dissolved Solids (1)	1	2018/07/10	2018/07/10	QUE SOP-00119	MA115–S.D. 1.0 R4 m
Total KJELDAHL Nitrogen (TKN) (1)	1	2018/07/11	2018/07/12	QUE SOP-00128	MA.300–NTPT 2.0 R2 m
Total Organic Carbon (4)	1	N/A	2018/07/12	STL SOP-00243	SM 23 5310-B m
Uranium by ICP-MS	1	2018/07/10	2018/07/10	STL SOP-00006	MA.200–Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

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Your P.O. #: 2200002147
Your Project #: QC QUATERLY SURFACE WATER
Site#: TSMC
Site Location: GOODWOOD SURFACE WATER
Your C.O.C. #: 175757

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/17
Report #: R2383464
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B827486
Received: 2018/07/10, 12:58

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam - Québec
(2) Please note that in the event a biochemical oxygen demand analysis cannot begin within the 48-hours holding time required (for a sample preserved at 4°C), sample will be frozen, unless otherwise specified by a regulation, to maintain it's integrity.
(3) DOC present in the sample should be considered as non-purgeable DOC
(4) TOC present in the sample should be considered as non-purgeable TOC

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

HYDROCARBONS BY GCFID (SURFACE WATER)

Maxxam ID		FM8132		
Sampling Date		2018/07/09		
COC Number		175757		
	Units	**DSO4-GW-SP-OUT**	**RDL**	**QC Batch**
PETROLEUM HYDROCARBONS				
Petroleum Hydrocarbons (C10-C50)	ug/L	590	100	1914904
Surrogate Recovery (%)				
1-Chlorooctadecane	%	100	N/A	1914904

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

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TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FM8132		
Sampling Date		2018/07/09		
COC Number		175757		
	Units	**DSO4-GW-SP-OUT**	**RDL**	**QC Batch**
METALS				
Mercury (Hg) ††	mg/L	0.000016	0.000010	1916495
METALS ICP-MS				
Aluminum (Al)	ug/L	450	10	1915295
Antimony (Sb)	ug/L	<1.0	1.0	1915295
Silver (Ag)	ug/L	<1.0	1.0	1915295
Arsenic (As)	ug/L	<1.0	1.0	1915295
Barium (Ba)	ug/L	4.8	2.0	1915295
Boron (B) †	ug/L	<50	50	1915295
Cadmium (Cd)	ug/L	0.80	0.20	1915295
Calcium (Ca) †	ug/L	1600	500	1915295
Chromium (Cr)	ug/L	<5.0	5.0	1915295
Cobalt (Co)	ug/L	1.1	1.0	1915295
Copper (Cu)	ug/L	3.1	1.0	1915295
Total Hardness (CaCO3) ††	ug/L	8600	1000	1915295
Tin (Sn)	ug/L	2.4	2.0	1915295
Iron (Fe)	ug/L	980	60	1915295
Magnesium (Mg) †	ug/L	1100	100	1915295
Manganese (Mn)	ug/L	130	1.0	1915295
Molybdenum (Mo)	ug/L	<1.0	1.0	1915295
Nickel (Ni)	ug/L	14	2.0	1915295
Total phosphorous	ug/L	66	10	1915295
Lead (Pb)	ug/L	1.2	0.50	1915295
Potassium (K) †	ug/L	730	500	1915295
Selenium (Se)	ug/L	<3.0	3.0	1915295
Sodium (Na)	ug/L	<500	500	1915295
Thallium (Tl)	ug/L	<2.0	2.0	1915295
Titanium (Ti) ††	ug/L	17	10	1915295
Uranium (U) ††	ug/L	1.2	1.0	1915295
Vanadium (V)	ug/L	<2.0	2.0	1915295
Zinc (Zn)	ug/L	65	7.0	1915295

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
†† Parameter is not accreditable
† Parameter is not accredited

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FM8132		
Sampling Date		2018/07/09		
COC Number		175757		
	Units	DSO4-GW-SP-OUT	RDL	QC Batch
CONVENTIONALS				
BOD5	mg/L	<4.0	4.0	1915344
COD	mg/L	<10	10	1914946
Conductivity	mS/cm	0.027	0.0010	1914893
Dissolved organic carbon †	mg/L	0.51	0.20	1916390
Dissolved oxygen †	mg/L	9.8	1.0	1914813
Fluoride (F)	mg/L	<0.10	0.10	1915358
Hexavalent Chromium (Cr 6+)	mg/L	<0.0080	0.0080	1915070
Nitrates (N-NO3-)	mg/L	2.3	0.020	1914778
Nitrites (N-NO2-)	mg/L	<0.020	0.020	1914778
Nitrogen ammonia (N-NH3)	mg/L	0.45	0.020	1915076
pH	pH	6.42	N/A	1914879
Phenols-4AAP	mg/L	<0.0020	0.0020	1915607
Reactive silica (SiO2) †	mg/L	4.7	0.50	1914943
Sulfides (S2-)	mg/L	<0.020	0.020	1914812
TKN Total Kjeldahl Nitrogen	mg/L	0.53	0.40	1914956
Total Cyanide (CN)	mg/L	<0.010	0.010	1915292
Total Organic Carbon	mg/L	0.73	0.20	1915568
Alkalinity Total (as CaCO3) pH 4.5 †	mg/L	2.6	1.0	1914891
Chloride (Cl)	mg/L	0.34	0.050	1914779
Sulfates (SO4)	mg/L	<0.50	0.50	1914779
Total Dissolved Solids	mg/L	22	10	1914729
Total suspended solids (TSS)	mg/L	<2.0	2.0	1914837

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable
N/A = Not Applicable

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TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

MICROBIOLOGY (SURFACE WATER)

Maxxam ID		FM8132		
Sampling Date		2018/07/09		
COC Number		175757		
	Units	**DSO4-GW-SP-OUT**	**RDL**	**QC Batch**
MICROBIOLGICAL TESTS				
Total coliforms	UFC/100ml	10	10	1915045
Non-typical bacteria	UFC/100ml	20	10	1915045
Fecal coliforms	UFC/100ml	<10	10	1915041

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2018/07/17 17:01

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Reported detection limits are multiplied by dilution factors used for sample analysis.

Results relate only to the items tested.

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1914729	FRB	Spiked Blank	Total Dissolved Solids	2018/07/10		98	%
1914729	FRB	Method Blank	Total Dissolved Solids	2018/07/10	<10		mg/L
1914778	MCC	QC Standard	Nitrates (N-NO3-)	2018/07/10		99	%
1914778	MCC	Spiked Blank	Nitrites (N-NO2-)	2018/07/10		107	%
1914778	MCC	Method Blank	Nitrates (N-NO3-)	2018/07/10	<0.020		mg/L
			Nitrites (N-NO2-)	2018/07/10	<0.020		mg/L
1914779	MCC	QC Standard	Chloride (Cl)	2018/07/10		104	%
			Sulfates (SO4)	2018/07/10		102	%
1914779	MCC	Method Blank	Chloride (Cl)	2018/07/10	<0.050		mg/L
			Sulfates (SO4)	2018/07/10	<0.50		mg/L
1914812	LAR	QC Standard	Sulfides (S2-)	2018/07/10		102	%
1914812	LAR	Method Blank	Sulfides (S2-)	2018/07/10	<0.020		mg/L
1914837	MRT	Spiked Blank	Total suspended solids (TSS)	2018/07/10		98	%
1914837	MRT	Method Blank	Total suspended solids (TSS)	2018/07/10	<2.0		mg/L
1914879	CB8	QC Standard	pH	2018/07/10		100	%
1914891	CB8	QC Standard	Alkalinity Total (as CaCO3) pH 4.5	2018/07/10		96	%
1914891	CB8	Method Blank	Alkalinity Total (as CaCO3) pH 4.5	2018/07/10	<1.0		mg/L
1914893	CB8	QC Standard	Conductivity	2018/07/10		98	%
1914893	CB8	Method Blank	Conductivity	2018/07/10	<0.0010		mS/cm
1914904	DP3	Spiked Blank	1-Chlorooctadecane	2018/07/11		102	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/11		88	%
1914904	DP3	Method Blank	1-Chlorooctadecane	2018/07/11		99	%
			Petroleum Hydrocarbons (C10-C50)	2018/07/11	<100		ug/L
1914943	AG5	QC Standard	Reactive silica (SiO2)	2018/07/11		87	%
1914943	AG5	Method Blank	Reactive silica (SiO2)	2018/07/11	<0.10		mg/L
1914946	SSK	QC Standard	COD	2018/07/11		104	%
1914946	SSK	QC Standard DUP	COD	2018/07/11		93	%
1914946	SSK	Method Blank	COD	2018/07/11	<10		mg/L
1914956	MCC	QC Standard	TKN Total Kjeldahl Nitrogen	2018/07/12		100	%
1914956	MCC	Method Blank	TKN Total Kjeldahl Nitrogen	2018/07/12	<0.40		mg/L
1915070	DKH	QC Standard	Hexavalent Chromium (Cr 6+)	2018/07/11		97	%
1915070	DKH	Spiked Blank	Hexavalent Chromium (Cr 6+)	2018/07/11		100	%
1915070	DKH	Method Blank	Hexavalent Chromium (Cr 6+)	2018/07/11	<0.0080		mg/L
1915076	CB8	QC Standard	Nitrogen ammonia (N-NH3)	2018/07/11		106	%
1915076	CB8	Method Blank	Nitrogen ammonia (N-NH3)	2018/07/11	<0.020		mg/L
1915292	CB8	QC Standard	Total Cyanide (CN)	2018/07/11		88	%
1915292	CB8	Method Blank	Total Cyanide (CN)	2018/07/11	<0.010		mg/L
1915295	EHA	Spiked Blank	Aluminum (Al)	2018/07/12		112	%
			Antimony (Sb)	2018/07/12		104	%
			Silver (Ag)	2018/07/12		118	%
			Arsenic (As)	2018/07/12		101	%
			Barium (Ba)	2018/07/12		98	%
			Boron (B)	2018/07/12		116	%
			Cadmium (Cd)	2018/07/12		93	%
			Calcium (Ca)	2018/07/12		120	%
			Chromium (Cr)	2018/07/12		96	%
			Cobalt (Co)	2018/07/12		96	%
			Copper (Cu)	2018/07/12		96	%
			Tin (Sn)	2018/07/12		105	%
			Iron (Fe)	2018/07/12		99	%

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Maxxam Job #: B827486
Report Date: 2018/07/17

TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Magnesium (Mg)	2018/07/12		99	%
			Manganese (Mn)	2018/07/12		101	%
			Molybdenum (Mo)	2018/07/12		97	%
			Nickel (Ni)	2018/07/12		96	%
			Total phosphorous	2018/07/12		97	%
			Lead (Pb)	2018/07/12		119	%
			Potassium (K)	2018/07/12		100	%
			Selenium (Se)	2018/07/12		99	%
			Sodium (Na)	2018/07/12		99	%
			Thallium (Tl)	2018/07/12		117	%
			Titanium (Ti)	2018/07/12		99	%
			Uranium (U)	2018/07/12		117	%
			Vanadium (V)	2018/07/12		97	%
			Zinc (Zn)	2018/07/12		97	%
1915295	EHA	Method Blank	Aluminum (Al)	2018/07/12	17, RDL=10		ug/L
			Antimony (Sb)	2018/07/12	<1.0		ug/L
			Silver (Ag)	2018/07/12	<1.0		ug/L
			Arsenic (As)	2018/07/12	<1.0		ug/L
			Barium (Ba)	2018/07/12	<2.0		ug/L
			Boron (B)	2018/07/12	<50		ug/L
			Cadmium (Cd)	2018/07/12	<0.20		ug/L
			Calcium (Ca)	2018/07/12	<500		ug/L
			Chromium (Cr)	2018/07/12	<5.0		ug/L
			Cobalt (Co)	2018/07/12	<1.0		ug/L
			Copper (Cu)	2018/07/12	<1.0		ug/L
			Total Hardness (CaCO3)	2018/07/12	<1000		ug/L
			Tin (Sn)	2018/07/12	<2.0		ug/L
			Iron (Fe)	2018/07/12	<60		ug/L
			Magnesium (Mg)	2018/07/12	<100		ug/L
			Manganese (Mn)	2018/07/12	<1.0		ug/L
			Molybdenum (Mo)	2018/07/12	<1.0		ug/L
			Nickel (Ni)	2018/07/12	<2.0		ug/L
			Total phosphorous	2018/07/12	<10		ug/L
			Lead (Pb)	2018/07/12	<0.50		ug/L
			Potassium (K)	2018/07/12	<500		ug/L
			Selenium (Se)	2018/07/12	<3.0		ug/L
			Sodium (Na)	2018/07/12	<500		ug/L
			Thallium (Tl)	2018/07/12	<2.0		ug/L
			Titanium (Ti)	2018/07/12	<10		ug/L
			Uranium (U)	2018/07/12	<1.0		ug/L
			Vanadium (V)	2018/07/12	<2.0		ug/L
			Zinc (Zn)	2018/07/12	<7.0		ug/L
1915344	AG5	Spiked Blank	BOD5	2018/07/16		103	%
1915344	AG5	Spiked Blank DUP	BOD5	2018/07/16		102	%
1915344	AG5	Method Blank	BOD5	2018/07/16	<4.0		mg/L
1915344	AG5	Method Blank DUP	BOD5	2018/07/16	<4.0		mg/L
1915358	LAR	QC Standard	Fluoride (F)	2018/07/11		106	%
1915358	LAR	Method Blank	Fluoride (F)	2018/07/11	<0.10		mg/L
1915568	HMS	Spiked Blank	Total Organic Carbon	2018/07/12		99	%

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Maxxam Job #: B827486
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TATA STEEL MINERALS CANADA
Client Project #: QC QUATERLY SURFACE WATER
Site Location: GOODWOOD SURFACE WATER
Your P.O. #: 2200002147
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1915568	HMS	Method Blank	Total Organic Carbon	2018/07/12	<0.20		mg/L
1915607	MR4	Spiked Blank	Phenols-4AAP	2018/07/12		89	%
1915607	MR4	Method Blank	Phenols-4AAP	2018/07/12	<0.0020		mg/L
1916390	MR4	Spiked Blank	Dissolved organic carbon	2018/07/14		98	%
1916390	MR4	Method Blank	Dissolved organic carbon	2018/07/14	<0.20		mg/L
1916495	SD2	Spiked Blank	Mercury (Hg)	2018/07/17		105	%
1916495	SD2	Method Blank	Mercury (Hg)	2018/07/17	<0.000010		mg/L

RDL = Reportable Detection Limit

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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VALIDATION SIGNATURE PAGE

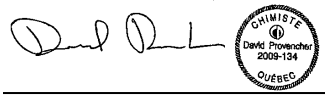
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



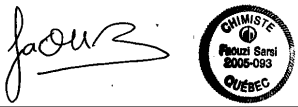
Alain Saint-Jean, B.Sc., Chemist, Supervisor



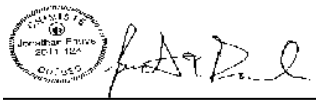
Dochka Koleva Hristova, B.Sc., Chemist



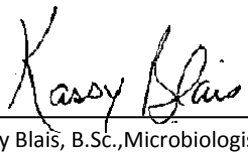
David Provencher, B.Sc., Chemist, Senior Analyst



Faouzi Sarsi, B.Sc. Chemist



Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics



Kassy Blais, B.Sc.,Microbiologist, Ste-Foy



Miryam Assayag

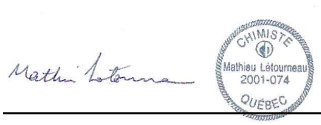
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VALIDATION SIGNATURE PAGE(CONT'D)

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



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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.

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Maxxam
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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B825713
Client Project Name & Number: TSMC GOODWOOD SED POND No. d'échantillon : FL8745-01

Test Result:

48 hrs LC50 %v/v (95% CL): 80.4 (<6.25-100) Statistical Method: Binomial **Toxic unit:** 1.24
48 hrs EC50 %v/v (95% CL): 80.4 (<6.25-100) Statistical Method: Binomial **Comment:** Toxic

Sample Name : DSO4-GW-SP-OUT-4 Sample Matrix : SURFACE WATER
Description: orange, opaque, inodore Sample Prior to Analysis:
Sample Collected: Jun 28, 2018 10:15 AM Sampling Method : Grab pH: 6.2
Sample Collected By: Youness Elhariri Site Collection: N/A Temperature : 20 °C
Sample Received: Jun 29, 2018 10:49 AM Volume Received: 1L Dissolved Oxygen: 9.3 mg/L
Analysis Start : Jul 03, 2018 11:35 PM Temp.Upon Arrival: 18 °C Sample Conductance: 18 µS/cm
End : Jul 05, 2018 01:50 PM Storage: 2-6°C Hardness: 5 mg $CaCO_3$/L

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Immobility (#)	Immobility (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	48 hrs	48 hr	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
0	22	7.1	466	8.6	21	7.6	8.1	0	0	1	10.0
6.25	22	7.2	445	8.6	21	7.6	8.2	0	0	1	10.0
12.5	21	7.2	424	8.6	22	7.5	7.9	0	0	0	0
25	21	7.2	377	8.7	21	7.5	8.4	1	10.0	0	0
50	21	7.2	281	8.7	22	7.3	8.1	0	0	0	0
100	21	6.7	82	9.0	22	6.9	8.1	0	0	8	80.0

Comments :

Culture/Control/Dilution Water: Reconstitued water for Daphnia
Hardness: 170 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Pre-aeration Time :	0 min	Rate of Pre-aeration :	40±5 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	Yes, 31 mg $CaCO_3$/L
Test Volume :	150 mL	Vessel Volume :	270 ml	Test pH Adjusted:	No
Loading Density :	15.0 mL/Daphnia	Photoperiod :	16 hours of of light; 8 hours of darkness		

Test Organism : *Daphnia magna* Source : Maxxam Lab Culture
Age at Test Initiation : <24 hres Average Brood Size : 32.6
Culture Photoperiod : 16 hours of of light; 8 hours of darkness % Mortality within 7 days : 0
Culture Temperature : 20 ± 2 °C Time To First Brood : 8 Days
Culture Diet Fed once a day.

Reference chemical: Potassium Dichromate Test Date: Jun 26, 2018
Test Endpoint 48 hrs LC50 (95% confidence interval) : 0.18 (<6.25, 0.25)mg/L Statistical Method : Binomial
Historical Mean LC50 (warning limits) : 0.17 (0.099, 0.31) mg/L Concentration : 0,0.0625,0.125,0.25,0.5,1 mg/L

Test Method QUE SOP-00406. Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. EPS1/RM/14 - Second Edition. Environment Canada. 2000.

This is essentially a 48H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations: No change was made to the method.

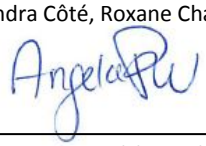
The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B825713

Client Project Name & Number: TSMC GOODWOOD SED POND No. d'échantillon : FL8745-01

Analyst : Alexandra Côté, Roxane Champagne



Verified By : Angela Paquet-Walsh, Analyst 2 Date: Jul 16, 2018 10:56 AM

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

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Client : 4526 TATA STEEL MINERALS CANADA Job Number: B825713

Client Project Name & Number: TSMC GOODWOOD SED POND

Test Result:

96 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual

Toxic unit: <1

Comment: Non-toxic

Sample Name : DSO4-GW-SP-OUT-4 Sample Matrix : SURFACE WATER

Description: Pink, few solids, opaque Sample Number: FL8745-01

Sample Collected: Jun 28, 2018 10:15 AM Sampling Method : Grab Site Collection: N/A

Sample Collected By: Youness Elhariri Volume Received: 40 L Temp.Upon Arrival: 18 °C Storage: 2-6°C

Sample Received: Jun 29, 2018 10:49 AM pH: 5.6 Dissolved Oxygen: 10.0 mg/L

Analysis Start : Jul 02, 2018 04:55 PM Temperature : 15 °C Sample Conductance: 16 µS/cm

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	96 hrs	96 hr	96 hrs	24 hrs	24 hrs	24 hrs	24 hrs
0	15	7.4	218	9.9	15	7.3	8.7	0	0	0	0
6.25	15	7.4	206	10.0	15	7.4	10.0	0	0	0	0
12.5	15	7.4	191	10.0	15	7.4	10.0	0	0	0	0
25	15	7.3	170	10.0	15	7.4	10.3	0	0	0	0
50	15	7.2	118	10.0	15	7.3	9.9	0	0	0	0
100	15	5.7	17	10.0	15	6.2	10.1	0	0	0	0

Concentration	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	48 hrs	48 hrs	48 hrs	48 hrs	72 hrs	72 hrs	72 hrs	72 hrs	96 hrs	96 hrs	96 hrs	96 hrs
0	0	0	0	0	0	0	0	0	0	0	0	0
6.25	0	0	0	0	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0

Comments : No discrepancies observed during the test.

Culture/Control/Dilution Water Dechlorinated municipal tap water

Hardness: 54 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	35 cm
Total # of Organisms Used :	60	Pre-aeration Time :	30 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	16 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.3 g/L	Photoperiod :	16 hours of of light; 8 hours of darkness		
Test vessel:	20L glass aquarium with polyethylene bag.				

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client :	4526	TATA STEEL MINERALS CANADA		Job Number:	B825713
Client Project Name & Number:		TSMC GOODWOOD SED POND		Sample Number:	FL8745-01

Test Organism :	Rainbow Trout *(Oncorhynchus mykiss)*		Source :	Piscicultures Les Arpents Verts	
Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.5 ± 0.1 g	Length (Mean) +- SD :	3.67 ± 0.26 cm
Culture Water Renewal :	2 liters/min	Weight (Range) :	0.3 – 0.7 g	Length (Range) :	3.20 – 4.20 cm
Culture Photoperiod :	16 hours of of light; 8 hours of darkness			% Mortality within 7 days :	0%
Feeding rate and frequency :	1-2x a day; 1-5% of the body weights.			Acclimation Time:	>14 days

Reference chemical:	Phenol	Test Date:	Jun 29, 2018
Test Endpoint 96 hrs LC50 (95% confidence interval) :	9.70 (8.22, 11.3)mg/L	Statistical Method :	Probit
Historical Mean LC50 (warning limits) :	9.78 (7.75, 12.3) mg/L	Concentration :	0,4,6,9,13,18 mg/L

Test Method

QUE SOP - 00408. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS1/RM/13 - Second Edition. Environment Canada. 2000. (Including Amendments: May 2007).

This is essentially a 96H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations : No change was made to the method.

Analyst : Alexandra Côté, Alexis Roy, Olivier Roberge

Verified By : Angela Paquet-Walsh, Analyst 2

Date: Jul 16, 2018 09:34 AM

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/16
Report #: R2382914
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825713
Received: 2018/06/29, 10:49

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Daphnia - LC50 (acute-48h)-Federal (1)	1	N/A	2018/07/03	QUE SOP-00406	EPS1/RM/14
Hardness by ICP-MS (1)	1	2018/06/29	2018/06/29	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Hardness by ICP-MS (1)	1	2018/07/03	2018/07/03	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Rainbow Trout - LC50 (acute-96h) (1)	1	N/A	2018/07/02	QUE SOP - 00408	EPS1/RM/13

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam - Québec

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/16
Report #: R2382914
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825713
Received: 2018/06/29, 10:49

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B825713
Report Date: 2018/07/16

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

ECOTOXICOLOGY (SURFACE WATER)

Maxxam ID		FL8745	
Sampling Date		2018/06/28 10:15	
COC Number		N-A	
	Units	**DSO4-GW-SP-OUT-4**	**QC Batch**
Daphnia Magna - Can			
LC50	%v/v	ATTACHED	1912246
Rainbow Trout			
LC50	%v/v	ATTACHED	1912167
QC Batch = Quality Control Batch			

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Maxxam Job #: B825713
Report Date: 2018/07/16

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

GENERAL COMMENTS

Results relate only to the items tested.

2018/07/16 10:58

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Maxxam Job #: B825713
Report Date: 2018/07/16

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

VALIDATION SIGNATURE PAGE

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



Angela Paquet-Walsh, M.Sc. Biologist, Analyst 2

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Votre # du projet: B825709

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/17
Rapport: R5299224
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8G5902
Reçu: 2018/07/05, 09:10

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/07/16	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B825709

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/17
Rapport: R5299224
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8G5902
Reçu: 2018/07/05, 09:10

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8G5902
Date du rapport: 2018/07/17

Maxxam Analytique
Votre # du projet: B825709

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HDD219		
Date d'échantillonnage		2018/06/28 10:15		
	Unités	**FL8741-01R\DSO4-GW-SP-OUT-4**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5625014

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8G5902
Date du rapport: 2018/07/17

Maxxam Analytique
Votre # du projet: B825709

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8G5902
Date du rapport: 2018/07/17

Maxxam Analytique
Votre # du projet: B825709

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5625014	RK6	Blanc fortifié	Radium-226	2018/07/16		100	%	85 - 115
5625014	RK6	Blanc de méthode	Radium-226	2018/07/16	<0.0050		Bq/L	
5625014	RK6	RPD	Radium-226	2018/07/16	29		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération

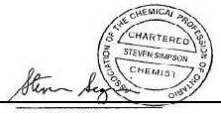
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Dossier Maxxam: B8G5902
Date du rapport: 2018/07/17

Maxxam Analytique
Votre # du projet: B825709

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



B.Sc., M.B.A., CChem

Steven Simpson

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/18
Report #: R2383544
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825709
Received: 2018/06/29, 10:43

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/18
Report #: R2383544
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825709
Received: 2018/06/29, 10:43

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B825709
Report Date: 2018/07/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/03
Report #: R2379818
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825695
Received: 2018/06/29, 10:02

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Suspended Solids (1)	1	2018/06/29	2018/06/29	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level) (1)	1	2018/06/29	2018/06/29	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
pH (1)	1	N/A	2018/06/29	QUE SOP-00142	MA.303-TitrAuto 2.1m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam - Québec

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/03
Report #: R2379818
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B825695
Received: 2018/06/29, 10:02

Encryption Key

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Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B825695
Report Date: 2018/07/03

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FL8726		
Sampling Date		2018/06/28 10:15		
COC Number		N-A		
	Units	**DSO4-GW-SP-OUT-4**	**RDL**	**QC Batch**
METALS ICP-MS				
Arsenic (As)	ug/L	1.1	1.0	1911733
Copper (Cu)	ug/L	2.4	1.0	1911733
Iron (Fe)	ug/L	4400	60	1911733
Nickel (Ni)	ug/L	<2.0	2.0	1911733
Lead (Pb)	ug/L	0.61	0.50	1911733
Zinc (Zn)	ug/L	8.6	7.0	1911733

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B825695
Report Date: 2018/07/03

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FL8726		
Sampling Date		2018/06/28 10:15		
COC Number		N-A		
	Units	**DSO4-GW-SP-OUT-4**	**RDL**	**QC Batch**
CONVENTIONALS				
pH	pH	6.54	N/A	1912040
Total suspended solids (TSS)	mg/L	7.2	2.0	1911814

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

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Maxxam Job #: B825695
Report Date: 2018/07/03

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

GENERAL COMMENTS

Results relate only to the items tested.

2018/07/03 08:58

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Maxxam Job #: B825695
Report Date: 2018/07/03

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1911733	DRL	QC Standard	Arsenic (As)	2018/06/29		103	%
			Copper (Cu)	2018/06/29		103	%
			Iron (Fe)	2018/06/29		118	%
			Nickel (Ni)	2018/06/29		102	%
			Lead (Pb)	2018/06/29		103	%
			Zinc (Zn)	2018/06/29		101	%
1911733	DRL	Spiked Blank	Arsenic (As)	2018/06/29		105	%
			Copper (Cu)	2018/06/29		104	%
			Iron (Fe)	2018/06/29		105	%
			Nickel (Ni)	2018/06/29		100	%
			Lead (Pb)	2018/06/29		106	%
			Zinc (Zn)	2018/06/29		105	%
1911733	DRL	Method Blank	Arsenic (As)	2018/06/29	<1.0		ug/L
			Copper (Cu)	2018/06/29	<1.0		ug/L
			Iron (Fe)	2018/06/29	<60		ug/L
			Nickel (Ni)	2018/06/29	<2.0		ug/L
			Lead (Pb)	2018/06/29	<0.50		ug/L
			Zinc (Zn)	2018/06/29	<7.0		ug/L
1911814	SSK	Spiked Blank	Total suspended solids (TSS)	2018/06/29		108	%
1911814	SSK	Method Blank	Total suspended solids (TSS)	2018/06/29	<2.0		mg/L
1912040	CB8	QC Standard	pH	2018/06/29		100	%

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

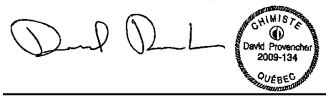
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Report Date: 2018/07/03

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: YE

VALIDATION SIGNATURE PAGE

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David Provencher, B.Sc., Chemist, Senior Analyst

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B824562

Client Project Name & Number: TSMC GOODWOOD SED POND

Test Result:

96 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual

Toxic unit: <1.0

Comment: non-toxique

Sample Name : DSO4-GW-SP-OUT-3

Sample Matrix : SURFACE WATER

Description: Rouge, opaque et présence de solides

Sample Number: FL3236-02

Sample Collected: Jun 21, 2018 10:00 AM Sampling Method : Grab

Site Collection: N/A

Sample Collected By: Pallav Sinha Volume Received: 40 L

Temp.Upon Arrival: 19 °C Storage: 2-6°C

Sample Received: Jun 22, 2018 11:22 AM pH: 5.3

Dissolved Oxygen: 10.3 mg/L

Analysis Start : Jun 23, 2018 11:30 AM Temperature : 15 °C

Sample Conductance: 16 µS/cm

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	96 hrs	96 hr	96 hrs	24 hrs	24 hrs	24 hrs	24 hrs
0	16	7.1	181	10.0	15	7.4	10.2	0	0	0	0
6.25	16	7.1	172	9.9	15	7.1	9.3	0	0	0	0
12.5	16	7.0	161	10.0	15	7.2	10.0	0	0	0	0
25	16	7.0	143	10.0	15	7.2	10.2	0	0	0	0
50	16	6.9	102	10.2	15	7.1	10.3	0	0	0	0
100	15	5.4	16	10.2	15	6.0	10.2	0	0	0	0

Concentration	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	48 hrs	48 hrs	48 hrs	48 hrs	72 hrs	72 hrs	72 hrs	72 hrs	96 hrs	96 hrs	96 hrs	96 hrs
0	0	0	0	0	0	0	0	0	0	0	0	0
6.25	0	0	0	0	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0

Comments : Aucune anomalie observée durant l'essai.

Culture/Control/Dilution Water Dechlorinated municipal tap water

Hardness: 54 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	35 cm
Total # of Organisms Used :	60	Pre-aeration Time :	120 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	16 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.3 g/L	Photoperiod :	16 hours of of light; 8 hours of darkness		
Test vessel:	Plastic container with polyethylene bag.				

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client :	4526	TATA STEEL MINERALS CANADA		Job Number:	B824562
Client Project Name & Number:		TSMC GOODWOOD SED POND		Sample Number:	FL3236-02

Test Organism :	Rainbow Trout *(Oncorhynchus mykiss)*		Source :	Piscicultures Les Arpents Verts	
Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.4 ± 0.1 g	Length (Mean) +- SD :	3.67 ± 0.26 cm
Culture Water Renewal :	2 liters/min	Weight (Range) :	0.3 – 0.7 g	Length (Range) :	3.10 – 4.00 cm
Culture Photoperiod :	16 hours of of light; 8 hours of darkness			% Mortality within 7 days :	0.2%
Feeding rate and frequency :	1-2x a day; 1-5% of the body weights.			Acclimation Time:	>14 days

Reference chemical:	Phenol	Test Date:	Jun 19, 2018
Test Endpoint 96 hrs LC50 (95% confidence interval) :	11.6 (9.98, 13.3)mg/L	Statistical Method :	Probit
Historical Mean LC50 (warning limits) :	9.73 (7.75, 12.2) mg/L	Concentration :	0,4,6,9,13,18 mg/L

Test Method

QUE SOP - 00408. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS1/RM/13 - Second Edition. Environment Canada. 2000. (Including Amendments: May 2007).

This is essentially a 96H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations : Aucune

Analyst : Alexis Roy, Olivier Roberge, Roxane Champagne

Alexandra Côté

Verified By : Alexandra Côté, B.Sc. Biologist

Date: Jul 10, 2018 10:50 AM

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B824562

Client Project Name & Number: TSMC GOODWOOD SED POND No. d'échantillon : FL3236-01

Test Result:

48 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual **Toxic unit:** <1.0

48 hrs EC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual **Comment:** non-toxique

Sample Name : DSO4-GW-SP-OUT-3 Sample Matrix : SURFACE WATER

Description: Orange, opaque, inodore, présence de solides décantables Sample Prior to Analysis:

Sample Collected:	Jun 21, 2018 10:00 AM	Sampling Method :	Grab	pH:	6.5
Sample Collected By:	Pallav Sinha	Site Collection:	N/A	Temperature :	20 °C
Sample Received:	Jun 22, 2018 11:22 AM	Volume Received:	1 L	Dissolved Oxygen:	9.9 mg/L
Analysis Start :	Jun 26, 2018 11:00 AM	Temp.Upon Arrival:	19 °C	Sample Conductance:	87 µS/cm
End :	Jun 28, 2018 09:50 AM	Storage:	2-6°C	Hardness:	4 mg $CaCO_3$/L

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Immobility (#)	Immobility (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	48 hrs	48 hr	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
0	20	7.3	460	8.7	20	7.3	8.7	0	0	0	0
6.25	20	7.4	442	8.8	20	7.4	8.7	0	0	0	0
12.5	20	7.4	427	8.8	20	7.4	8.7	0	0	0	0
25	20	7.4	380	8.8	19	7.4	8.9	0	0	0	0
50	20	7.4	289	9.0	20	7.3	8.7	0	0	0	0
100	19	7.2	89	9.1	20	7.1	8.8	0	0	4	40.0

Comments : Présence de mortalités dans le 100% v/v.

Culture/Control/Dilution Water: Dechlorinated municipal tap water

Hardness: 54 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Pre-aeration Time :	30 min	Rate of Pre-aeration :	40±5 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	Yes, 32 mg $CaCO_3$/L
Test Volume :	150 mL	Vessel Volume :	270 ml	Test pH Adjusted:	No
Loading Density :	15.0 mL/Daphnia	Photoperiod :	16 hours of of light; 8 hours of darkness		

Test Organism : *Daphnia magna* Source : Maxxam Lab Culture

Age at Test Initiation :	<24 hres	Average Brood Size :	15.0
Culture Photoperiod :	16 hours of of light; 8 hours of darkness	% Mortality within 7 days :	0
Culture Temperature :	20 ± 2 °C	Time To First Brood :	8 Days
Culture Diet	Fed once a day.		

Reference chemical: Potassium Dichromate Test Date: Jun 26, 2018

Test Endpoint 48 hrs LC50 (95% confidence interval) : 0.18 (N/A, 0.25)mg/L Statistical Method : Binomial

Historical Mean LC50 (warning limits) : 0.17 (0.099, 0.31) mg/L Concentration : 0,0.0625,0.125,0.25,0.5,1 mg/L

Test Method QUE SOP-00406. Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. EPS1/RM/14 - Second Edition. Environment Canada. 2000.

This is essentially a 48H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations: Aucune

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Client : 4526 TATA STEEL MINERALS CANADA

Job Number: B824562

Client Project Name & Number: TSMC GOODWOOD SED POND

No. d'échantillon : FL3236-01

Analyst : Angela Paquet-Walsh, Roxane Champagne

Verified By : Alexandra Côté, B.Sc. Biologist

Date: Jul 10, 2018 10:47 AM

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/10
Report #: R2381591
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824562
Received: 2018/06/22, 11:22

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Daphnia - LC50 (acute-48h)-Federal (1)	1	N/A	2018/06/26	QUE SOP-00406	EPS1/RM/14
Hardness by ICP-MS (1)	1	2018/06/22	2018/06/22	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Hardness by ICP-MS (1)	1	2018/06/26	2018/06/26	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Rainbow Trout - LC50 (acute-96h) (1)	1	N/A	2018/06/23	QUE SOP - 00408	EPS1/RM/13

Remarks:

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam - Québec

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
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MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/10
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Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824562
Received: 2018/06/22, 11:22

Encryption Key

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Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B824562
Report Date: 2018/07/10

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

ECOTOXICOLOGY (SURFACE WATER)

Maxxam ID		FL3236	
Sampling Date		2018/06/21 10:00	
COC Number		N-A	
	Units	**DSO4-GW-SP-OUT-3**	**QC Batch**
Daphnia Magna - Can			
LC50	%v/v	ATTACHED	1910313
Rainbow Trout			
LC50	%v/v	ATTACHED	1910190
QC Batch = Quality Control Batch			

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Maxxam Job #: B824562
Report Date: 2018/07/10

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

Results relate only to the items tested.

2018/07/10 11:25

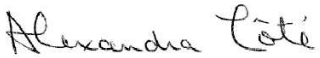
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Maxxam Job #: B824562
Report Date: 2018/07/10

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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



Alexandra Côté, B.Sc. Biologist

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Votre # du projet: B824558

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/05
Rapport: R5281887
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8F7937
Reçu: 2018/06/27, 08:45

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/07/04	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B824558

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/05
Rapport: R5281887
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8F7937
Reçu: 2018/06/27, 08:45

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

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Dossier Maxxam: B8F7937
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B824558

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		HBI789		
Date d'échantillonnage		2018/06/21 10:00		
	Unités	**FL3232-01R\DSO4-GW -SP-OUT-3**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5597212

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8F7937
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B824558

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8F7937
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B824558

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5597212	RK6	Blanc fortifié	Radium-226	2018/07/04		91	%	85 - 115
5597212	RK6	Blanc de méthode	Radium-226	2018/07/04	<0.0050		Bq/L	
5597212	RK6	RPD [HBI789-01]	Radium-226	2018/07/04	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

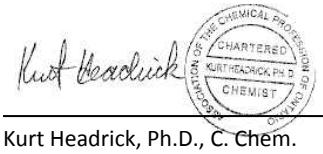
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Dossier Maxxam: B8F7937
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B824558

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/10
Report #: R2381563
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824558
Received: 2018/06/22, 11:17

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/10
Report #: R2381563
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824558
Received: 2018/06/22, 11:17

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B824558
Report Date: 2018/07/10

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/26
Report #: R2378427
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824526
Received: 2018/06/22, 10:22

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Suspended Solids (1)	1	2018/06/22	2018/06/22	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level) (1)	1	2018/06/22	2018/06/22	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
pH (1)	1	N/A	2018/06/22	QUE SOP-00142	MA.303-TitrAuto 2.1m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam - Québec

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: N-A

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/26
Report #: R2378427
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B824526
Received: 2018/06/22, 10:22

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B824526
Report Date: 2018/06/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FL3163		
Sampling Date		2018/06/21 10:00		
COC Number		N-A		
	Units	**DSO4-GW-SP-OUT-3**	**RDL**	**QC Batch**
METALS ICP-MS				
Arsenic (As)	ug/L	1.4	1.0	1909839
Copper (Cu)	ug/L	<1.0	1.0	1909839
Nickel (Ni)	ug/L	<2.0	2.0	1909839
Lead (Pb)	ug/L	<0.50	0.50	1909839
Zinc (Zn)	ug/L	7.1	7.0	1909839

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B824526
Report Date: 2018/06/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FL3163		
Sampling Date		2018/06/21 10:00		
COC Number		N-A		
	Units	**DSO4-GW-SP-OUT-3**	**RDL**	**QC Batch**
CONVENTIONALS				
pH	pH	6.38	N/A	1910128
Total suspended solids (TSS)	mg/L	<2.0	2.0	1909842

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

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Maxxam Job #: B824526
Report Date: 2018/06/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

Results relate only to the items tested.

2018/06/26 09:37

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Maxxam Job #: B824526
Report Date: 2018/06/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1909839	JRC	QC Standard	Arsenic (As)	2018/06/22		103	%
			Copper (Cu)	2018/06/22		102	%
			Nickel (Ni)	2018/06/22		101	%
			Lead (Pb)	2018/06/22		96	%
			Zinc (Zn)	2018/06/22		99	%
1909839	JRC	Spiked Blank	Arsenic (As)	2018/06/22		106	%
			Copper (Cu)	2018/06/22		96	%
			Nickel (Ni)	2018/06/22		101	%
			Lead (Pb)	2018/06/22		101	%
			Zinc (Zn)	2018/06/22		101	%
1909839	JRC	Method Blank	Arsenic (As)	2018/06/23	<1.0		ug/L
			Copper (Cu)	2018/06/23	<1.0		ug/L
			Nickel (Ni)	2018/06/23	<2.0		ug/L
			Lead (Pb)	2018/06/23	<0.50		ug/L
			Zinc (Zn)	2018/06/23	<7.0		ug/L
1909842	SSK	Spiked Blank	Total suspended solids (TSS)	2018/06/22		118	%
1909842	SSK	Method Blank	Total suspended solids (TSS)	2018/06/22	<2.0		mg/L
1910128	LAR	QC Standard	pH	2018/06/22		100	%

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

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Maxxam Job #: B824526
Report Date: 2018/06/26

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Votre # du projet: B823156

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/05
Rapport: R5281760
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8E9337
Reçu: 2018/06/19, 10:15

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/07/04	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B823156

Attention: Martine Lepage

Maxxam Analytique
2690 Avenue Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/07/05
Rapport: R5281760
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8E9337
Reçu: 2018/06/19, 10:15

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8E9337
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B823156

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		GZN022		
Date d'échantillonnage		2018/06/14 07:48		
	Unités	**FK4964-01R\DSO4-GW-SP-OUT-2**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5592682

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8E9337
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B823156

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8E9337
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B823156

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5592682	RK6	Blanc fortifié	Radium-226	2018/07/04		96	%	85 - 115
5592682	RK6	Blanc de méthode	Radium-226	2018/07/04	<0.0050		Bq/L	
5592682	RK6	RPD [GZN022-01]	Radium-226	2018/07/04	NC		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

NC (RPD du duplicata) : La RPD du duplicata n'a pas été calculée. La concentration de l'échantillon ou du duplicata était trop faible pour permettre le calcul de la RPD (différence absolue <= 2x LDR)

Réc = Récupération

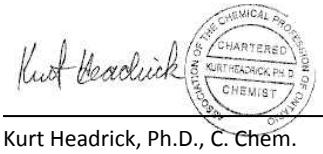
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Dossier Maxxam: B8E9337
Date du rapport: 2018/07/05

Maxxam Analytique
Votre # du projet: B823156

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: 175752

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/06
Report #: R2380845
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B823156
Received: 2018/06/15, 13:04

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: 175752

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/07/06
Report #: R2380845
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B823156
Received: 2018/06/15, 13:04

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B823156
Report Date: 2018/07/06

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

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.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: 1757752

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/18
Report #: R2376703
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B823102
Received: 2018/06/15, 10:36

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Suspended Solids (1)	1	2018/06/15	2018/06/15	QUE SOP-00111	MA.104–S.S. 2.0 m
Total Extractable Metals (Low Level) (1)	1	2018/06/15	2018/06/15	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
pH (1)	1	N/A	2018/06/15	QUE SOP-00142	MA.303-TitrAuto 2.1m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam - Québec

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site Location: TSMC
Your C.O.C. #: 1757752

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/18
Report #: R2376703
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B823102
Received: 2018/06/15, 10:36

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B823102
Report Date: 2018/06/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

TOTAL EXTRACTABLE METALS (SURFACE WATER)

Maxxam ID		FK3806		
Sampling Date		2018/06/14 07:48		
COC Number		1757752		
	Units	**DSO4-GW-SP-OUT-2**	**RDL**	**QC Batch**
METALS ICP-MS				
Arsenic (As)	ug/L	1.2	1.0	1907566
Copper (Cu)	ug/L	1.8	1.0	1907566
Iron (Fe)	ug/L	5600	60	1907566
Nickel (Ni)	ug/L	<2.0	2.0	1907566
Lead (Pb)	ug/L	0.75	0.50	1907566
Zinc (Zn)	ug/L	7.1	7.0	1907566

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B823102
Report Date: 2018/06/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (SURFACE WATER)

Maxxam ID		FK3806	FK3806		
Sampling Date		2018/06/14 07:48	2018/06/14 07:48		
COC Number		1757752	1757752		
	Units	DSO4-GW-SP-OUT-2	DSO4-GW-SP-OUT-2 Lab-Dup	RDL	QC Batch
CONVENTIONALS					
pH	pH	6.69	N/A	N/A	1907775
Total suspended solids (TSS)	mg/L	<2.0	<2.0	2.0	1907526

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

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Maxxam Job #: B823102
Report Date: 2018/06/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

Results relate only to the items tested.

2018/06/18 07:58

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Maxxam Job #: B823102
Report Date: 2018/06/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1907526	FRB	Spiked Blank	Total suspended solids (TSS)	2018/06/15		109	%
1907526	FRB	Method Blank	Total suspended solids (TSS)	2018/06/15	<2.0		mg/L
1907566	JRC	QC Standard	Arsenic (As)	2018/06/15		104	%
			Copper (Cu)	2018/06/15		101	%
			Iron (Fe)	2018/06/15		106	%
			Nickel (Ni)	2018/06/15		102	%
			Lead (Pb)	2018/06/15		100	%
			Zinc (Zn)	2018/06/15		101	%
1907566	JRC	Spiked Blank	Arsenic (As)	2018/06/15		106	%
			Copper (Cu)	2018/06/15		101	%
			Iron (Fe)	2018/06/15		105	%
			Nickel (Ni)	2018/06/15		105	%
			Lead (Pb)	2018/06/15		99	%
			Zinc (Zn)	2018/06/15		99	%
1907566	JRC	Method Blank	Arsenic (As)	2018/06/15	<1.0		ug/L
			Copper (Cu)	2018/06/15	<1.0		ug/L
			Iron (Fe)	2018/06/15	<60		ug/L
			Nickel (Ni)	2018/06/15	<2.0		ug/L
			Lead (Pb)	2018/06/15	<0.50		ug/L
			Zinc (Zn)	2018/06/15	<7.0		ug/L
1907775	GG1	QC Standard	pH	2018/06/15		100	%

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

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Maxxam Job #: B823102
Report Date: 2018/06/18

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: TSMC
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Mathieu Letourneau, B. Sc., Chemist, Scientific Service Specialist

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Votre # du projet: B822102

Attention: Martine Lepage

Maxxam for TATA Steels
2690 Ave Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/06/20
Rapport: R5258119
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8E1563
Reçu: 2018/06/12, 08:50

Matrice: Eau
Nombre d'échantillons reçus: 1

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	(référence)
Radium-226 par spectrométrie alpha (1)	1	N/A	2018/06/19	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Spectrométrie alpha

Remarques:

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Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
(1) Les résultats pour le radium-226 n'ont pas été corrigé pour le blanc de méthode.

Votre # du projet: B822102

Attention: Martine Lepage

Maxxam for TATA Steels
2690 Ave Dalton
Sainte-Foy, QC
Canada G1P 3S4

Date du rapport: 2018/06/20
Rapport: R5258119
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B8E1563
Reçu: 2018/06/12, 08:50

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Faiz Ahmed,
Courriel: FAhmed@maxxam.ca
Téléphone (905) 826-3080

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B8E1563
Date du rapport: 2018/06/20

Maxxam for TATA Steels
Votre # du projet: B822102

RÉSULTATS D'ANALYSES POUR LES ÉCHANTILLONS D' EAU

Identification Maxxam		GXU723		
Date d'échantillonnage		2018/06/07 08:45		
	Unités	**FJ8353-01R\DSO4-GW -SP-OUT-1**	**LDR**	**Lot CQ**
Radium-226	Bq/L	<0.0050	0.0050	5576164

LDR = limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

Maxxam Analytics International Corporation o/a Maxxam Analytics 6790 Kitimat Rd, Unit 4, Mississauga, ON L5N 5L9 Phone: (905) 826-3080 Fax: (905) 826-4151 Toll Free: 1 877-726-3080 www.maxxam.ca

Dossier Maxxam: B8E1563
Date du rapport: 2018/06/20

Maxxam for TATA Steels
Votre # du projet: B822102

REMARQUES GÉNÉRALES

Radium-226: Cette analyse est accréditée par le MDDELCC.

Les résultats s'appliquent seulement pour les paramètres analysés.

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Dossier Maxxam: B8E1563
Date du rapport: 2018/06/20

Maxxam for TATA Steels
Votre # du projet: B822102

RAPPORT ASSURANCE QUALITÉ

Lot Lot	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités	Limites CQ
5576164	RK6	Blanc fortifié	Radium-226	2018/06/18		98	%	85 - 115
5576164	RK6	Blanc de méthode	Radium-226	2018/06/18	<0.0050		Bq/L	
5576164	RK6	RPD	Radium-226	2018/06/18	4.5		%	N/A

N/A = Non Applicable

Duplicata: Deux parties aliquotes distinctes obtenues à partir d'un même échantillon et soumises en même temps au même processus analytique du prétraitement au dosage. Les duplicatas servent à vérifier la variance de la mesure.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération

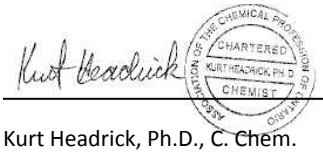
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Votre # du projet: B822102

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Kurt Headrick, Ph.D., C. Chem.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les <<signataires>> requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Success Through Science®

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/21
Report #: R2377937
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B822102
Received: 2018/06/08, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Radium 226 (MMER LOW LEVEL) (1)	1	N/A	N/A		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam-Radiological Lab

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/21
Report #: R2377937
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B822102
Received: 2018/06/08, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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.

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Maxxam Job #: B822102
Report Date: 2018/06/21

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B821844

Client Project Name & Number: DSO4 1A GOODWOOD SED POND (ECOTOX)

Test Result:

96 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual

Toxic unit: <1.0

Comment: non-toxique

Sample Name : DSO4-GW-SP-OUT-1

Sample Matrix : SURFACE WATER

Description: orange, opaque, particules fines, inodore

Sample Number: FJ6803-01

Sample Collected: Jun 06, 2018 08:45 AM Sampling Method : Grab

Site Collection: N/A

Sample Collected By: J.F.DION Volume Received: 40L

Temp.Upon Arrival: 18 °C Storage: 2-6°C

Sample Received: Jun 08, 2018 08:30 AM pH: 6.1

Dissolved Oxygen: 9.6 mg/L

Analysis Start : Jun 09, 2018 12:45 PM Temperature : 15 °C

Sample Conductance: 16 µS/cm

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	96 hrs	96 hr	96 hrs	24 hrs	24 hrs	24 hrs	24 hrs
0	15	7.2	219	9.4	14	7.4	10.3	0	0	0	0
6.25	15	7.3	208	9.5	15	7.4	10.2	0	0	0	0
12.5	15	7.4	196	9.6	15	7.4	10.2	0	0	0	0
25	15	7.4	172	9.6	15	7.3	9.9	0	0	0	0
50	15	7.3	124	9.6	15	7.2	10.2	0	0	0	0
100	15	6.4	16	9.3	15	6.2	10.2	0	0	0	0

Concentration	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)	Atypical Behaviour (#)	Atypical Behaviour (%)	Mortality (#)	Mortality (%)
%v/v	48 hrs	48 hrs	48 hrs	48 hrs	72 hrs	72 hrs	72 hrs	72 hrs	96 hrs	96 hrs	96 hrs	96 hrs
0	0	0	0	0	0	0	0	0	0	0	1	10.0
6.25	0	0	0	0	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0

Comments :

Culture/Control/Dilution Water Dechlorinated municipal tap water

Hardness: 79 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Test Temperature :	15 ± 1 °C	Solution Depth :	35 cm
Total # of Organisms Used :	60	Pre-aeration Time :	30 min.	Rate of Aeration	6.5±1 mL/min/L
Test Volume :	16 L	Vessel Volume :	20L	Test pH Adjusted:	No
Loading Density :	0.3 g/L	Photoperiod :	16 hours of of light; 8 hours of darkness		
Test vessel:	Plastic container with polyethylene bag.				

The results contained in this report refer only to the testing of the sample submitted. This report may not be reproduced, except in its entirety, without the written approval of the laboratory.

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RESULTS OF RAINBOW TROUT - LC50 (ACUTE-96H)

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Client : 4526 TATA STEEL MINERALS CANADA Job Number: B821844

Client Project Name & Number: DSO4 1A GOODWOOD SED POND (ECOTOX) Sample Number: FJ6803-01

Test Organism :	Rainbow Trout *(Oncorhynchus mykiss)*	Source :	Piscicultures Les Arpents Verts		
Culture Temperature :	15 ± 2 °C	Weight (Mean) +- SD :	0.4 ± 0.1 g	Length (Mean) +- SD :	3.46 ± 0.28 cm
Culture Water Renewal :	2 liters/min	Weight (Range) :	0.3 – 0.7 g	Length (Range) :	3.10 – 4.10 cm
Culture Photoperiod :	16 hours of of light; 8 hours of darkness			% Mortality within 7 days :	0%
Feeding rate and frequency :	1-2x a day; 1-5% of the body weights.			Acclimation Time:	>14 days

Reference chemical:	Phenol	Test Date:	Jun 14, 2018
Test Endpoint 96 hrs LC50 (95% confidence interval) :	10.8 (9.48, 12.3)mg/L	Statistical Method :	Probit
Historical Mean LC50 (warning limits) :	9.66 (7.67, 12.2) mg/L	Concentration :	0,4,6,9,13,18 mg/L

Test Method

QUE SOP - 00408. Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout. EPS1/RM/13 - Second Edition. Environment Canada. 2000. (Including Amendments: May 2007).

This is essentially a 96H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations : Aucune

Analyst : Alexandra Côté, Alexis Roy, Angela Paquet-Walsh

Alexandra Côté

Verified By : Alexandra Côté, B.Sc. Biologist

Date: Jun 20, 2018 09:34 AM

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Success Through Science®

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B821844

Client Project Name & Number: DSO4 1A GOODWOOD SED POND (ECOTOX) No. d'échantillon : FJ6803-02

Test Result:

48 hrs LC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual **Toxic unit:** <1.0

48 hrs EC50 %v/v (95% CL): >100 (N/A) Statistical Method: Visual **Comment:** non-toxique

Sample Name : DSO4-GW-SP-OUT-1 Sample Matrix : SURFACE WATER

Description: opaque, orangé, inodore, particules fines en suspension Sample Prior to Analysis:

Sample Collected:	Jun 06, 2018 08:45 AM	Sampling Method :	Grab	pH:	5.7
Sample Collected By:	J.F.DION	Site Collection:	N/A	Temperature :	20 °C
Sample Received:	Jun 08, 2018 08:30 AM	Volume Received:	1L	Dissolved Oxygen:	8.2 mg/L
Analysis Start :	Jun 11, 2018 12:45 PM	Temp.Upon Arrival:	18 °C	Sample Conductance:	22 µS/cm
End :	Jun 13, 2018 02:40 PM	Storage:	2-6°C	Hardness:	4 mg $CaCO_3$/L

Concentration	Temperature (°C)	pH (pH)	Conductivity (uS/cm)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (pH)	Dissolved oxygen (mg/L)	Immobility (#)	Immobility (%)	Mortality (#)	Mortality (%)
%v/v	Initial	Initial	Initial	Initial	48 hrs	48 hr	48 hrs	48 hrs	48 hrs	48 hrs	48 hrs
0	18	7.5	459	9.0	20	7.4	8.7	0	0	0	0
6.25	19	7.5	452	8.7	20	7.5	8.6	0	0	1	10.0
12.5	19	7.5	428	9.0	19	7.5	8.8	0	0	0	0
25	19	7.4	384	8.9	20	7.5	8.6	0	0	0	0
50	19	7.3	293	8.9	20	7.5	8.6	1	10.0	1	10.0
100	20	7.1	93	8.8	20	7.5	8.7	0	0	1	10.0

Comments :

Culture/Control/Dilution Water: Reconstitued water for Daphnia

Hardness: 170 mg/l $CaCO_3$ Other parameters available on request.

Test Conditions Test concentration : 0,6.25,12.5,25,50,100 (%v/v)

Organisms per Vessel :	10	Pre-aeration Time :	30 min	Rate of Pre-aeration :	40±5 mL/min/L
Total # of Organisms Used :	60	Test Temperature :	20 ± 2 °C	Test Hardness Adjusted :	Yes, 30 mg $CaCO_3$/L
Test Volume :	150 mL	Vessel Volume :	270 ml	Test pH Adjusted:	No
Loading Density :	15.0 mL/Daphnia	Photoperiod :	16 hours of of light; 8 hours of darkness		

Test Organism : *Daphnia magna* Source : Maxxam Lab Culture

Age at Test Initiation :	<24 hres	Average Brood Size :	25.6
Culture Photoperiod :	16 hours of of light; 8 hours of darkness	% Mortality within 7 days :	2.0
Culture Temperature :	20 ± 2 °C	Time To First Brood :	8 Days
Culture Diet	Fed once a day.		

Reference chemical: Potassium Dichromate Test Date: Jun 11, 2018

Test Endpoint 48 hrs LC50 (95% confidence interval) :	0.20 (0.13, 0.50)mg/L	Statistical Method :	Binomial
Historical Mean LC50 (warning limits) :	0.18 (0.098, 0.32) mg/L	Concentration :	0,0.0625,0.125,0.25,0.5,1 mg/L

Test Method QUE SOP-00406. Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. EPS1/RM/14 - Second Edition. Environment Canada. 2000.

This is essentially a 48H static test. Ten individuals are submitted to different effluent concentrations in order to measure the LC50 in controlled temperature, light intensity and loading density.

Method Deviations: Aucune

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RESULTS OF DAPHNIA - LC50 (ACUTE-48H)-FEDERAL

Client : 4526 TATA STEEL MINERALS CANADA Job Number: B821844

Client Project Name & Number: DSO4 1A GOODWOOD SED POND (ECOTOX) No. d'échantillon : FJ6803-02

Analyst : Alexandra Côté, Angela Paquet-Walsh, Maude Marcoux

Verified By : Alexandra Côté, B.Sc. Biologist Date: Jun 20, 2018 09:19 AM

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Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND (ECOTOX)
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/06/20
Report #: R2377419
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B821844
Received: 2018/06/08, 08:30

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Daphnia - LC50 (acute-48h)-Federal	1	N/A	2018/06/11	QUE SOP-00406	EPS1/RM/14
Hardness by ICP-MS	1	2018/06/11	2018/06/11	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Hardness by ICP-MS	1	2018/06/11	2018/06/12	QUE SOP-00132	MA.200–Mét. 1.2 R5 m
Rainbow Trout - LC50 (acute-96h)	1	N/A	2018/06/09	QUE SOP - 00408	EPS1/RM/13

Remarks:

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: GOODWOOD SED POND (ECOTOX)
Site#: TSMC
Site Location: DSO4 1A
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

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CANADA H3A 3G4

Report Date: 2018/06/20
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Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B821844
Received: 2018/06/08, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B821844
Report Date: 2018/06/20

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND (ECOTOX)
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

ECOTOXICOLOGY (SURFACE WATER)

Maxxam ID		FJ6803	
Sampling Date		2018/06/06 08:45	
COC Number		157354-13-01	
	Units	**DSO4-GW-SP-OUT-1**	**QC Batch**
Daphnia Magna - Can			
LC50	%v/v	ATTACHED	1905731
Rainbow Trout			
LC50	%v/v	ATTACHED	1905481
QC Batch = Quality Control Batch			

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B821844
Report Date: 2018/06/20

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND (ECOTOX)
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B821844
Report Date: 2018/06/20

TATA STEEL MINERALS CANADA
Client Project #: GOODWOOD SED POND (ECOTOX)
Site Location: DSO4 1A
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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

Alexandra Côté

Alexandra Côté, B.Sc. Biologist

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C. Sediment Quality

2009

Attention: Daniel Néron
GROUPE HÉMISPHÈRES INC.
1453, rue Beaubien est
bureau 301
Montréal, PQ
CANADA H2G 3C6

Votre # de commande: 16810
Votre # du projet: PR84E
Chantier:DSO
Votre # Bordereau: E-780311, E-780312, E-780313, E-780318

Date du rapport: 2009/08/11

RÉSULTATS POUR CONVENTIONNEL

 # DE DOSSIER MAXXAM: A937177
Reçu: 2009/07/30, 11:00

Matrice: SÉDIMENT
Nombre d'échantillons reçus: 5

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Méthode d'analyse
Anions	5	2009/08/03	2009/08/05	QUE SOP-00141/2	MA. 300. Ions 1.2
Conductivité	5	2009/08/05	2009/08/06	QUE SOP-00142/1	MA.303 -TitrAuto 1.1
Azote ammoniacal	5	2009/08/04	2009/08/07	QUE SOP-00127/2	MENVIQ 313 - N 2.2
Nitrate et/ou Nitrite	5	2009/08/10	2009/08/10	QUE SOP-00130/2	SM 4500-NO3-H
pH	5	2009/08/05	2009/08/05	QUE SOP-00103/2	MA. 100- pH 1.1
Phosphore totale	5	2009/08/10	2009/08/07	STL SOP-00006/7	MA.200- Mét 1.1

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

CAROLINE MARION, B. Sc. Microbiologie, Superviseur
Email: Caroline.Marion@maxxamanalytics.com
Phone# (418) 658-5784

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation malsaine de la signature électronique et emploi les signataires requis selon la section 5.10.2 du guide ISO/IEC 17025:2005(E). Le CCN et le CALA ont tous deux approuvé cette façon de rapporter les résultats ainsi que ce format électronique de rapport.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél : (418) 658-5784 Télécopieur : (418) 658-6594

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Dossier Maxxam: A937177
Date du rapport: 2009/08/11

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

PARAMÈTRES CONVENTIONNELS (SÉDIMENT)

ID Maxxam		I14633	I14655	I14664		
Date d'échantillonnage		2009/07/22 13:00	2009/07/25 10:00	2009/07/26 15:00		
# Bordereau		E-780311	E-780311	E-780312		
	Unités	**LAC-KIV5A**	**LAC-SUNNY 1**	**LAC-DSO4-FR**	**LDR**	**Lot CQ**
Azote ammoniacal (N-NH3)	mg/kg	ND	26	ND	20	647409
Conductivité	mS/cm	0.04	0.05	0.07	0.02	647969
Nitrate(N) et Nitrite(N)	mg/Kg	ND	ND	ND	30	649018
pH	pH	5.68	5.89	6.22	N/A	647963
Phosphore total	mg/kg	1100	1700	990	5	648892
Chlorures (Cl)	mg/kg	13	15	7	5	647141
Sulfates (SO4)	mg/kg	600	720	620	1	647141

ND = Non détecté
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

ID Maxxam		I14664	I14668	I14682		
Date d'échantillonnage		2009/07/26 15:00	2009/07/25 10:00	2009/07/28 11:00		
# Bordereau		E-780312	E-780312	E-780313		
	Unités	**LAC-DSO4-FR Dup. de Lab.**	**LAC-KIV4**	**LAC-NEIGE**	**LDR**	**Lot CQ**
Azote ammoniacal (N-NH3)	mg/kg	N/A	ND	45	20	647409
Conductivité	mS/cm	N/A	0.03	0.03	0.02	647969
Nitrate(N) et Nitrite(N)	mg/Kg	N/A	ND	ND	30	649018
pH	pH	N/A	5.21	5.55	N/A	647963
Phosphore total	mg/kg	900	720	930	5	648892
Chlorures (Cl)	mg/kg	N/A	19	17	5	647141
Sulfates (SO4)	mg/kg	N/A	790	880	1	647141

ND = Non détecté
N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél : (418) 658-5784 Télécopieur : (418) 658-6594

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Dossier Maxxam: A937177
Date du rapport: 2009/08/11

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

REMARQUES GÉNÉRALES

État des échantillons à l'arrivée: BON

Tous les résultats sont calculés sur une base sèche excepté lorsque non-applicable.

PARAMÈTRES CONVENTIONNELS (SÉDIMENT)

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc.

Les résultats s'appliquent seulement pour les paramètres analysés.

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GROUPE HÉMISPHÈRES INC.
Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité

Dossier Maxxam: A937177

Lot AQ/CQ Num Init	Type CQ	Paramètre	Date Analysé aaaa/mm/jj	Valeur	Réc	Unités
647141 MCC	Matériau de référence certifié	Chlorures (Cl)	2009/08/05		92	%
	Matériau de référence certifié DUP	Chlorures (Cl)	2009/08/05		84	%
	Matériau de référence certifié	Sulfates (SO4)	2009/08/05		97	%
	Matériau de référence certifié DUP	Sulfates (SO4)	2009/08/05		93	%
	Blanc de méthode	Chlorures (Cl)	2009/08/05	ND, LDR=0.5		mg/kg
	Blanc de méthode DUP	Chlorures (Cl)	2009/08/05	ND, LDR=0.5		mg/kg
	Blanc de méthode	Sulfates (SO4)	2009/08/05	ND, LDR=1		mg/kg
	Blanc de méthode DUP	Sulfates (SO4)	2009/08/05	ND, LDR=1		mg/kg
647409 MB6	Matériau de référence certifié	Azote ammoniacal (N-NH3)	2009/08/07		103	%
	Blanc de méthode	Azote ammoniacal (N-NH3)	2009/08/07	ND, LDR=20		mg/kg
647963 MB6	Matériau de référence certifié	pH	2009/08/05		99	%
647969 MB6	Blanc fortifié	Conductivité	2009/08/06		88	%
	Blanc de méthode	Conductivité	2009/08/06	ND, LDR=0.02		mS/cm
648892 NS	Matériau de référence certifié	Phosphore total	2009/08/07		101	%
	Matériau de référence certifié DUP	Phosphore total	2009/08/07		103	%
	Blanc de méthode	Phosphore total	2009/08/07	63, LDR=5		mg/kg
	Blanc de méthode DUP	Phosphore total	2009/08/07	59, LDR=5		mg/kg
649018 MB6	Matériau de référence certifié	Nitrate(N) et Nitrite(N)	2009/08/10		106	%
	Blanc de méthode	Nitrate(N) et Nitrite(N)	2009/08/10	ND, LDR=30		mg/Kg

Matériau de référence certifié: Matériau ou substance dont une ou plusieurs propriétés sont suffisamment bien définies pour permettre de l'utiliser pour évaluer une méthode analytique. Ils sont délivrés par un organisme de certification et ils sont accompagnés d'un certificat.
Blanc fortifié: Consitué de matrice « blanche » à laquelle une quantité connue d'analyte(s) a été ajoutée en laboratoire, il est soumis, avec les échantillons, aux mêmes procédures analytiques du prétraitement au dosage. Il sert à évaluer la récuperation de l'analyte.
Blanc de méthode: Consitué de matrice « blanche », il est soumis, avec les échantillons, aux mêmes procédures analytiques du prétraitement au dosage. Les résultats obtenus servent à évaluer le degré de contamination.
LDR = Limite de détection rapportée
Réc = Récupération

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Attention: Daniel Néron
GROUPE HÉMISPHÈRES INC.
1453, rue Beaubien est
bureau 301
Montréal, PQ
CANADA H2G 3C6

Votre # de commande: 16810
Votre # du projet: PR84E
Chantier:DSO
Votre # Bordereau: E-780311, E-780312, E-780313, E-780318

Date du rapport: 2009/08/14

RÉSULTATS POUR CONVENTIONNEL

 # DE DOSSIER MAXXAM: A937177
Reçu: 2009/07/30, 11:00

Matrice: SÉDIMENT
Nombre d'échantillons reçus: 5

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Méthode d'analyse
Soufre	5	2009/08/11	2009/08/14	STL SOP-00028/3	MA310-CS 1.0

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

CAROLINE MARION, B. Sc. Microbiologie, Superviseur
Email: Caroline.Marion@maxxamanalytics.com
Phone# (514) 448-9001

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889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tél. : (514) 448-9001 Télécopieur : (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

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Dossier Maxxam: A937177
Date du rapport: 2009/08/14

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

PARAMÈTRES CONVENTIONNELS (SÉDIMENT)

ID Maxxam		I14633	I14655	I14664		
Date d'échantillonnage		2009/07/22 13:00	2009/07/25 10:00	2009/07/26 15:00		
# Bordereau		E-780311	E-780311	E-780312		
	Unités	**LAC-KIV5A**	**LAC-SUNNY 1**	**LAC-DSO4-FR**	**LDR**	**Lot CQ**
Soufre (S)	%	0.12	0.12	0.13	0.01	650444

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

ID Maxxam		I14668	I14682		
Date d'échantillonnage		2009/07/25 10:00	2009/07/28 11:00		
# Bordereau		E-780312	E-780313		
	Unités	**LAC-KIV4**	**LAC-NEIGE**	**LDR**	**Lot CQ**
Soufre (S)	%	0.13	0.23	0.01	650444

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tél. : (514) 448-9001 Télécopieur : (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)
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Dossier Maxxam: A937177
Date du rapport: 2009/08/14

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

REMARQUES GÉNÉRALES

État des échantillons à l'arrivée: BON

Tous les résultats sont calculés sur une base sèche excepté lorsque non-applicable.

PARAMÈTRES CONVENTIONNELS (SÉDIMENT)

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc.

Les résultats s'appliquent seulement pour les paramètres analysés.

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GROUPE HÉMISPHÈRES INC.
Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité

Dossier Maxxam: A937177

Lot AQ/CQ Num Init	Type CQ	Paramètre	Date Analysé aaaa/mm/jj	Valeur	Réc	Unités
650444 JS2	ÉTALON CQ	Soufre (S)	2009/08/14		113	%
	Blanc de méthode	Soufre (S)	2009/08/14	ND, LDR=0.01		%

Matériau de référence certifié: Matériau dont une ou plusieurs valeurs des propriétés sont certifiées par une procédure techniquement valide, délivré par un organisme de certification et accompagné d'un certificat. Sert à évaluer l'exactitude d'une méthode analytique.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
LDR = Limite de détection rapportée
Réc = Récupération

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tél. : (514) 448-9001 Télécopieur : (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

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Attention: Daniel Néron
GROUPE HÉMISPHÈRES INC.
1453, rue Beaubien est
bureau 301
Montréal, PQ
CANADA H2G 3C6

Votre # de commande: 16810
Votre # du projet: PR84E
Chantier:DSO
Votre # Bordereau: E-780311, E-780312, E-780313, E-780318

Date du rapport: 2009/08/10

RÉSULTATS POUR MÉTAUX

 # DE DOSSIER MAXXAM: A937177
Reçu: 2009/07/30, 11:00

Matrice: SÉDIMENT
Nombre d'échantillons reçus: 5

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Méthode d'analyse
Mercure par icp-ms	5	2009/08/06	2009/08/06	QUE SOP-00137/2	MA. 200 - Mét 1.1
Métaux	5	2009/08/06	2009/08/06	LCQ 04.02/ICP-03	MA 200-Mét 1.1
Silicium extractible par ICP	5	2009/08/06	2009/08/06	QUE SOP-00136/1	MA 200-Mét 1.1
Uranium	5	N/A	2009/08/06	QUE SOP-00132/2	ICP

clé de cryptage

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CAROLINE MARION, B. Sc. Microbiologie, Superviseur
Email: Caroline.Marion@maxxamanalytics.com
Phone# (418) 658-5784

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Dossier Maxxam: A937177
Date du rapport: 2009/08/10

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (SÉDIMENT)

ID Maxxam		I14633			I14655		
Date d'échantillonnage		2009/07/22 13:00			2009/07/25 10:00		
# Bordereau		E-780311			E-780311		
	Unités	**LAC-KIV5A**	**LDR**	**Lot CQ**	**LAC-SUNNY 1**	**LDR**	**Lot CQ**
Mercure (Hg)	mg/kg	0.12	0.01	648432	0.12	0.01	647545
Uranium (U)	mg/kg	1.5	0.5	648433	2.0	0.5	647552
Argent (Ag)	mg/kg	0.4	0.2	648431	0.5	0.2	647543
Arsenic (As)	mg/kg	4.8	0.5	648431	3.2	0.5	647543
Baryum (Ba)	mg/kg	50	1	648431	65	5	647543
Cadmium (Cd)	mg/kg	ND	0.5	648431	ND	0.5	647543
Cobalt (Co)	mg/kg	6	1	648431	6	1	647543
Chrome (Cr)	mg/kg	36	1	648431	40	1	647543
Cuivre (Cu)	mg/kg	28	1	648431	30	1	647543
Etain (Sn)	mg/kg	ND	2	648431	ND	2	647543
Manganèse (Mn)	mg/kg	260	1	648431	340	1	647543
Molybdène (Mo)	mg/kg	ND	2	648431	ND	2	647543
Nickel (Ni)	mg/kg	19	5	648431	22	5	647543
Plomb (Pb)	mg/kg	18	5	648431	16	5	647543
Zinc (Zn)	mg/kg	110	2	648431	99	2	647543
Aluminium (Al)	mg/kg	14000	5	648431	17000	5	647543
Antimoine (Sb)	mg/kg	ND	0.5	648431	ND	0.5	647543
Béryllium (Be)	mg/kg	0.8	0.2	648431	1.2	0.2	647543
Bore (B)	mg/kg	1	1	648431	2	1	647543
Calcium (Ca)	mg/kg	270	30	648431	400	30	647543
Fer (Fe)	mg/kg	56000	5	648431	46000	5	647543
Magnésium (Mg)	mg/kg	3100	10	648431	3300	10	647543
Potassium (K)	mg/kg	640	10	648431	1200	10	647543
Silicium (Si)(soluble dans HNO3)	mg/kg	380	10	648435	350	10	647548
Sodium (Na)	mg/kg	32	30	648431	36	30	647543
Strontium (Sr)	mg/kg	ND	2	648431	3	2	647543
Titane (Ti)	mg/kg	360	2	648431	310	2	647543
Bismuth (Bi)	mg/kg	0.2	0.2	648431	ND	0.2	647543
Vanadium (V)	mg/kg	39	5	648431	44	5	647543
Thallium (Tl)	mg/kg	ND	0.5	648431	ND	0.5	647543
Tellurium (Te)	mg/kg	ND	2	648431	ND	2	647543

ND = Non détecté
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

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Dossier Maxxam: A937177
Date du rapport: 2009/08/10

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (SÉDIMENT)

ID Maxxam		I14664	I14664	I14668		
Date d'échantillonnage		2009/07/26 15:00	2009/07/26 15:00	2009/07/25 10:00		
# Bordereau		E-780312	E-780312	E-780312		
	Unités	**LAC-DSO4-FR**	**LAC-DSO4-FR Dup. de Lab.**	**LAC-KIV4**	**LDR**	**Lot CQ**
Mercure (Hg)	mg/kg	0.09	0.08	0.09	0.01	647545
Uranium (U)	mg/kg	1.3	1.3	1.6	0.5	647552
Argent (Ag)	mg/kg	0.5	0.5	0.4	0.2	647543
Arsenic (As)	mg/kg	8.5	8.9	3.7	0.5	647543
Baryum (Ba)	mg/kg	41	40	59	5	647543
Cadmium (Cd)	mg/kg	ND	ND	ND	0.5	647543
Cobalt (Co)	mg/kg	12	11	6	1	647543
Chrome (Cr)	mg/kg	34	33	34	1	647543
Cuivre (Cu)	mg/kg	26	24	24	1	647543
Etain (Sn)	mg/kg	ND	ND	ND	2	647543
Manganèse (Mn)	mg/kg	400	380	210	1	647543
Molybdène (Mo)	mg/kg	ND	ND	ND	2	647543
Nickel (Ni)	mg/kg	21	20	22	5	647543
Plomb (Pb)	mg/kg	13	12	14	5	647543
Zinc (Zn)	mg/kg	76	71	97	2	647543
Aluminium (Al)	mg/kg	12000	12000	14000	5	647543
Antimoine (Sb)	mg/kg	ND	ND	ND	0.5	647543
Béryllium (Be)	mg/kg	0.7	0.9	0.7	0.2	647543
Bore (B)	mg/kg	1	1	2	1	647543
Calcium (Ca)	mg/kg	190	180	330	30	647543
Fer (Fe)	mg/kg	110000	100000	36000	5	647543
Magnésium (Mg)	mg/kg	2700	2700	3400	10	647543
Potassium (K)	mg/kg	870	820	1200	10	647543
Silicium (Si)(soluble dans HNO3)	mg/kg	410	410	350	10	647548
Sodium (Na)	mg/kg	ND	ND	34	30	647543
Strontium (Sr)	mg/kg	ND	ND	2	2	647543
Titane (Ti)	mg/kg	430	420	380	2	647543
Bismuth (Bi)	mg/kg	ND	ND	ND	0.2	647543
Vanadium (V)	mg/kg	34	31	35	5	647543
Thallium (Tl)	mg/kg	ND	ND	ND	0.5	647543
Tellurium (Te)	mg/kg	ND	ND	ND	2	647543

ND = Non détecté
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél : (418) 658-5784 Télécopieur : (418) 658-6594

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Dossier Maxxam: A937177
Date du rapport: 2009/08/10

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (SÉDIMENT)

ID Maxxam		I14682		
Date d'échantillonnage		2009/07/28 11:00		
# Bordereau		E-780313		
	Unités	**LAC-NEIGE**	**LDR**	**Lot CQ**
Mercure (Hg)	mg/kg	0.09	0.01	647545
Uranium (U)	mg/kg	1.3	0.5	647552
Argent (Ag)	mg/kg	0.7	0.2	647543
Arsenic (As)	mg/kg	1.6	0.5	647543
Baryum (Ba)	mg/kg	53	5	647543
Cadmium (Cd)	mg/kg	ND	0.5	647543
Cobalt (Co)	mg/kg	5	1	647543
Chrome (Cr)	mg/kg	21	1	647543
Cuivre (Cu)	mg/kg	21	1	647543
Etain (Sn)	mg/kg	ND	2	647543
Manganèse (Mn)	mg/kg	170	1	647543
Molybdène (Mo)	mg/kg	ND	2	647543
Nickel (Ni)	mg/kg	21	5	647543
Plomb (Pb)	mg/kg	11	5	647543
Zinc (Zn)	mg/kg	67	2	647543
Aluminium (Al)	mg/kg	11000	5	647543
Antimoine (Sb)	mg/kg	ND	0.5	647543
Béryllium (Be)	mg/kg	0.6	0.2	647543
Bore (B)	mg/kg	3	1	647543
Calcium (Ca)	mg/kg	1200	30	647543
Fer (Fe)	mg/kg	18000	5	647543
Magnésium (Mg)	mg/kg	1800	10	647543
Potassium (K)	mg/kg	670	10	647543
Silicium (Si)(soluble dans HNO3)	mg/kg	420	10	647548
Sodium (Na)	mg/kg	ND	30	647543
Strontium (Sr)	mg/kg	4	2	647543
Titane (Ti)	mg/kg	160	2	647543
Bismuth (Bi)	mg/kg	ND	0.2	647543
Vanadium (V)	mg/kg	21	5	647543
Thallium (Tl)	mg/kg	ND	0.5	647543
Tellurium (Te)	mg/kg	ND	2	647543

ND = Non détecté
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél : (418) 658-5784 Télécopieur : (418) 658-6594

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Dossier Maxxam: A937177
Date du rapport: 2009/08/10

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

REMARQUES GÉNÉRALES

État des échantillons à l'arrivée: BON

Tous les résultats sont calculés sur une base sèche excepté lorsque non-applicable.

MÉTAUX (SÉDIMENT)

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc.

Les résultats s'appliquent seulement pour les paramètres analysés.

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GROUPE HÉMISPHÈRES INC.
Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité

Dossier Maxxam: A937177

Lot AQ/CQ Num Init	Type CQ	Paramètre	Date Analysé aaaa/mm/jj	Valeur	Réc	Unités
647543 DP3	Matériau de référence certifié	Arsenic (As)	2009/08/06		84	%
		Cadmium (Cd)	2009/08/06		101	%
		Cobalt (Co)	2009/08/06		98	%
		Chrome (Cr)	2009/08/06		85	%
		Cuivre (Cu)	2009/08/06		95	%
		Manganèse (Mn)	2009/08/06		94	%
		Molybdène (Mo)	2009/08/06		87	%
		Nickel (Ni)	2009/08/06		99	%
		Plomb (Pb)	2009/08/06		97	%
		Zinc (Zn)	2009/08/06		93	%
		Aluminium (Al)	2009/08/06		96	%
		Bore (B)	2009/08/06		106	%
		Calcium (Ca)	2009/08/06		97	%
		Magnésium (Mg)	2009/08/06		92	%
		Potassium (K)	2009/08/06		91	%
	Blanc fortifié	Argent (Ag)	2009/08/06		87	%
		Arsenic (As)	2009/08/06		98	%
		Baryum (Ba)	2009/08/06		96	%
		Cadmium (Cd)	2009/08/06		91	%
		Cobalt (Co)	2009/08/06		100	%
		Chrome (Cr)	2009/08/06		97	%
		Cuivre (Cu)	2009/08/06		99	%
		Etain (Sn)	2009/08/06		97	%
		Manganèse (Mn)	2009/08/06		95	%
		Molybdène (Mo)	2009/08/06		101	%
		Nickel (Ni)	2009/08/06		101	%
		Plomb (Pb)	2009/08/06		104	%
		Zinc (Zn)	2009/08/06		98	%
		Antimoine (Sb)	2009/08/06		94	%
		Béryllium (Be)	2009/08/06		105	%
		Bore (B)	2009/08/06		102	%
		Calcium (Ca)	2009/08/06		102	%
		Fer (Fe)	2009/08/06		104	%
		Magnésium (Mg)	2009/08/06		97	%
		Potassium (K)	2009/08/06		98	%
		Sodium (Na)	2009/08/06		97	%
		Strontium (Sr)	2009/08/06		98	%
		Titane (Ti)	2009/08/06		98	%
		Bismuth (Bi)	2009/08/06		111	%
		Vanadium (V)	2009/08/06		95	%
		Thallium (Tl)	2009/08/06		104	%
		Tellurium (Te)	2009/08/06		88	%
	Blanc de méthode	Argent (Ag)	2009/08/06	ND, LDR=0.2		mg/kg
		Arsenic (As)	2009/08/06	ND, LDR=0.5		mg/kg
		Baryum (Ba)	2009/08/06	ND, LDR=5		mg/kg
		Cadmium (Cd)	2009/08/06	ND, LDR=0.5		mg/kg
		Cobalt (Co)	2009/08/06	ND, LDR=1		mg/kg
		Chrome (Cr)	2009/08/06	2, LDR=1		mg/kg
		Cuivre (Cu)	2009/08/06	ND, LDR=1		mg/kg
		Etain (Sn)	2009/08/06	ND, LDR=2		mg/kg
		Manganèse (Mn)	2009/08/06	ND, LDR=1		mg/kg
		Molybdène (Mo)	2009/08/06	ND, LDR=2		mg/kg
		Nickel (Ni)	2009/08/06	ND, LDR=5		mg/kg
		Plomb (Pb)	2009/08/06	ND, LDR=5		mg/kg

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GROUPE HÉMISPHÈRES INC.
Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité (Suite)

Dossier Maxxam: A937177

Lot AQ/CQ Num Init	Type CQ	Paramètre	Date Analysé aaaa/mm/jj	Valeur	Réc	Unités
647543 DP3	Blanc de méthode	Zinc (Zn)	2009/08/06	ND, LDR=2		mg/kg
		Aluminium (Al)	2009/08/06	ND, LDR=5		mg/kg
		Antimoine (Sb)	2009/08/06	ND, LDR=0.5		mg/kg
		Béryllium (Be)	2009/08/06	ND, LDR=0.2		mg/kg
		Bore (B)	2009/08/06	ND, LDR=1		mg/kg
		Calcium (Ca)	2009/08/06	ND, LDR=30		mg/kg
		Fer (Fe)	2009/08/06	6, LDR=5		mg/kg
		Magnésium (Mg)	2009/08/06	ND, LDR=10		mg/kg
		Potassium (K)	2009/08/06	13, LDR=10		mg/kg
		Sodium (Na)	2009/08/06	ND, LDR=30		mg/kg
		Strontium (Sr)	2009/08/06	ND, LDR=2		mg/kg
		Titane (Ti)	2009/08/06	ND, LDR=2		mg/kg
		Bismuth (Bi)	2009/08/06	ND, LDR=0.2		mg/kg
		Vanadium (V)	2009/08/06	ND, LDR=5		mg/kg
		Thallium (Tl)	2009/08/06	ND, LDR=0.5		mg/kg
		Tellurium (Te)	2009/08/06	ND, LDR=2		mg/kg
647545 DP3	Matériau de référence certifié	Mercure (Hg)	2009/08/06		94	%
	Blanc fortifié	Mercure (Hg)	2009/08/06		98	%
	Blanc de méthode	Mercure (Hg)	2009/08/06	ND, LDR=0.01		mg/kg
647548 DP3	Blanc fortifié	Silicium (Si)(soluble dans HNO3)	2009/08/06		115	%
	Blanc de méthode	Silicium (Si)(soluble dans HNO3)	2009/08/06	ND, LDR=10		mg/kg
647552 DP3	Blanc fortifié	Uranium (U)	2009/08/06		102	%
	Blanc de méthode	Uranium (U)	2009/08/06	ND, LDR=0.5		mg/kg
648431 DP3	Matériau de référence certifié	Arsenic (As)	2009/08/07		103	%
		Cadmium (Cd)	2009/08/07		80	%
		Cobalt (Co)	2009/08/07		99	%
		Chrome (Cr)	2009/08/07		90	%
		Cuivre (Cu)	2009/08/07		94	%
		Manganèse (Mn)	2009/08/07		105	%
		Molybdène (Mo)	2009/08/07		89	%
		Nickel (Ni)	2009/08/07		94	%
		Plomb (Pb)	2009/08/07		99	%
		Zinc (Zn)	2009/08/07		91	%
		Aluminium (Al)	2009/08/07		101	%
		Bore (B)	2009/08/07		112	%
		Calcium (Ca)	2009/08/07		101	%
		Magnésium (Mg)	2009/08/07		97	%
		Potassium (K)	2009/08/07		89	%
	Blanc fortifié	Argent (Ag)	2009/08/07		81	%
		Arsenic (As)	2009/08/07		91	%
		Baryum (Ba)	2009/08/07		93	%
		Cadmium (Cd)	2009/08/07		82	%
		Cobalt (Co)	2009/08/07		99	%
		Chrome (Cr)	2009/08/07		101	%
		Cuivre (Cu)	2009/08/07		96	%
		Etain (Sn)	2009/08/07		89	%
		Manganèse (Mn)	2009/08/07		97	%
		Molybdène (Mo)	2009/08/07		91	%
		Nickel (Ni)	2009/08/07		99	%
		Plomb (Pb)	2009/08/07		105	%
		Zinc (Zn)	2009/08/07		91	%
		Antimoine (Sb)	2009/08/07		83	%
		Béryllium (Be)	2009/08/07		102	%

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GROUPE HÉMISPHÈRES INC.
Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité (Suite)

Dossier Maxxam: A937177

Lot AQ/CQ Num Init	Type CQ	Paramètre	Date Analysé aaaa/mm/jj	Valeur	Réc	Unités
648431 DP3	Blanc fortifié	Bore (B)	2009/08/07		101	%
		Calcium (Ca)	2009/08/07		99	%
		Fer (Fe)	2009/08/07		105	%
		Magnésium (Mg)	2009/08/07		96	%
		Potassium (K)	2009/08/07		86	%
		Sodium (Na)	2009/08/07		95	%
		Strontium (Sr)	2009/08/07		93	%
		Titane (Ti)	2009/08/07		98	%
		Bismuth (Bi)	2009/08/07		99	%
		Vanadium (V)	2009/08/07		88	%
		Thallium (Tl)	2009/08/07		99	%
		Tellurium (Te)	2009/08/07		80	%
	Blanc de méthode	Argent (Ag)	2009/08/07	ND, LDR=0.2		mg/kg
		Arsenic (As)	2009/08/07	ND, LDR=0.5		mg/kg
		Baryum (Ba)	2009/08/07	ND, LDR=1		mg/kg
		Cadmium (Cd)	2009/08/07	ND, LDR=5		mg/kg
		Cobalt (Co)	2009/08/07	ND, LDR=1		mg/kg
		Chrome (Cr)	2009/08/07	1, LDR=1		mg/kg
		Cuivre (Cu)	2009/08/07	ND, LDR=1		mg/kg
		Etain (Sn)	2009/08/07	ND, LDR=2		mg/kg
		Manganèse (Mn)	2009/08/07	ND, LDR=1		mg/kg
		Molybdène (Mo)	2009/08/07	ND, LDR=2		mg/kg
		Nickel (Ni)	2009/08/07	ND, LDR=5		mg/kg
		Plomb (Pb)	2009/08/07	ND, LDR=5		mg/kg
		Zinc (Zn)	2009/08/07	ND, LDR=2		mg/kg
		Aluminium (Al)	2009/08/07	ND, LDR=5		mg/kg
		Antimoine (Sb)	2009/08/07	ND, LDR=0.5		mg/kg
		Béryllium (Be)	2009/08/07	ND, LDR=0.2		mg/kg
		Bore (B)	2009/08/07	ND, LDR=1		mg/kg
		Calcium (Ca)	2009/08/07	ND, LDR=30		mg/kg
		Fer (Fe)	2009/08/07	6, LDR=5		mg/kg
		Magnésium (Mg)	2009/08/07	ND, LDR=10		mg/kg
		Potassium (K)	2009/08/07	ND, LDR=10		mg/kg
		Sodium (Na)	2009/08/07	ND, LDR=30		mg/kg
		Strontium (Sr)	2009/08/07	ND, LDR=2		mg/kg
		Titane (Ti)	2009/08/07	ND, LDR=2		mg/kg
		Bismuth (Bi)	2009/08/07	ND, LDR=0.2		mg/kg
		Vanadium (V)	2009/08/07	ND, LDR=5		mg/kg
		Thallium (Tl)	2009/08/07	ND, LDR=0.5		mg/kg
		Tellurium (Te)	2009/08/07	ND, LDR=2		mg/kg
648432 DP3	Matériau de référence certifié	Mercure (Hg)	2009/08/07		101	%
	Blanc fortifié	Mercure (Hg)	2009/08/07		94	%
	Blanc de méthode	Mercure (Hg)	2009/08/07	0.03, LDR=0.01		mg/kg
648433 DP3	Blanc fortifié	Uranium (U)	2009/08/07		98	%
	Blanc de méthode	Uranium (U)	2009/08/07	ND, LDR=0.5		mg/kg
648435 DP3	Blanc fortifié	Silicium (Si)(soluble dans HNO3)	2009/08/07		115	%
	Blanc de méthode	Silicium (Si)(soluble dans HNO3)	2009/08/07	ND, LDR=10		mg/kg

Matériau de référence certifié: Matériau ou substance dont une ou plusieurs propriétés sont suffisamment bien définies pour permettre de l'utiliser pour évaluer une méthode analytique. Ils sont délivrés par un organisme de certification et ils sont accompagnés d'un certificat.
Blanc fortifié: Consitué de matrice « blanche » à laquelle une quantité connue d'analyte(s) a été ajoutée en laboratoire, il est soumis, avec les échantillons, aux mêmes procédures analytiques du prétraitement au dosage. Il sert à évaluer la récuperation de l'analyte.
Blanc de méthode: Consitué de matrice « blanche », il est soumis, avec les échantillons, aux mêmes procédures analytiques du prétraitement au dosage. Les résultats obtenus servent à évaluer le degré de contamination.
LDR = Limite de détection rapportée

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GROUPE HÉMISPHÈRES INC.
Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité (Suite)

Dossier Maxxam: A937177

Réc = Récupération

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél : (418) 658-5784 Télécopieur : (418) 658-6594

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Attention: Daniel Néron
GROUPE HÉMISPHÈRES INC.
1453, rue Beaubien est
bureau 301
Montréal, PQ
CANADA H2G 3C6

Votre # de commande: 16810
Votre # du projet: PR84E
Chantier:DSO
Votre # Bordereau: E-780311, E-780312, E-780313, E-780318

Date du rapport: 2009/08/24

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: A937177
Reçu: 2009/07/30, 11:00

Matrice: SÉDIMENT
Nombre d'échantillons reçus: 5

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Méthode d'analyse
Anions	5	2009/08/03	2009/08/05	QUE SOP-00141/2	MA. 300. Ions 1.2
Conductivité	5	2009/08/05	2009/08/06	QUE SOP-00142/1	MA.303 -TitrAuto 1.1
Mercure par icp-ms	5	2009/08/06	2009/08/06	QUE SOP-00137/2	MA. 200 - Mét 1.1
Métaux	5	2009/08/06	2009/08/06	LCQ 04.02/ICP-03	MA 200-Mét 1.1
Azote ammoniacal	5	2009/08/04	2009/08/07	QUE SOP-00127/2	MENVIQ 313 - N 2.2
Nitrate et/ou Nitrite	5	2009/08/10	2009/08/10	QUE SOP-00130/2	SM 4500-NO3-H
pH	5	2009/08/05	2009/08/05	QUE SOP-00103/2	MA. 100- pH 1.1
Sédimentométrie (1)	5	N/A	N/A		
Phosphore total	5	2009/08/10	2009/08/07	QUE SOP-00132/4	MA. 200 - Met 1.1
Soufre (2)	5	2009/08/11	2009/08/14	STL SOP-00028/3	MA310-CS 1.0
Silicium extractible par ICP	5	2009/08/06	2009/08/06	QUE SOP-00136/1	MA 200-Mét 1.1
Uranium	5	N/A	2009/08/06	QUE SOP-00132/2	ICP

Matrice: EAU DE SURFACE
Nombre d'échantillons reçus: 12

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Méthode d'analyse
Frais de gestion	12	N/A	2009/07/30		
Mercure par icp-ms	8	2009/08/04	2009/08/04	QUE SOP-00137/2	MA. 200 - Mét 1.1
Matieres en suspension	4	2009/07/31	2009/07/31	QUE SOP-00111/2	SM 2540 D
Métaux par ICP-MS	8	2009/08/04	2009/08/04	QUE SOP-00132/1	MA. 200 - Mét. 1.1
Phosphore total (3)	8	N/A	N/A		
Anions sulfures (S=) (4)	8	2009/07/31	2009/07/31	QUE SOP-00107/2	SM 427 C*
Uranium	8	2009/08/04	2009/08/04	STL SOP-00006/7	MA.200- Mét 1.1

(1) Cette analyse a été effectuée par Maxxam Analytics - Bedford
(2) Cette analyse a été effectuée par Maxxam -Ville St. Laurent
(3) Cette analyse a été effectuée par Bodycote - Québec
(4) * Standard Methods for the Examination of Water and Wastewater. 16e Edition 1985.

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Attention: Daniel Néron
GROUPE HÉMISPHÈRES INC.
1453, rue Beaubien est
bureau 301
Montréal, PQ
CANADA H2G 3C6

Votre # de commande: 16810
Votre # du projet: PR84E
Chantier:DSO
Votre # Bordereau: E-780311, E-780312, E-780313, E-780318

Date du rapport: 2009/08/24

CERTIFICAT D'ANALYSES

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

CAROLINE MARION, B. Sc. Microbiologie, Superviseur
Email: Caroline.Marion@maxxamanalytics.com
Phone# (418) 658-5784

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation malsaine de la signature électronique et emploi les signataires requis selon la section 5.10.2 du guide ISO/IEC 17025:2005(E). Le CCN et le CALA ont tous deux approuvé cette façon de rapporter les résultats ainsi que ce format électronique de rapport.

Veuillez vous référer à la page des signatures de validation pour le détail des validations par département.

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (SÉDIMENT)

ID Maxxam		I14633			I14655		
Date d'échantillonnage		2009/07/22 13:00			2009/07/25 10:00		
# Bordereau		E-780311			E-780311		
	Unités	**LAC-KIV5A**	**LDR**	**Lot CQ**	**LAC-SUNNY 1**	**LDR**	**Lot CQ**
MÉTAUX							
Mercure (Hg)	mg/kg	0.12	0.01	648432	0.12	0.01	647545
Uranium (U)	mg/kg	1.5	0.5	648433	2.0	0.5	647552
Argent (Ag)	mg/kg	0.4	0.2	648431	0.5	0.2	647543
Arsenic (As)	mg/kg	4.8	0.5	648431	3.2	0.5	647543
Baryum (Ba)	mg/kg	50	1	648431	65	5	647543
Cadmium (Cd)	mg/kg	ND	0.5	648431	ND	0.5	647543
Cobalt (Co)	mg/kg	6	1	648431	6	1	647543
Chrome (Cr)	mg/kg	36	1	648431	40	1	647543
Cuivre (Cu)	mg/kg	28	1	648431	30	1	647543
Etain (Sn)	mg/kg	ND	2	648431	ND	2	647543
Manganèse (Mn)	mg/kg	260	1	648431	340	1	647543
Molybdène (Mo)	mg/kg	ND	2	648431	ND	2	647543
Nickel (Ni)	mg/kg	19	5	648431	22	5	647543
Plomb (Pb)	mg/kg	18	5	648431	16	5	647543
Zinc (Zn)	mg/kg	110	2	648431	99	2	647543
Aluminium (Al)	mg/kg	14000	5	648431	17000	5	647543
Antimoine (Sb)	mg/kg	ND	0.5	648431	ND	0.5	647543
Béryllium (Be)	mg/kg	0.8	0.2	648431	1.2	0.2	647543
Bore (B)	mg/kg	1	1	648431	2	1	647543
Calcium (Ca)	mg/kg	270	30	648431	400	30	647543
Fer (Fe)	mg/kg	56000	5	648431	46000	5	647543
Magnésium (Mg)	mg/kg	3100	10	648431	3300	10	647543
Potassium (K)	mg/kg	640	10	648431	1200	10	647543
Silicium (Si)(soluble dans HNO3)	mg/kg	380	10	648435	350	10	647548
Sodium (Na)	mg/kg	32	30	648431	36	30	647543
Strontium (Sr)	mg/kg	ND	2	648431	3	2	647543
Titane (Ti)	mg/kg	360	2	648431	310	2	647543
Bismuth (Bi)	mg/kg	0.2	0.2	648431	ND	0.2	647543
Vanadium (V)	mg/kg	39	5	648431	44	5	647543
Thallium (Tl)	mg/kg	ND	0.5	648431	ND	0.5	647543

ND = Non détecté
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Lot CQ = Lot contrôle qualité

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (SÉDIMENT)

ID Maxxam		I14633			I14655		
Date d'échantillonnage		2009/07/22 13:00			2009/07/25 10:00		
# Bordereau		E-780311			E-780311		
	Unités	**LAC-KIV5A**	**LDR**	**Lot CQ**	**LAC-SUNNY 1**	**LDR**	**Lot CQ**
Tellurium (Te)	mg/kg	ND	2	648431	ND	2	647543

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (SÉDIMENT)

ID Maxxam		I14664	I14664	I14668		
Date d'échantillonnage		2009/07/26 15:00	2009/07/26 15:00	2009/07/25 10:00		
# Bordereau		E-780312	E-780312	E-780312		
	Unités	**LAC-DSO4-FR**	**LAC-DSO4-FR Dup. de Lab.**	**LAC-KIV4**	**LDR**	**Lot CQ**
MÉTAUX						
Mercure (Hg)	mg/kg	0.09	0.08	0.09	0.01	647545
Uranium (U)	mg/kg	1.3	1.3	1.6	0.5	647552
Argent (Ag)	mg/kg	0.5	0.5	0.4	0.2	647543
Arsenic (As)	mg/kg	8.5	8.9	3.7	0.5	647543
Baryum (Ba)	mg/kg	41	40	59	5	647543
Cadmium (Cd)	mg/kg	ND	ND	ND	0.5	647543
Cobalt (Co)	mg/kg	12	11	6	1	647543
Chrome (Cr)	mg/kg	34	33	34	1	647543
Cuivre (Cu)	mg/kg	26	24	24	1	647543
Etain (Sn)	mg/kg	ND	ND	ND	2	647543
Manganèse (Mn)	mg/kg	400	380	210	1	647543
Molybdène (Mo)	mg/kg	ND	ND	ND	2	647543
Nickel (Ni)	mg/kg	21	20	22	5	647543
Plomb (Pb)	mg/kg	13	12	14	5	647543
Zinc (Zn)	mg/kg	76	71	97	2	647543
Aluminium (Al)	mg/kg	12000	12000	14000	5	647543
Antimoine (Sb)	mg/kg	ND	ND	ND	0.5	647543
Béryllium (Be)	mg/kg	0.7	0.9	0.7	0.2	647543
Bore (B)	mg/kg	1	1	2	1	647543
Calcium (Ca)	mg/kg	190	180	330	30	647543
Fer (Fe)	mg/kg	110000	100000	36000	5	647543
Magnésium (Mg)	mg/kg	2700	2700	3400	10	647543
Potassium (K)	mg/kg	870	820	1200	10	647543
Silicium (Si)(soluble dans HNO3)	mg/kg	410	410	350	10	647548
Sodium (Na)	mg/kg	ND	ND	34	30	647543
Strontium (Sr)	mg/kg	ND	ND	2	2	647543
Titane (Ti)	mg/kg	430	420	380	2	647543
Bismuth (Bi)	mg/kg	ND	ND	ND	0.2	647543
Vanadium (V)	mg/kg	34	31	35	5	647543
Thallium (Tl)	mg/kg	ND	ND	ND	0.5	647543

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (SÉDIMENT)

ID Maxxam		I14664	I14664	I14668		
Date d'échantillonnage		2009/07/26 15:00	2009/07/26 15:00	2009/07/25 10:00		
# Bordereau		E-780312	E-780312	E-780312		
	Unités	**LAC-DSO4-FR**	**LAC-DSO4-FR Dup. de Lab.**	**LAC-KIV4**	**LDR**	**Lot CQ**
Tellurium (Te)	mg/kg	ND	ND	ND	2	647543

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (SÉDIMENT)

ID Maxxam		I14682		
Date d'échantillonnage		2009/07/28 11:00		
# Bordereau		E-780313		
	Unités	**LAC-NEIGE**	**LDR**	**Lot CQ**
MÉTAUX				
Mercure (Hg)	mg/kg	0.09	0.01	647545
Uranium (U)	mg/kg	1.3	0.5	647552
Argent (Ag)	mg/kg	0.7	0.2	647543
Arsenic (As)	mg/kg	1.6	0.5	647543
Baryum (Ba)	mg/kg	53	5	647543
Cadmium (Cd)	mg/kg	ND	0.5	647543
Cobalt (Co)	mg/kg	5	1	647543
Chrome (Cr)	mg/kg	21	1	647543
Cuivre (Cu)	mg/kg	21	1	647543
Etain (Sn)	mg/kg	ND	2	647543
Manganèse (Mn)	mg/kg	170	1	647543
Molybdène (Mo)	mg/kg	ND	2	647543
Nickel (Ni)	mg/kg	21	5	647543
Plomb (Pb)	mg/kg	11	5	647543
Zinc (Zn)	mg/kg	67	2	647543
Aluminium (Al)	mg/kg	11000	5	647543
Antimoine (Sb)	mg/kg	ND	0.5	647543
Béryllium (Be)	mg/kg	0.6	0.2	647543
Bore (B)	mg/kg	3	1	647543
Calcium (Ca)	mg/kg	1200	30	647543
Fer (Fe)	mg/kg	18000	5	647543
Magnésium (Mg)	mg/kg	1800	10	647543
Potassium (K)	mg/kg	670	10	647543
Silicium (Si)(soluble dans HNO3)	mg/kg	420	10	647548
Sodium (Na)	mg/kg	ND	30	647543
Strontium (Sr)	mg/kg	4	2	647543
Titane (Ti)	mg/kg	160	2	647543
Bismuth (Bi)	mg/kg	ND	0.2	647543
Vanadium (V)	mg/kg	21	5	647543
Thallium (Tl)	mg/kg	ND	0.5	647543

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Lot CQ = Lot contrôle qualité

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (SÉDIMENT)

ID Maxxam		I14682		
Date d'échantillonnage		2009/07/28 11:00		
# Bordereau		E-780313		
	Unités	**LAC-NEIGE**	**LDR**	**Lot CQ**
Tellurium (Te)	mg/kg	ND	2	647543

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

PARAMÈTRES CONVENTIONNELS (SÉDIMENT)

ID Maxxam		I14633	I14655	I14664		
Date d'échantillonnage		2009/07/22 13:00	2009/07/25 10:00	2009/07/26 15:00		
# Bordereau		E-780311	E-780311	E-780312		
	Unités	**LAC-KIV5A**	**LAC-SUNNY 1**	**LAC-DSO4-FR**	**LDR**	**Lot CQ**
CONVENTIONNELS						
Azote ammoniacal (N-NH3)	mg/kg	ND	26	ND	20	647409
Conductivité	mS/cm	0.04	0.05	0.07	0.02	647969
Nitrate(N) et Nitrite(N)	mg/Kg	ND	ND	ND	30	649018
pH	pH	5.68	5.89	6.22	N/A	647963
Phosphore total	mg/kg	1100	1700	990	5	648892
Soufre (S)	%	0.12	0.12	0.13	0.01	650444
Chlorures (Cl)	mg/kg	13	15	7	5	647141
Sulfates (SO4)	mg/kg	600	720	620	1	647141

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ID Maxxam		I14664	I14668	I14682		
Date d'échantillonnage		2009/07/26 15:00	2009/07/25 10:00	2009/07/28 11:00		
# Bordereau		E-780312	E-780312	E-780313		
	Unités	**LAC-DSO4-FR Dup. de Lab.**	**LAC-KIV4**	**LAC-NEIGE**	**LDR**	**Lot CQ**
CONVENTIONNELS						
Azote ammoniacal (N-NH3)	mg/kg	N/A	ND	45	20	647409
Conductivité	mS/cm	N/A	0.03	0.03	0.02	647969
Nitrate(N) et Nitrite(N)	mg/Kg	N/A	ND	ND	30	649018
pH	pH	N/A	5.21	5.55	N/A	647963
Phosphore total	mg/kg	900	720	930	5	648892
Soufre (S)	%	N/A	0.13	0.23	0.01	650444
Chlorures (Cl)	mg/kg	N/A	19	17	5	647141
Sulfates (SO4)	mg/kg	N/A	790	880	1	647141

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (EAU DE SURFACE)

ID Maxxam		I14570	I14642	I14663		
Date d'échantillonnage		2009/07/22 13:00	2009/07/25 09:00	2009/07/26 15:00		
# Bordereau		E-780311	E-780311	E-780311		
	Unités	**LAC-KIV5A**	**LAC-SUNNY 1**	**LAC-DSO4-FR**	**LDR**	**Lot CQ**
MÉTAUX						
Mercure (Hg)	mg/L	ND	ND	ND	0.00005	647493
Uranium (U)	ug/L	ND	ND	ND	0.1	647495
MÉTAUX ICP-MS						
Aluminium (Al)	ug/L	12	7.1	17	1.0	647492
Antimoine (Sb)	ug/L	ND	ND	ND	1.0	647492
Argent (Ag)	ug/L	ND	ND	ND	0.10	647492
Arsenic (As)	ug/L	ND	ND	ND	1.0	647492
Baryum (Ba)	ug/L	0.66	ND	1.4	0.50	647492
Cadmium (Cd)	ug/L	0.024	0.021	0.024	0.020	647492
Chrome (Cr)	ug/L	ND	ND	ND	1.0	647492
Cobalt (Co)	ug/L	ND	ND	ND	1.0	647492
Cuivre (Cu)	ug/L	ND	ND	1.3	1.0	647492
Manganèse (Mn)	ug/L	4.4	2.9	18	1.0	647492
Molybdène (Mo)	ug/L	ND	ND	ND	2.0	647492
Nickel (Ni)	ug/L	ND	ND	ND	1.0	647492
Sodium (Na)	ug/L	ND	ND	ND	500	647492
Zinc (Zn)	ug/L	2.1	2.4	2.8	1.0	647492
Bore (B)	ug/L	ND	ND	ND	20	647492
Fer (Fe)	ug/L	13	33	11	1.0	647492
Magnésium (Mg)	ug/L	53	85	81	20	647492
Potassium (K)	ug/L	83	87	66	20	647492
Sélénium (Se)	ug/L	ND	ND	ND	1.0	647492
Strontium (Sr)	ug/L	ND	ND	ND	1.0	647492
Etain (Sn)	ug/L	ND	ND	ND	2.0	647492
Titane (Ti)	ug/L	ND	ND	ND	2.0	647492
Vanadium (V)	ug/L	ND	ND	ND	5.0	647492
Béryllium (Be)	ug/L	ND	ND	ND	0.10	647492
Bismuth (Bi)	ug/L	ND	ND	ND	0.50	647492
Calcium (Ca)	ug/L	ND	ND	ND	500	647492
Silicium (Si)(soluble dans HNO3)	ug/L	ND	ND	290	100	647492

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (EAU DE SURFACE)

ID Maxxam		I14570	I14642	I14663		
Date d'échantillonnage		2009/07/22 13:00	2009/07/25 09:00	2009/07/26 15:00		
# Bordereau		E-780311	E-780311	E-780311		
	Unités	**LAC-KIV5A**	**LAC-SUNNY 1**	**LAC-DSO4-FR**	**LDR**	**Lot CQ**
Plomb (Pb)	ug/L	ND	ND	ND	1.0	647492
Thallium (Tl)	ug/L	ND	ND	ND	1.0	647492
Tellurium (Te)	ug/L	ND	ND	ND	5.0	647492

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (EAU DE SURFACE)

ID Maxxam		I14666	I14669	I14673		
Date d'échantillonnage		2009/07/25 10:00	2009/07/21 16:00	2009/07/27 10:00		
# Bordereau		E-780312	E-780312	E-780318		
	Unités	**LAC-KIV4**	**LAC-GOODWOOD**	**DSO4-JB1**	**LDR**	**Lot CQ**
MÉTAUX						
Mercure (Hg)	mg/L	ND	ND	ND	0.00005	647493
Uranium (U)	ug/L	ND	ND	ND	0.1	647495
MÉTAUX ICP-MS						
Aluminium (Al)	ug/L	12	1.5	ND	1.0	647492
Antimoine (Sb)	ug/L	ND	ND	ND	1.0	647492
Argent (Ag)	ug/L	ND	ND	ND	0.10	647492
Arsenic (As)	ug/L	ND	ND	ND	1.0	647492
Baryum (Ba)	ug/L	0.74	0.54	ND	0.50	647492
Cadmium (Cd)	ug/L	ND	ND	ND	0.020	647492
Chrome (Cr)	ug/L	ND	ND	ND	1.0	647492
Cobalt (Co)	ug/L	ND	ND	ND	1.0	647492
Cuivre (Cu)	ug/L	1.3	ND	ND	1.0	647492
Manganèse (Mn)	ug/L	2.0	7.7	1.5	1.0	647492
Molybdène (Mo)	ug/L	ND	ND	ND	2.0	647492
Nickel (Ni)	ug/L	ND	ND	ND	1.0	647492
Sodium (Na)	ug/L	ND	530	500	500	647492
Zinc (Zn)	ug/L	1.3	ND	ND	1.0	647492
Bore (B)	ug/L	ND	ND	ND	20	647492
Fer (Fe)	ug/L	14	48	8.7	1.0	647492
Magnésium (Mg)	ug/L	64	1500	1100	20	647492
Potassium (K)	ug/L	110	160	220	20	647492
Sélénium (Se)	ug/L	ND	ND	ND	1.0	647492
Strontium (Sr)	ug/L	ND	4.6	3.1	1.0	647492
Etain (Sn)	ug/L	ND	ND	ND	2.0	647492
Titane (Ti)	ug/L	ND	ND	ND	2.0	647492
Vanadium (V)	ug/L	ND	ND	ND	5.0	647492
Béryllium (Be)	ug/L	ND	ND	ND	0.10	647492
Bismuth (Bi)	ug/L	ND	ND	ND	0.50	647492
Calcium (Ca)	ug/L	ND	2300	1500	500	647492
Silicium (Si)(soluble dans HNO3)	ug/L	120	1100	1400	100	647492

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Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (EAU DE SURFACE)

ID Maxxam		I14666	I14669	I14673		
Date d'échantillonnage		2009/07/25 10:00	2009/07/21 16:00	2009/07/27 10:00		
# Bordereau		E-780312	E-780312	E-780318		
	Unités	**LAC-KIV4**	**LAC-GOODWOOD**	**DSO4-JB1**	**LDR**	**Lot CQ**
Plomb (Pb)	ug/L	ND	ND	ND	1.0	647492
Thallium (Tl)	ug/L	ND	ND	ND	1.0	647492
Tellurium (Te)	ug/L	ND	ND	ND	5.0	647492

ND = Non détecté
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél : (418) 658-5784 Télécopieur : (418) 658-6594

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (EAU DE SURFACE)

ID Maxxam		I14680	I14681		
Date d'échantillonnage		2009/07/27 15:00	2009/07/28 11:00		
# Bordereau		E-780318	E-780313		
	Unités	**DSO4-FOG1**	**LAC-NEIGE**	**LDR**	**Lot CQ**
MÉTAUX					
Mercure (Hg)	mg/L	ND	ND	0.00005	647493
Uranium (U)	ug/L	ND	ND	0.1	647495
MÉTAUX ICP-MS					
Aluminium (Al)	ug/L	1.6	18	1.0	647492
Antimoine (Sb)	ug/L	ND	ND	1.0	647492
Argent (Ag)	ug/L	ND	ND	0.10	647492
Arsenic (As)	ug/L	ND	ND	1.0	647492
Baryum (Ba)	ug/L	1.1	2.1	0.50	647492
Cadmium (Cd)	ug/L	ND	ND	0.020	647492
Chrome (Cr)	ug/L	ND	ND	1.0	647492
Cobalt (Co)	ug/L	ND	ND	1.0	647492
Cuivre (Cu)	ug/L	ND	1.3	1.0	647492
Manganèse (Mn)	ug/L	ND	6.9	1.0	647492
Molybdène (Mo)	ug/L	ND	ND	2.0	647492
Nickel (Ni)	ug/L	ND	ND	1.0	647492
Sodium (Na)	ug/L	720	ND	500	647492
Zinc (Zn)	ug/L	1.8	1.9	1.0	647492
Bore (B)	ug/L	ND	ND	20	647492
Fer (Fe)	ug/L	2.8	53	1.0	647492
Magnésium (Mg)	ug/L	1600	440	20	647492
Potassium (K)	ug/L	270	98	20	647492
Sélénium (Se)	ug/L	ND	ND	1.0	647492
Strontium (Sr)	ug/L	4.7	1.4	1.0	647492
Etain (Sn)	ug/L	ND	ND	2.0	647492
Titane (Ti)	ug/L	ND	ND	2.0	647492
Vanadium (V)	ug/L	ND	ND	5.0	647492
Béryllium (Be)	ug/L	ND	ND	0.10	647492
Bismuth (Bi)	ug/L	ND	ND	0.50	647492
Calcium (Ca)	ug/L	1900	570	500	647492
Silicium (Si)(soluble dans HNO3)	ug/L	1800	120	100	647492

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

MÉTAUX (EAU DE SURFACE)

ID Maxxam		I14680	I14681		
Date d'échantillonnage		2009/07/27 15:00	2009/07/28 11:00		
# Bordereau		E-780318	E-780313		
	Unités	**DSO4-FOG1**	**LAC-NEIGE**	**LDR**	**Lot CQ**
Plomb (Pb)	ug/L	ND	ND	1.0	647492
Thallium (Tl)	ug/L	ND	ND	1.0	647492
Tellurium (Te)	ug/L	ND	ND	5.0	647492

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

PARAMÈTRES CONVENTIONNELS (EAU DE SURFACE)

ID Maxxam		I14570	I14640	I14642		
Date d'échantillonnage		2009/07/22 13:00	2009/07/25 9:00	2009/07/25 09:00		
# Bordereau		E-780311	E-780311	E-780311		
	Unités	**LAC-KIV5A**	**DSO4-GO2**	**LAC-SUNNY 1**	**LDR**	**Lot CQ**
CONVENTIONNELS						
Anions sulfures (S=)	mg/L	ND	N/A	ND	0.02	646793
Matières en suspension (MES)	mg/L	N/A	ND	N/A	2	646714

ND = Non détecté
N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

ID Maxxam		I14663	I14663	I14666		
Date d'échantillonnage		2009/07/26 15:00	2009/07/26 15:00	2009/07/25 10:00		
# Bordereau		E-780311	E-780311	E-780312		
	Unités	**LAC-DSO4-FR**	**LAC-DSO4-FR Dup. de Lab.**	**LAC-KIV4**	**LDR**	**Lot CQ**
CONVENTIONNELS						
Anions sulfures (S=)	mg/L	ND	ND	ND	0.02	646793

ND = Non détecté
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

ID Maxxam		I14669	I14673	I14676		
Date d'échantillonnage		2009/07/21 16:00	2009/07/27 10:00	2009/07/27 17:00		
# Bordereau		E-780312	E-780318	E-780318		
	Unités	**LAC-GOODWOOD**	**DSO4-JB1**	**DSO2-STA1**	**LDR**	**Lot CQ**
CONVENTIONNELS						
Anions sulfures (S=)	mg/L	ND	ND	N/A	0.02	646793
Matières en suspension (MES)	mg/L	N/A	N/A	ND	2	646714

ND = Non détecté
N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

PARAMÈTRES CONVENTIONNELS (EAU DE SURFACE)

ID Maxxam		I14677	I14678	I14680		
Date d'échantillonnage		2009/07/27 15:00	2009/07/27 10:00	2009/07/27 15:00		
# Bordereau		E-780318	E-780318	E-780318		
	Unités	**DSO4-FOG1**	**DSO4-JB1**	**DSO4-FOG1**	**LDR**	**Lot CQ**
CONVENTIONNELS						
Anions sulfures (S=)	mg/L	N/A	N/A	ND	0.02	646793
Matières en suspension (MES)	mg/L	ND	ND	N/A	2	646714

ND = Non détecté
N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

ID Maxxam		I14681		
Date d'échantillonnage		2009/07/28 11:00		
# Bordereau		E-780313		
	Unités	**LAC-NEIGE**	**LDR**	**Lot CQ**
CONVENTIONNELS				
Anions sulfures (S=)	mg/L	ND	0.02	646793

ND = Non détecté
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

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Dossier Maxxam: A937177
Date du rapport: 2009/08/24

GROUPE HÉMISPHÈRES INC.
Votre # du projet: PR84E
Nom de projet: DSO
Votre # de commande: 16810
Initiales du préleveur: JT

REMARQUES GÉNÉRALES

État des échantillons à l'arrivée: BON

Tous les résultats sont calculés sur une base sèche excepté lorsque non-applicable.

MÉTAUX (SÉDIMENT)

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc.

PARAMÈTRES CONVENTIONNELS (SÉDIMENT)

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc.

MÉTAUX (EAU DE SURFACE)

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc.

PARAMÈTRES CONVENTIONNELS (EAU DE SURFACE)

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité. Veuillez noter que les résultats ont été corrigés pour le blanc.

Les résultats s'appliquent seulement pour les paramètres analysés.

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GROUPE HÉMISPHÈRES INC.
Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité

Dossier Maxxam: A937177

Lot AQ/CQ Num Init	Type CQ	Paramètre	Date Analysé aaaa/mm/jj	Valeur	Réc	Unités
646714 MCC	Blanc fortifié	Matières en suspension (MES)	2009/07/31		110	%
	Blanc de méthode	Matières en suspension (MES)	2009/07/31	2, LDR=2		mg/L
646793 DP3	Matériau de référence certifié	Anions sulfures (S=)	2009/07/31		85	%
	Blanc de méthode	Anions sulfures (S=)	2009/07/31	ND, LDR=0.02		mg/L
647141 MCC	Matériau de référence certifié	Chlorures (Cl)	2009/08/05		92	%
	Matériau de référence certifié DUP	Chlorures (Cl)	2009/08/05		84	%
	Matériau de référence certifié	Sulfates (SO4)	2009/08/05		97	%
	Matériau de référence certifié DUP	Sulfates (SO4)	2009/08/05		93	%
	Blanc de méthode	Chlorures (Cl)	2009/08/05	ND, LDR=0.5		mg/kg
	Blanc de méthode DUP	Chlorures (Cl)	2009/08/05	ND, LDR=0.5		mg/kg
	Blanc de méthode	Sulfates (SO4)	2009/08/05	ND, LDR=1		mg/kg
	Blanc de méthode DUP	Sulfates (SO4)	2009/08/05	ND, LDR=1		mg/kg
647409 MB6	Matériau de référence certifié	Azote ammoniacal (N-NH3)	2009/08/07		103	%
	Blanc de méthode	Azote ammoniacal (N-NH3)	2009/08/07	ND, LDR=20		mg/kg
647492 DP3	Blanc fortifié	Aluminium (Al)	2009/08/04		90	%
		Antimoine (Sb)	2009/08/04		106	%
		Argent (Ag)	2009/08/04		82	%
		Arsenic (As)	2009/08/04		101	%
		Baryum (Ba)	2009/08/04		99	%
		Cadmium (Cd)	2009/08/04		102	%
		Chrome (Cr)	2009/08/04		94	%
		Cobalt (Co)	2009/08/04		98	%
		Cuivre (Cu)	2009/08/04		97	%
		Manganèse (Mn)	2009/08/04		92	%
		Molybdène (Mo)	2009/08/04		101	%
		Nickel (Ni)	2009/08/04		100	%
		Sodium (Na)	2009/08/04		93	%
		Zinc (Zn)	2009/08/04		96	%
		Bore (B)	2009/08/04		100	%
		Fer (Fe)	2009/08/04		99	%
		Magnésium (Mg)	2009/08/04		97	%
		Potassium (K)	2009/08/04		91	%
		Sélénium (Se)	2009/08/04		104	%
		Strontium (Sr)	2009/08/04		97	%
		Etain (Sn)	2009/08/04		103	%
		Titane (Ti)	2009/08/04		102	%
		Vanadium (V)	2009/08/04		95	%
		Béryllium (Be)	2009/08/04		104	%
		Bismuth (Bi)	2009/08/04		120	%
		Calcium (Ca)	2009/08/04		96	%
		Silicium (Si)(soluble dans HNO3)	2009/08/04		90	%
		Plomb (Pb)	2009/08/04		99	%
		Thallium (Tl)	2009/08/04		111	%
		Tellurium (Te)	2009/08/04		102	%
	Blanc de méthode	Aluminium (Al)	2009/08/04	ND, LDR=1.0		ug/L

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Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité (Suite)

Dossier Maxxam: A937177

Lot AQ/CQ Num Init	Type CQ	Paramètre	Date Analysé aaaa/mm/jj	Valeur	Réc	Unités
647492 DP3	Blanc de méthode	Antimoine (Sb)	2009/08/04	ND, LDR=1.0		ug/L
		Argent (Ag)	2009/08/04	ND, LDR=0.10		ug/L
		Arsenic (As)	2009/08/04	ND, LDR=1.0		ug/L
		Baryum (Ba)	2009/08/04	ND, LDR=0.50		ug/L
		Cadmium (Cd)	2009/08/04	0.030, LDR=0.020		ug/L
		Chrome (Cr)	2009/08/04	ND, LDR=1.0		ug/L
		Cobalt (Co)	2009/08/04	ND, LDR=1.0		ug/L
		Cuivre (Cu)	2009/08/04	ND, LDR=1.0		ug/L
		Manganèse (Mn)	2009/08/04	ND, LDR=1.0		ug/L
		Molybdène (Mo)	2009/08/04	ND, LDR=2.0		ug/L
		Nickel (Ni)	2009/08/04	ND, LDR=1.0		ug/L
		Sodium (Na)	2009/08/04	ND, LDR=500		ug/L
		Zinc (Zn)	2009/08/04	ND, LDR=1.0		ug/L
		Bore (B)	2009/08/04	ND, LDR=20		ug/L
		Fer (Fe)	2009/08/04	1.2, LDR=1.0		ug/L
		Magnésium (Mg)	2009/08/04	ND, LDR=20		ug/L
		Potassium (K)	2009/08/04	ND, LDR=20		ug/L
		Sélénium (Se)	2009/08/04	ND, LDR=1.0		ug/L
		Strontium (Sr)	2009/08/04	ND, LDR=1.0		ug/L
		Etain (Sn)	2009/08/04	ND, LDR=2.0		ug/L
		Titane (Ti)	2009/08/04	ND, LDR=2.0		ug/L
		Vanadium (V)	2009/08/04	ND, LDR=5.0		ug/L
		Béryllium (Be)	2009/08/04	ND, LDR=0.10		ug/L
		Bismuth (Bi)	2009/08/04	ND, LDR=0.50		ug/L
		Calcium (Ca)	2009/08/04	ND, LDR=500		ug/L
		Silicium (Si)(soluble dans HNO3)	2009/08/04	ND, LDR=100		ug/L
		Plomb (Pb)	2009/08/04	ND, LDR=1.0		ug/L
		Thallium (Tl)	2009/08/04	ND, LDR=1.0		ug/L
		Tellurium (Te)	2009/08/04	ND, LDR=5.0		ug/L
647493 DP3	Blanc fortifié	Mercure (Hg)	2009/08/04		86	%
	Blanc de méthode	Mercure (Hg)	2009/08/04	ND, LDR=0.00005		mg/L
647495 DP3	Blanc fortifié	Uranium (U)	2009/08/04		99	%
	Blanc de méthode	Uranium (U)	2009/08/04	ND, LDR=0.1		ug/L
647543 DP3	Matériau de référence certifié	Arsenic (As)	2009/08/06		84	%
		Cadmium (Cd)	2009/08/06		101	%
		Cobalt (Co)	2009/08/06		98	%
		Chrome (Cr)	2009/08/06		85	%
		Cuivre (Cu)	2009/08/06		95	%
		Manganèse (Mn)	2009/08/06		94	%
		Molybdène (Mo)	2009/08/06		87	%
		Nickel (Ni)	2009/08/06		99	%
		Plomb (Pb)	2009/08/06		97	%
		Zinc (Zn)	2009/08/06		93	%
		Aluminium (Al)	2009/08/06		96	%
		Bore (B)	2009/08/06		106	%
		Calcium (Ca)	2009/08/06		97	%
		Magnésium (Mg)	2009/08/06		92	%
		Potassium (K)	2009/08/06		91	%
	Blanc fortifié	Argent (Ag)	2009/08/06		87	%
		Arsenic (As)	2009/08/06		98	%
		Baryum (Ba)	2009/08/06		96	%
		Cadmium (Cd)	2009/08/06		91	%
		Cobalt (Co)	2009/08/06		100	%
		Chrome (Cr)	2009/08/06		97	%

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Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité (Suite)

Dossier Maxxam: A937177

Lot AQ/CQ Num Init	Type CQ	Paramètre	Date Analysé aaaa/mm/jj	Valeur	Réc	Unités
647543 DP3	Blanc fortifié	Cuivre (Cu)	2009/08/06		99	%
		Etain (Sn)	2009/08/06		97	%
		Manganèse (Mn)	2009/08/06		95	%
		Molybdène (Mo)	2009/08/06		101	%
		Nickel (Ni)	2009/08/06		101	%
		Plomb (Pb)	2009/08/06		104	%
		Zinc (Zn)	2009/08/06		98	%
		Antimoine (Sb)	2009/08/06		94	%
		Béryllium (Be)	2009/08/06		105	%
		Bore (B)	2009/08/06		102	%
		Calcium (Ca)	2009/08/06		102	%
		Fer (Fe)	2009/08/06		104	%
		Magnésium (Mg)	2009/08/06		97	%
		Potassium (K)	2009/08/06		98	%
		Sodium (Na)	2009/08/06		97	%
		Strontium (Sr)	2009/08/06		98	%
		Titane (Ti)	2009/08/06		98	%
		Bismuth (Bi)	2009/08/06		111	%
		Vanadium (V)	2009/08/06		95	%
		Thallium (Tl)	2009/08/06		104	%
		Tellurium (Te)	2009/08/06		88	%
	Blanc de méthode	Argent (Ag)	2009/08/06	ND, LDR=0.2		mg/kg
		Arsenic (As)	2009/08/06	ND, LDR=0.5		mg/kg
		Baryum (Ba)	2009/08/06	ND, LDR=5		mg/kg
		Cadmium (Cd)	2009/08/06	ND, LDR=0.5		mg/kg
		Cobalt (Co)	2009/08/06	ND, LDR=1		mg/kg
		Chrome (Cr)	2009/08/06	2, LDR=1		mg/kg
		Cuivre (Cu)	2009/08/06	ND, LDR=1		mg/kg
		Etain (Sn)	2009/08/06	ND, LDR=2		mg/kg
		Manganèse (Mn)	2009/08/06	ND, LDR=1		mg/kg
		Molybdène (Mo)	2009/08/06	ND, LDR=2		mg/kg
		Nickel (Ni)	2009/08/06	ND, LDR=5		mg/kg
		Plomb (Pb)	2009/08/06	ND, LDR=5		mg/kg
		Zinc (Zn)	2009/08/06	ND, LDR=2		mg/kg
		Aluminium (Al)	2009/08/06	ND, LDR=5		mg/kg
		Antimoine (Sb)	2009/08/06	ND, LDR=0.5		mg/kg
		Béryllium (Be)	2009/08/06	ND, LDR=0.2		mg/kg
		Bore (B)	2009/08/06	ND, LDR=1		mg/kg
		Calcium (Ca)	2009/08/06	ND, LDR=30		mg/kg
		Fer (Fe)	2009/08/06	6, LDR=5		mg/kg
		Magnésium (Mg)	2009/08/06	ND, LDR=10		mg/kg
		Potassium (K)	2009/08/06	13, LDR=10		mg/kg
		Sodium (Na)	2009/08/06	ND, LDR=30		mg/kg
		Strontium (Sr)	2009/08/06	ND, LDR=2		mg/kg
		Titane (Ti)	2009/08/06	ND, LDR=2		mg/kg
		Bismuth (Bi)	2009/08/06	ND, LDR=0.2		mg/kg
		Vanadium (V)	2009/08/06	ND, LDR=5		mg/kg
		Thallium (Tl)	2009/08/06	ND, LDR=0.5		mg/kg
		Tellurium (Te)	2009/08/06	ND, LDR=2		mg/kg
647545 DP3	Matériau de référence certifié	Mercure (Hg)	2009/08/06		94	%
	Blanc fortifié	Mercure (Hg)	2009/08/06		98	%
	Blanc de méthode	Mercure (Hg)	2009/08/06	ND, LDR=0.01		mg/kg
647548 DP3	Blanc fortifié	Silicium (Si)(soluble dans HNO3)	2009/08/06		115	%
	Blanc de méthode	Silicium (Si)(soluble dans HNO3)	2009/08/06	ND, LDR=10		mg/kg

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GROUPE HÉMISPHÈRES INC.
Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité (Suite)

Dossier Maxxam: A937177

Lot AQ/CQ Num Init	Type CQ	Paramètre	Date Analysé aaaa/mm/jj	Valeur	Réc	Unités
647552 DP3	Blanc fortifié	Uranium (U)	2009/08/06		102	%
	Blanc de méthode	Uranium (U)	2009/08/06	ND, LDR=0.5		mg/kg
647963 MB6	Matériau de référence certifié	pH	2009/08/05		99	%
647969 MB6	Blanc fortifié	Conductivité	2009/08/06		88	%
	Blanc de méthode	Conductivité	2009/08/06	ND, LDR=0.02		mS/cm
648431 DP3	Matériau de référence certifié	Arsenic (As)	2009/08/07		103	%
		Cadmium (Cd)	2009/08/07		80	%
		Cobalt (Co)	2009/08/07		99	%
		Chrome (Cr)	2009/08/07		90	%
		Cuivre (Cu)	2009/08/07		94	%
		Manganèse (Mn)	2009/08/07		105	%
		Molybdène (Mo)	2009/08/07		89	%
		Nickel (Ni)	2009/08/07		94	%
		Plomb (Pb)	2009/08/07		99	%
		Zinc (Zn)	2009/08/07		91	%
		Aluminium (Al)	2009/08/07		101	%
		Bore (B)	2009/08/07		112	%
		Calcium (Ca)	2009/08/07		101	%
		Magnésium (Mg)	2009/08/07		97	%
		Potassium (K)	2009/08/07		89	%
	Blanc fortifié	Argent (Ag)	2009/08/07		81	%
		Arsenic (As)	2009/08/07		91	%
		Baryum (Ba)	2009/08/07		93	%
		Cadmium (Cd)	2009/08/07		82	%
		Cobalt (Co)	2009/08/07		99	%
		Chrome (Cr)	2009/08/07		101	%
		Cuivre (Cu)	2009/08/07		96	%
		Etain (Sn)	2009/08/07		89	%
		Manganèse (Mn)	2009/08/07		97	%
		Molybdène (Mo)	2009/08/07		91	%
		Nickel (Ni)	2009/08/07		99	%
		Plomb (Pb)	2009/08/07		105	%
		Zinc (Zn)	2009/08/07		91	%
		Antimoine (Sb)	2009/08/07		83	%
		Béryllium (Be)	2009/08/07		102	%
		Bore (B)	2009/08/07		101	%
		Calcium (Ca)	2009/08/07		99	%
		Fer (Fe)	2009/08/07		105	%
		Magnésium (Mg)	2009/08/07		96	%
		Potassium (K)	2009/08/07		86	%
		Sodium (Na)	2009/08/07		95	%
		Strontium (Sr)	2009/08/07		93	%
		Titane (Ti)	2009/08/07		98	%
		Bismuth (Bi)	2009/08/07		99	%
		Vanadium (V)	2009/08/07		88	%
		Thallium (Tl)	2009/08/07		99	%
		Tellurium (Te)	2009/08/07		80	%
	Blanc de méthode	Argent (Ag)	2009/08/07	ND, LDR=0.2		mg/kg
		Arsenic (As)	2009/08/07	ND, LDR=0.5		mg/kg
		Baryum (Ba)	2009/08/07	ND, LDR=1		mg/kg
		Cadmium (Cd)	2009/08/07	ND, LDR=5		mg/kg
		Cobalt (Co)	2009/08/07	ND, LDR=1		mg/kg
		Chrome (Cr)	2009/08/07	1, LDR=1		mg/kg

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GROUPE HÉMISPHÈRES INC.
Attention: Daniel Néron
Votre # du projet: PR84E
P.O. #: 16810
Nom de projet: DSO

Rapport Assurance Qualité (Suite)

Dossier Maxxam: A937177

Lot AQ/CQ Num Init	Type CQ	Paramètre	Date Analysé aaaa/mm/jj	Valeur	Réc	Unités
648431 DP3	Blanc de méthode	Cuivre (Cu)	2009/08/07	ND, LDR=1		mg/kg
		Etain (Sn)	2009/08/07	ND, LDR=2		mg/kg
		Manganèse (Mn)	2009/08/07	ND, LDR=1		mg/kg
		Molybdène (Mo)	2009/08/07	ND, LDR=2		mg/kg
		Nickel (Ni)	2009/08/07	ND, LDR=5		mg/kg
		Plomb (Pb)	2009/08/07	ND, LDR=5		mg/kg
		Zinc (Zn)	2009/08/07	ND, LDR=2		mg/kg
		Aluminium (Al)	2009/08/07	ND, LDR=5		mg/kg
		Antimoine (Sb)	2009/08/07	ND, LDR=0.5		mg/kg
		Béryllium (Be)	2009/08/07	ND, LDR=0.2		mg/kg
		Bore (B)	2009/08/07	ND, LDR=1		mg/kg
		Calcium (Ca)	2009/08/07	ND, LDR=30		mg/kg
		Fer (Fe)	2009/08/07	6, LDR=5		mg/kg
		Magnésium (Mg)	2009/08/07	ND, LDR=10		mg/kg
		Potassium (K)	2009/08/07	ND, LDR=10		mg/kg
		Sodium (Na)	2009/08/07	ND, LDR=30		mg/kg
		Strontium (Sr)	2009/08/07	ND, LDR=2		mg/kg
		Titane (Ti)	2009/08/07	ND, LDR=2		mg/kg
		Bismuth (Bi)	2009/08/07	ND, LDR=0.2		mg/kg
		Vanadium (V)	2009/08/07	ND, LDR=5		mg/kg
		Thallium (Tl)	2009/08/07	ND, LDR=0.5		mg/kg
		Tellurium (Te)	2009/08/07	ND, LDR=2		mg/kg
648432 DP3	Matériau de référence certifié	Mercure (Hg)	2009/08/07		101	%
	Blanc fortifié	Mercure (Hg)	2009/08/07		94	%
	Blanc de méthode	Mercure (Hg)	2009/08/07	0.03, LDR=0.01		mg/kg
648433 DP3	Blanc fortifié	Uranium (U)	2009/08/07		98	%
	Blanc de méthode	Uranium (U)	2009/08/07	ND, LDR=0.5		mg/kg
648435 DP3	Blanc fortifié	Silicium (Si)(soluble dans HNO3)	2009/08/07		115	%
	Blanc de méthode	Silicium (Si)(soluble dans HNO3)	2009/08/07	ND, LDR=10		mg/kg
648892 NS	Matériau de référence certifié	Phosphore total	2009/08/07		101	%
	Matériau de référence certifié DUP	Phosphore total	2009/08/07		103	%
	Blanc de méthode	Phosphore total	2009/08/07	63, LDR=5		mg/kg
	Blanc de méthode DUP	Phosphore total	2009/08/07	59, LDR=5		mg/kg
649018 MB6	Matériau de référence certifié	Nitrate(N) et Nitrite(N)	2009/08/10		106	%
	Blanc de méthode	Nitrate(N) et Nitrite(N)	2009/08/10	ND, LDR=30		mg/Kg
650444 JS2	Matériau de référence certifié	Soufre (S)	2009/08/14		113	%
	Blanc de méthode	Soufre (S)	2009/08/14	ND, LDR=0.01		%

Matériau de référence certifié: Matériau dont une ou plusieurs valeurs des propriétés sont certifiées par une procédure techniquement valide, délivré par un organisme de certification et accompagné d'un certificat. Sert à évaluer l'exactitude d'une méthode analytique.
Blanc fortifié: Blanc auquel a été ajouté une quantité connue d'un ou de pusieurs composés chimiques d'intérêt. Sert à évaluer la récupération des composés d'intérêts.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
LDR = Limite de détection rapportée
Réc = Récupération

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Page des signatures de validation

Dossier Maxxam: A937177

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



DOMINIQUE PELLETIER, B. Sc., chimiste,



MATHIEU LETOURNEAU, B.Sc., chimiste,

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation malsaine de la signature électronique et emploi les signataires requis selon la section 5.10.2 du guide ISO/IEC 17025:2005(E). Le CCN et le CALA ont tous deux approuvé cette façon de rapporter les résultats ainsi que ce format électronique de rapport.

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Your Project #: A937177
Your C.O.C. #: N/A

Attention: Caroline Marion
Maxxam Analytics
Sainte-Foy to Bedford
2690 Dalton Ave
Sainte-Foy, PQ
CANADA G1P3S4

Report Date: 2009/08/20

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A9A3476
Received: 2009/08/13, 9:57

Sample Matrix: Soil
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Particle size in solids (pipette&sieve)	4	N/A	2009/08/18	ATL SOP 00012 R3	based on MSAMS-1978
Particle size in solids (pipette&sieve)	1	N/A	2009/08/19	ATL SOP 00012 R3	based on MSAMS-1978

* 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.

KATIE COHOON, Bedford Client Services
Email: Katie.Cohoon.Reports@MaxxamAnalytics.com
Phone# (902) 420-0203

==========

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. SCC and CALA have approved this reporting process and electronic report format.

Total cover pages: 1

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Maxxam Job #: A9A3476
Report Date: 2009/08/20

Maxxam Analytics
Client Project #: A937177

RESULTS OF ANALYSES OF SOIL

Maxxam ID		DJ0156	DJ0159		
Sampling Date		2009/07/22	2009/07/25		
COC Number		N/A	N/A		
Registration #					
	Units	**I14633-01R\LAC-KIV5A**	**I14655-01R\LAC-SUNNY 1**	**RDL**	**QC Batch**
Inorganics					
< -4 Phi (16 mm)	%	100	100	0.1	1910692
< -3 Phi (8 mm)	%	100	100	0.1	1910692
< -2 Phi (4 mm)	%	100	100	0.1	1910692
< -1 Phi (2 mm)	%	100	99	0.1	1910692
< 0 Phi (1 mm)	%	99	98	0.1	1910692
< +1 Phi (0.5 mm)	%	98	98	0.1	1910692
< +2 Phi (0.25 mm)	%	96	96	0.1	1910692
< +3 Phi (0.12 mm)	%	93	93	0.1	1910692
< +4 Phi (0.062 mm)	%	90	90	0.1	1910692
< +5 Phi (0.031 mm)	%	83	85	0.1	1910692
< +6 Phi (0.016 mm)	%	76	78	0.1	1910692
< +7 Phi (0.0078 mm)	%	54	60	0.1	1910692
< +8 Phi (0.0039 mm)	%	45	54	0.1	1910692
< +9 Phi (0.0020 mm)	%	30	40	0.1	1910692
Gravel	%	ND	0.6	0.1	1910692
Sand	%	10	9.2	0.1	1910692
Silt	%	44	37	0.1	1910692
Clay	%	45	54	0.1	1910692

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

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Maxxam Job #: A9A3476
Report Date: 2009/08/20

Maxxam Analytics
Client Project #: A937177

RESULTS OF ANALYSES OF SOIL

Maxxam ID		DJ0160	DJ0161		
Sampling Date		2009/07/26	2009/07/25		
COC Number		N/A	N/A		
Registration #					
	Units	**I14664-01R\LAC-DSO4-FR**	**I14668-01R\LAC-KIV4**	**RDL**	**QC Batch**
Inorganics					
< -4 Phi (16 mm)	%	100	100	0.1	1910692
< -3 Phi (8 mm)	%	100	100	0.1	1910692
< -2 Phi (4 mm)	%	100	100	0.1	1910692
< -1 Phi (2 mm)	%	100	100	0.1	1910692
< 0 Phi (1 mm)	%	92	99	0.1	1910692
< +1 Phi (0.5 mm)	%	88	98	0.1	1910692
< +2 Phi (0.25 mm)	%	85	98	0.1	1910692
< +3 Phi (0.12 mm)	%	81	97	0.1	1910692
< +4 Phi (0.062 mm)	%	77	95	0.1	1910692
< +5 Phi (0.031 mm)	%	68	92	0.1	1910692
< +6 Phi (0.016 mm)	%	55	85	0.1	1910692
< +7 Phi (0.0078 mm)	%	29	67	0.1	1910692
< +8 Phi (0.0039 mm)	%	24	59	0.1	1910692
< +9 Phi (0.0020 mm)	%	16	43	0.1	1910692
Gravel	%	0.4	0.4	0.1	1910692
Sand	%	23	4.1	0.1	1910692
Silt	%	53	36	0.1	1910692
Clay	%	24	59	0.1	1910692

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

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Maxxam Job #: A9A3476
Report Date: 2009/08/20

Maxxam Analytics
Client Project #: A937177

RESULTS OF ANALYSES OF SOIL

Maxxam ID		DJ0162		
Sampling Date		2009/07/28		
COC Number		N/A		
Registration #				
	Units	**I14682-01R\LAC-NEIGE**	**RDL**	**QC Batch**
Inorganics				
< -4 Phi (16 mm)	%	100	0.1	1911920
< -3 Phi (8 mm)	%	100	0.1	1911920
< -2 Phi (4 mm)	%	100	0.1	1911920
< -1 Phi (2 mm)	%	99	0.1	1911920
< 0 Phi (1 mm)	%	98	0.1	1911920
< +1 Phi (0.5 mm)	%	96	0.1	1911920
< +2 Phi (0.25 mm)	%	95	0.1	1911920
< +3 Phi (0.12 mm)	%	94	0.1	1911920
< +4 Phi (0.062 mm)	%	93	0.1	1911920
< +5 Phi (0.031 mm)	%	91	0.1	1911920
< +6 Phi (0.016 mm)	%	84	0.1	1911920
< +7 Phi (0.0078 mm)	%	53	0.1	1911920
< +8 Phi (0.0039 mm)	%	44	0.1	1911920
< +9 Phi (0.0020 mm)	%	31	0.1	1911920
Gravel	%	0.9	0.1	1911920
Sand	%	6.3	0.1	1911920
Silt	%	48	0.1	1911920
Clay	%	44	0.1	1911920

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

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Maxxam Job #: A9A3476
Report Date: 2009/08/20

Maxxam Analytics
Client Project #: A937177

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Analytics
Attention: Caroline Marion
Client Project #: A937177
P.O. #:
Project name:

Quality Assurance Report

Maxxam Job Number: DA9A3476

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1910692	MC2	RPD	< -4 Phi (16 mm)	2009/08/18	0		%	25
			< -3 Phi (8 mm)	2009/08/18	0		%	25
			< -2 Phi (4 mm)	2009/08/18	0		%	25
			< -1 Phi (2 mm)	2009/08/18	0.01		%	25
			< 0 Phi (1 mm)	2009/08/18	0.06		%	25
			< +1 Phi (0.5 mm)	2009/08/18	0.2		%	25
			< +2 Phi (0.25 mm)	2009/08/18	0.2		%	25
			< +3 Phi (0.12 mm)	2009/08/18	0.5		%	25
			< +4 Phi (0.062 mm)	2009/08/18	0.8		%	25
			< +5 Phi (0.031 mm)	2009/08/18	3.1		%	25
			< +6 Phi (0.016 mm)	2009/08/18	2.0		%	25
			< +7 Phi (0.0078 mm)	2009/08/18	7.5		%	25
			< +8 Phi (0.0039 mm)	2009/08/18	3.5		%	25
			< +9 Phi (0.0020 mm)	2009/08/18	8.2		%	25
			Gravel	2009/08/18	NC		%	25
			Sand	2009/08/18	0.9		%	25
			Silt	2009/08/18	0.6		%	25
			Clay	2009/08/18	3.5		%	25

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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D. Air Quality

2017

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Your P.O. #: 2200001372
Your Project #: DUSTFALL
Site Location: DSO3-4 / TSMC
Your C.O.C. #: N-A

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/08/07
Report #: R2307402
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B738998
Received: 2017/07/07, 08:00

Sample Matrix: WASTE WATER
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Weight of particles (1)*	8	2017/07/14	2017/07/14	STL SOP-00020	MA100–Part. 1.0 R4 m
Extractable Metals in Impinger (1)***	8	2017/08/03	2017/08/03	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

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Your P.O. #: 2200001372
Your Project #: DUSTFALL
Site Location: DSO3-4 / TSMC
Your C.O.C. #: N-A

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/08/07
Report #: R2307402
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B738998
Received: 2017/07/07, 08:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

==========

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 Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B738998
Report Date: 2017/08/07

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO3-4 / TSMC
Your P.O. #: 2200001372
Sampler Initials: JFD

METALS (WASTE WATER)

Maxxam ID		EF6135	EF6563	EF6564	EF6565	EF6566		
Sampling Date		2017/07/04 12:29	2017/07/04 13:22	2017/07/04 14:13	2017/07/04 16:00	2017/07/06 06:21		
COC Number		N-A	N-A	N-A	N-A	N-A		
	Units	DSO4-AQS1-DF-3	DSO4-AQS2-DF-3	DSO4-AQS3-DF-3	DSO4-AQS4-DF-3	DSO3-AQS6-DF-3	RDL	QC Batch
METALS								
Antimony (Sb)	ug	<0.1	0.1	<0.1	<0.1	<0.1	0.1	1820392
Silver (Ag)	ug	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	1820392
Arsenic (As)	ug	<0.1	<0.1	<0.1	0.4	<0.1	0.1	1820392
Barium (Ba)	ug	8.16	13.4	27.9	22.0	19.9	0.05	1820392
Beryllium (Be)	ug	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1820392
Cadmium (Cd)	ug	<0.05	<0.05	<0.05	0.10	<0.05	0.05	1820392
Chromium (Cr)	ug	1.1	0.6	1.4	1.6	0.6	0.1	1820392
Copper (Cu)	ug	3.4	2.6	7.4	0.6	4.3	0.1	1820392
Manganese (Mn)	ug	35.2	10.5	14.1	233	24.0	0.1	1820392
Mercury (Hg)	ug	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1820392
Nickel (Ni)	ug	1.0	0.7	1.1	0.8	0.6	0.1	1820392
Lead (Pb)	ug	2.1	<0.5	2.9	1.8	1.6	0.5	1820392
Thallium (Tl)	ug	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	1820392
Vanadium (V)	ug	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	1820392
Zinc (Zn)	ug	13.2	121	16.4	437	12.2	0.1	1820392

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B738998
Report Date: 2017/08/07

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO3-4 / TSMC
Your P.O. #: 2200001372
Sampler Initials: JFD

METALS (WASTE WATER)

Maxxam ID		EF6567	EF6568	EF6574		
Sampling Date		2017/07/06 11:20	2017/07/06 14:06	2017/07/06 15:23		
COC Number		N-A	N-A	N-A		
	Units	DSO3-AQS7-DF-3	DSO3-AQS8-DF-3	DSO3-AQS9-DF-3	RDL	QC Batch
METALS						
Antimony (Sb)	ug	<0.1	<0.1	<0.1	0.1	1820392
Silver (Ag)	ug	<0.5	<0.5	<0.5	0.5	1820392
Arsenic (As)	ug	0.2	<0.1	<0.1	0.1	1820392
Barium (Ba)	ug	16.6	8.09	8.83	0.05	1820392
Beryllium (Be)	ug	<0.05	<0.05	<0.05	0.05	1820392
Cadmium (Cd)	ug	0.19	0.19	0.10	0.05	1820392
Chromium (Cr)	ug	1.1	0.7	1.0	0.1	1820392
Copper (Cu)	ug	2.3	0.8	2.2	0.1	1820392
Manganese (Mn)	ug	49.1	25.9	11.0	0.1	1820392
Mercury (Hg)	ug	<0.05	<0.05	<0.05	0.05	1820392
Nickel (Ni)	ug	2.2	2.2	1.1	0.1	1820392
Lead (Pb)	ug	<0.5	2.6	0.9	0.5	1820392
Thallium (Tl)	ug	<0.1	<0.1	<0.1	0.1	1820392
Vanadium (V)	ug	<0.2	<0.2	<0.2	0.2	1820392
Zinc (Zn)	ug	23.0	729	122	0.1	1820392

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B738998
Report Date: 2017/08/07

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO3-4 / TSMC
Your P.O. #: 2200001372
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (WASTE WATER)

Maxxam ID		EF6135	EF6563	EF6564	EF6565	EF6566		
Sampling Date		2017/07/04 12:29	2017/07/04 13:22	2017/07/04 14:13	2017/07/04 16:00	2017/07/06 06:21		
COC Number		N-A	N-A	N-A	N-A	N-A		
	Units	DSO4-AQS1-DF-3	DSO4-AQS2-DF-3	DSO4-AQS3-DF-3	DSO4-AQS4-DF-3	DSO3-AQS6-DF-3	RDL	QC Batch
CONVENTIONALS								
Weight of particles	g	0.039	0.019	0.018	0.051	0.0067	0.0010	1803397

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		EF6567	EF6568	EF6574		
Sampling Date		2017/07/06 11:20	2017/07/06 14:06	2017/07/06 15:23		
COC Number		N-A	N-A	N-A		
	Units	DSO3-AQS7-DF-3	DSO3-AQS8-DF-3	DSO3-AQS9-DF-3	RDL	QC Batch
CONVENTIONALS						
Weight of particles	g	0.021	0.024	0.023	0.0010	1803397

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B738998
Report Date: 2017/08/07

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO3-4 / TSMC
Your P.O. #: 2200001372
Sampler Initials: JFD

GENERAL COMMENTS

METALS (WASTE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (WASTE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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Maxxam Job #: B738998
Report Date: 2017/08/07

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO3-4 / TSMC
Your P.O. #: 2200001372
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1803397	SCL	Spiked Blank	Weight of particles	2017/07/14		103	%
1803397	SCL	Spiked Blank DUP	Weight of particles	2017/07/14		101	%
1803397	SCL	Method Blank	Weight of particles	2017/07/14	<0.0010		g

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.

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Maxxam Job #: B738998
Report Date: 2017/08/07

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO3-4 / TSMC
Your P.O. #: 2200001372
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Olga Zlatov Polevoi, Analyst I

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Your P.O. #: 2200001778
Your Project #: DSO3-4 DUST FALL
Site#: TSMC
Site Location: DUST FALL
Your C.O.C. #: 157354-13-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/09/13
Report #: R2318532
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B747035
Received: 2017/08/08, 09:30

Sample Matrix: WASTE WATER
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Weight of particles (1)*	7	2017/08/18	2017/08/18	STL SOP-00020	MA100–Part. 1.0 R4 m
Extractable Metals in Impinger (1)***	7	2017/09/11	2017/09/13	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

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Your P.O. #: 2200001778
Your Project #: DSO3-4 DUST FALL
Site#: TSMC
Site Location: DUST FALL
Your C.O.C. #: 157354-13-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/09/13
Report #: R2318532
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B747035
Received: 2017/08/08, 09:30

Encryption Key

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Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

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Maxxam Job #: B747035
Report Date: 2017/09/13

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUST FALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JFD

METALS (WASTE WATER)

Maxxam ID		EJ7238	EJ7248	EJ7249	EJ7250	EJ7251		
Sampling Date		2017/08/06 08:42	2017/08/06 10:28	2017/08/06 09:47	2017/08/06 18:29	2017/08/07 10:25		
COC Number		157354-13-01	157354-13-01	157354-13-01	157354-13-01	157354-13-01		
	Units	DSO4-AQS2-DF-4	DSO4-AQS3-DF-4	DSO4-AQS4-DF-4	DSO3-AQS6-DF-4	DSO3-AQS7-DF-4	RDL	QC Batch
METALS								
Antimony (Sb)	ug	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	1835914
Silver (Ag)	ug	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	1835914
Arsenic (As)	ug	<0.1	<0.1	0.2	<0.1	0.1	0.1	1835914
Barium (Ba)	ug	9.99	20.5	41.3	12.4	17.9	0.05	1835914
Beryllium (Be)	ug	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1835914
Cadmium (Cd)	ug	0.27	<0.05	0.07	<0.05	<0.05	0.05	1835914
Chromium (Cr)	ug	2.1	1.2	1.7	1.1	0.5	0.1	1835914
Copper (Cu)	ug	0.7	5.3	4.7	6.8	2.5	0.1	1835914
Manganese (Mn)	ug	23.3	32.4	58.9	32.0	69.8	0.1	1835914
Mercury (Hg)	ug	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1835914
Nickel (Ni)	ug	0.4	1.0	1.3	1.1	1.1	0.1	1835914
Lead (Pb)	ug	4.1	2.6	3.6	2.8	1.3	0.5	1835914
Vanadium (V)	ug	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	1835914
Zinc (Zn)	ug	1200	13.6	75.8	10.7	10.4	0.1	1835914

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B747035
Report Date: 2017/09/13

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUST FALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JFD

METALS (WASTE WATER)

Maxxam ID		EJ7252	EJ7253		
Sampling Date		2017/08/06 15:23	2017/08/06 11:55		
COC Number		157354-13-01	157354-13-01		
	Units	DSO3-AQS8-DF-4	DSO3-AQS9-DF-4	RDL	QC Batch
METALS					
Antimony (Sb)	ug	<0.1	<0.1	0.1	1835914
Silver (Ag)	ug	<0.5	<0.5	0.5	1835914
Arsenic (As)	ug	<0.1	<0.1	0.1	1835914
Barium (Ba)	ug	8.22	5.61	0.05	1835914
Beryllium (Be)	ug	<0.05	<0.05	0.05	1835914
Cadmium (Cd)	ug	<0.05	<0.05	0.05	1835914
Chromium (Cr)	ug	1.4	2.1	0.1	1835914
Copper (Cu)	ug	4.8	3.8	0.1	1835914
Manganese (Mn)	ug	16.5	26.7	0.1	1835914
Mercury (Hg)	ug	<0.05	<0.05	0.05	1835914
Nickel (Ni)	ug	1.3	1.0	0.1	1835914
Lead (Pb)	ug	6.8	5.1	0.5	1835914
Vanadium (V)	ug	<0.2	<0.2	0.2	1835914
Zinc (Zn)	ug	17.9	58.9	0.1	1835914

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B747035
Report Date: 2017/09/13

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUST FALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (WASTE WATER)

Maxxam ID		EJ7238	EJ7248	EJ7249	EJ7250	EJ7251		
Sampling Date		2017/08/06 08:42	2017/08/06 10:28	2017/08/06 09:47	2017/08/06 18:29	2017/08/07 10:25		
COC Number		157354-13-01	157354-13-01	157354-13-01	157354-13-01	157354-13-01		
	Units	DSO4-AQS2-DF-4	DSO4-AQS3-DF-4	DSO4-AQS4-DF-4	DSO3-AQS6-DF-4	DSO3-AQS7-DF-4	RDL	QC Batch
CONVENTIONALS								
Weight of particles	g	0.016	0.015	0.031	0.019	0.015	0.0010	1826904

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		EJ7252	EJ7253		
Sampling Date		2017/08/06 15:23	2017/08/06 11:55		
COC Number		157354-13-01	157354-13-01		
	Units	DSO3-AQS8-DF-4	DSO3-AQS9-DF-4	RDL	QC Batch
CONVENTIONALS					
Weight of particles	g	0.0071	0.011	0.0010	1826904

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B747035
Report Date: 2017/09/13

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUST FALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JFD

GENERAL COMMENTS

METALS (WASTE WATER)

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CONVENTIONAL PARAMETERS (WASTE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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Maxxam Job #: B747035
Report Date: 2017/09/13

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUST FALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1826904	MA3	Spiked Blank	Weight of particles	2017/08/18		98	%
1826904	MA3	Spiked Blank DUP	Weight of particles	2017/08/18		103	%
1826904	MA3	Method Blank	Weight of particles	2017/08/18	<0.0010		g
1835914	OZP	Spiked Blank	Antimony (Sb)	2017/09/13		95	%
			Silver (Ag)	2017/09/13		90	%
			Arsenic (As)	2017/09/13		97	%
			Barium (Ba)	2017/09/13		91	%
			Beryllium (Be)	2017/09/13		94	%
			Cadmium (Cd)	2017/09/13		94	%
			Chromium (Cr)	2017/09/13		95	%
			Copper (Cu)	2017/09/13		98	%
			Manganese (Mn)	2017/09/13		97	%
			Mercury (Hg)	2017/09/13		104	%
			Nickel (Ni)	2017/09/13		96	%
			Lead (Pb)	2017/09/13		96	%
			Vanadium (V)	2017/09/13		95	%
			Zinc (Zn)	2017/09/13		99	%
1835914	OZP	Method Blank	Antimony (Sb)	2017/09/13	<0.1		ug
			Silver (Ag)	2017/09/13	<0.5		ug
			Arsenic (As)	2017/09/13	<0.1		ug
			Barium (Ba)	2017/09/13	<0.05		ug
			Beryllium (Be)	2017/09/13	<0.05		ug
			Cadmium (Cd)	2017/09/13	<0.05		ug
			Chromium (Cr)	2017/09/13	<0.1		ug
			Copper (Cu)	2017/09/13	<0.1		ug
			Manganese (Mn)	2017/09/13	0.2, RDL=0.1		ug
			Mercury (Hg)	2017/09/13	<0.05		ug
			Nickel (Ni)	2017/09/13	<0.1		ug
			Lead (Pb)	2017/09/13	<0.5		ug
			Vanadium (V)	2017/09/13	<0.2		ug
			Zinc (Zn)	2017/09/13	<0.1		ug

RDL = Reportable Detection Limit

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.

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Maxxam Job #: B747035
Report Date: 2017/09/13

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUST FALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Miryam Assayag



Olga Zlatov Polevoi, Analyst I

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Your P.O. #: 2200001778
Your Project #: DSO3-4 DUST FALL
Site#: TSMC
Site Location: DUST FALL
Your C.O.C. #: 157354-13-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/11/02
Report #: R2331893
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B747035
Received: 2017/08/08, 09:30

Sample Matrix: WASTE WATER
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Weight of particles (1)*	7	2017/08/18	2017/08/18	STL SOP-00020	MA100–Part. 1.0 R4 m
Extractable Metals in Impinger (1)***	7	2017/09/11	2017/09/13	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

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MAXXAM JOB #: B747035
Received: 2017/08/08, 09:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

==========

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.

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Maxxam Job #: B747035
Report Date: 2017/11/02

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUST FALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JFD

METALS (WASTE WATER)

Maxxam ID		EJ7238	EJ7248	EJ7249	EJ7250	EJ7251		
Sampling Date		2017/08/06 08:42	2017/08/06 10:28	2017/08/06 09:47	2017/08/06 18:29	2017/08/07 10:25		
COC Number		157354-13-01	157354-13-01	157354-13-01	157354-13-01	157354-13-01		
	Units	DSO4-AQS2-DF-4	DSO4-AQS3-DF-4	DSO4-AQS4-DF-4	DSO3-AQS6-DF-4	DSO3-AQS7-DF-4	RDL	QC Batch
METALS								
Antimony (Sb)	ug	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	1835914
Silver (Ag)	ug	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	1835914
Arsenic (As)	ug	<0.1	<0.1	0.2	<0.1	0.1	0.1	1835914
Barium (Ba)	ug	9.99	20.5	41.3	12.4	17.9	0.05	1835914
Beryllium (Be)	ug	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1835914
Cadmium (Cd)	ug	0.27	<0.05	0.07	<0.05	<0.05	0.05	1835914
Chromium (Cr)	ug	2.1	1.2	1.7	1.1	0.5	0.1	1835914
Copper (Cu)	ug	0.7	5.3	4.7	6.8	2.5	0.1	1835914
Manganese (Mn)	ug	23.3	32.4	58.9	32.0	69.8	0.1	1835914
Mercury (Hg)	ug	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1835914
Nickel (Ni)	ug	0.4	1.0	1.3	1.1	1.1	0.1	1835914
Lead (Pb)	ug	4.1	2.6	3.6	2.8	1.3	0.5	1835914
Thallium (Tl)	ug	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	1835914
Vanadium (V)	ug	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	1835914
Zinc (Zn)	ug	1200	13.6	75.8	10.7	10.4	0.1	1835914

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B747035
Report Date: 2017/11/02

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUST FALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JFD

METALS (WASTE WATER)

Maxxam ID		EJ7252	EJ7253		
Sampling Date		2017/08/06 15:23	2017/08/06 11:55		
COC Number		157354-13-01	157354-13-01		
	Units	DSO3-AQS8-DF-4	DSO3-AQS9-DF-4	RDL	QC Batch
METALS					
Antimony (Sb)	ug	<0.1	<0.1	0.1	1835914
Silver (Ag)	ug	<0.5	<0.5	0.5	1835914
Arsenic (As)	ug	<0.1	<0.1	0.1	1835914
Barium (Ba)	ug	8.22	5.61	0.05	1835914
Beryllium (Be)	ug	<0.05	<0.05	0.05	1835914
Cadmium (Cd)	ug	<0.05	<0.05	0.05	1835914
Chromium (Cr)	ug	1.4	2.1	0.1	1835914
Copper (Cu)	ug	4.8	3.8	0.1	1835914
Manganese (Mn)	ug	16.5	26.7	0.1	1835914
Mercury (Hg)	ug	<0.05	<0.05	0.05	1835914
Nickel (Ni)	ug	1.3	1.0	0.1	1835914
Lead (Pb)	ug	6.8	5.1	0.5	1835914
Thallium (Tl)	ug	<0.1	<0.1	0.1	1835914
Vanadium (V)	ug	<0.2	<0.2	0.2	1835914
Zinc (Zn)	ug	17.9	58.9	0.1	1835914

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B747035
Report Date: 2017/11/02

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUST FALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (WASTE WATER)

Maxxam ID		EJ7238	EJ7248	EJ7249	EJ7250	EJ7251		
Sampling Date		2017/08/06 08:42	2017/08/06 10:28	2017/08/06 09:47	2017/08/06 18:29	2017/08/07 10:25		
COC Number		157354-13-01	157354-13-01	157354-13-01	157354-13-01	157354-13-01		
	Units	DSO4-AQS2-DF-4	DSO4-AQS3-DF-4	DSO4-AQS4-DF-4	DSO3-AQS6-DF-4	DSO3-AQS7-DF-4	RDL	QC Batch
CONVENTIONALS								
Weight of particles	g	0.016	0.015	0.031	0.019	0.015	0.0010	1826904

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		EJ7252	EJ7253		
Sampling Date		2017/08/06 15:23	2017/08/06 11:55		
COC Number		157354-13-01	157354-13-01		
	Units	DSO3-AQS8-DF-4	DSO3-AQS9-DF-4	RDL	QC Batch
CONVENTIONALS					
Weight of particles	g	0.0071	0.011	0.0010	1826904

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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TATA STEEL MINERALS CANADA
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Sampler Initials: JFD

GENERAL COMMENTS

Version 2 : Thalium added.

METALS (WASTE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (WASTE WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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TATA STEEL MINERALS CANADA
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Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1826904	MA3	Spiked Blank	Weight of particles	2017/08/18		98	%
1826904	MA3	Spiked Blank DUP	Weight of particles	2017/08/18		103	%
1826904	MA3	Method Blank	Weight of particles	2017/08/18	<0.0010		g
1835914	OZP	Spiked Blank	Antimony (Sb)	2017/09/13		95	%
			Silver (Ag)	2017/09/13		90	%
			Arsenic (As)	2017/09/13		97	%
			Barium (Ba)	2017/09/13		91	%
			Beryllium (Be)	2017/09/13		94	%
			Cadmium (Cd)	2017/09/13		94	%
			Chromium (Cr)	2017/09/13		95	%
			Copper (Cu)	2017/09/13		98	%
			Manganese (Mn)	2017/09/13		97	%
			Mercury (Hg)	2017/09/13		104	%
			Nickel (Ni)	2017/09/13		96	%
			Lead (Pb)	2017/09/13		96	%
			Thallium (Tl)	2017/09/13		93	%
			Vanadium (V)	2017/09/13		95	%
			Zinc (Zn)	2017/09/13		99	%
1835914	OZP	Method Blank	Antimony (Sb)	2017/09/13	<0.1		ug
			Silver (Ag)	2017/09/13	<0.5		ug
			Arsenic (As)	2017/09/13	<0.1		ug
			Barium (Ba)	2017/09/13	<0.05		ug
			Beryllium (Be)	2017/09/13	<0.05		ug
			Cadmium (Cd)	2017/09/13	<0.05		ug
			Chromium (Cr)	2017/09/13	<0.1		ug
			Copper (Cu)	2017/09/13	<0.1		ug
			Manganese (Mn)	2017/09/13	0.2, RDL=0.1		ug
			Mercury (Hg)	2017/09/13	<0.05		ug
			Nickel (Ni)	2017/09/13	<0.1		ug
			Lead (Pb)	2017/09/13	<0.5		ug
			Thallium (Tl)	2017/09/13	<0.1		ug
			Vanadium (V)	2017/09/13	<0.2		ug
			Zinc (Zn)	2017/09/13	<0.1		ug

RDL = Reportable Detection Limit

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.

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Site Location: DUST FALL
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Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Miryam Assayag

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BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/11/09
Report #: R2333770
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B757680
Received: 2017/09/21, 11:00

Sample Matrix: WATER
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Weight of particles (1)*	8	2017/10/04	2017/10/04	STL SOP-00020	MA100–Part. 1.0 R4 m
Extractable Metals in Impinger (1)***	2	2017/10/24	2017/10/26	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Extractable Metals in Impinger (1)***	2	2017/10/30	2017/11/01	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Extractable Metals in Impinger (1)***	4	2017/11/02	2017/11/05	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarks:

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All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

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Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

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Client Project #: DSO3-4 DUSTFALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JG

METALS (WATER)

Maxxam ID		EP3071	EP3082		EP3118		EP3119		
Sampling Date		2017/09/19 10:30	2017/09/09 09:07		2017/09/09 09:38		2017/09/09 10:02		
COC Number		157354-13-01	157354-13-01		157354-13-01		157354-13-01		
	Units	DSO4-AQS1-DF-4	DSO4-AQS2-DF-5	QC Batch	DSO4-AQS3-DF-5	QC Batch	DSO4-AQS4-DF-5	RDL	QC Batch
METALS									
Antimony (Sb)	ug	<0.1	<0.1	1853732	<0.1	1850793	<0.1	0.1	1852547
Silver (Ag)	ug	<0.5	<0.5	1853732	<0.5	1850793	<0.5	0.5	1852547
Arsenic (As)	ug	<0.1	<0.1	1853732	<0.1	1850793	<0.1	0.1	1852547
Barium (Ba)	ug	10.2	9.92	1853732	39.6	1850793	26.1	0.05	1852547
Beryllium (Be)	ug	<0.05	<0.05	1853732	<0.05	1850793	<0.05	0.05	1852547
Cadmium (Cd)	ug	<0.05	<0.05	1853732	<0.05	1850793	<0.05	0.05	1852547
Chromium (Cr)	ug	0.8	1.1	1853732	0.3	1850793	0.2	0.1	1852547
Copper (Cu)	ug	4.0	3.6	1853732	1.3	1850793	0.8	0.1	1852547
Manganese (Mn)	ug	46.7	16.8	1853732	16.9	1850793	16.7	0.1	1852547
Mercury (Hg)	ug	<0.05	<0.05	1853732	<0.05	1850793	<0.05	0.05	1852547
Nickel (Ni)	ug	0.9	0.5	1853732	0.4	1850793	0.4	0.1	1852547
Lead (Pb)	ug	3.1	1.6	1853732	1.2	1850793	<0.5	0.5	1852547
Thallium (Tl)	ug	<0.1	<0.1	1853732	<0.1	1850793	<0.1	0.1	1852547
Vanadium (V)	ug	<0.2	<0.2	1853732	<0.2	1850793	<0.2	0.2	1852547
Zinc (Zn)	ug	13.9	10.4	1853732	4.0	1850793	33.0	0.1	1852547

RDL = Reportable Detection Limit
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Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JG

METALS (WATER)

Maxxam ID		EP3120		EP3121	EP3122		EP3123		
Sampling Date		2017/09/11 08:09		2017/09/09 11:37	2017/09/10 07:21		2017/09/10 08:43		
COC Number		157354-13-01		157354-13-01	157354-13-01		157354-13-01		
	Units	DSO3-AQS6-DF-5	QC Batch	DSO3-AQS7-DF-5	DSO3-AQS8-DF-5	QC Batch	DSO3-AQS9-DF-5	RDL	QC Batch
METALS									
Antimony (Sb)	ug	<0.1	1850793	<0.1	<0.1	1853732	<0.1	0.1	1852547
Silver (Ag)	ug	<0.5	1850793	<0.5	<0.5	1853732	<0.5	0.5	1852547
Arsenic (As)	ug	<0.1	1850793	<0.1	<0.1	1853732	<0.1	0.1	1852547
Barium (Ba)	ug	6.93	1850793	7.23	2.72	1853732	1.69	0.05	1852547
Beryllium (Be)	ug	<0.05	1850793	<0.05	<0.05	1853732	<0.05	0.05	1852547
Cadmium (Cd)	ug	<0.05	1850793	<0.05	0.05	1853732	<0.05	0.05	1852547
Chromium (Cr)	ug	0.8	1850793	0.2	0.4	1853732	0.6	0.1	1852547
Copper (Cu)	ug	5.0	1850793	1.2	0.9	1853732	1.6	0.1	1852547
Manganese (Mn)	ug	6.8	1850793	49.5	9.5	1853732	18.4	0.1	1852547
Mercury (Hg)	ug	<0.05	1850793	<0.05	<0.05	1853732	<0.05	0.05	1852547
Nickel (Ni)	ug	0.2	1850793	0.5	0.7	1853732	0.5	0.1	1852547
Lead (Pb)	ug	1.2	1850793	<0.5	1.0	1853732	1.3	0.5	1852547
Thallium (Tl)	ug	<0.1	1850793	<0.1	<0.1	1853732	<0.1	0.1	1852547
Vanadium (V)	ug	<0.2	1850793	<0.2	<0.2	1853732	<0.2	0.2	1852547
Zinc (Zn)	ug	7.8	1850793	3.8	73.7	1853732	5.7	0.1	1852547

RDL = Reportable Detection Limit
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Maxxam Job #: B757680
Report Date: 2017/11/09

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUSTFALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JG

CONVENTIONAL PARAMETERS (WATER)

Maxxam ID		EP3071	EP3082	EP3118	EP3119	EP3120		
Sampling Date		2017/09/19 10:30	2017/09/09 09:07	2017/09/09 09:38	2017/09/09 10:02	2017/09/11 08:09		
COC Number		157354-13-01	157354-13-01	157354-13-01	157354-13-01	157354-13-01		
	Units	DSO4-AQS1-DF-4	DSO4-AQS2-DF-5	DSO4-AQS3-DF-5	DSO4-AQS4-DF-5	DSO3-AQS6-DF-5	RDL	QC Batch
CONVENTIONALS								
Weight of particles	g	0.022	0.021	0.0016	0.0066	0.013	0.0010	1844473

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		EP3121	EP3122	EP3123		
Sampling Date		2017/09/09 11:37	2017/09/10 07:21	2017/09/10 08:43		
COC Number		157354-13-01	157354-13-01	157354-13-01		
	Units	DSO3-AQS7-DF-5	DSO3-AQS8-DF-5	DSO3-AQS9-DF-5	RDL	QC Batch
CONVENTIONALS						
Weight of particles	g	0.0043	0.0089	0.0012	0.0010	1844473

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B757680
Report Date: 2017/11/09

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUSTFALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JG

GENERAL COMMENTS

METALS (WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUSTFALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JG

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1844473	KHO	Spiked Blank	Weight of particles	2017/10/04		114	%
1844473	KHO	Spiked Blank DUP	Weight of particles	2017/10/04		105	%
1844473	KHO	Method Blank	Weight of particles	2017/10/04	<0.0010		g
1850793	EMA	Spiked Blank	Antimony (Sb)	2017/10/26		97	%
			Silver (Ag)	2017/10/26		87	%
			Arsenic (As)	2017/10/26		91	%
			Barium (Ba)	2017/10/26		88	%
			Beryllium (Be)	2017/10/26		103	%
			Cadmium (Cd)	2017/10/26		92	%
			Chromium (Cr)	2017/10/26		89	%
			Copper (Cu)	2017/10/26		91	%
			Manganese (Mn)	2017/10/26		90	%
			Mercury (Hg)	2017/10/26		97	%
			Nickel (Ni)	2017/10/26		91	%
			Lead (Pb)	2017/10/26		97	%
			Thallium (Tl)	2017/10/26		93	%
			Vanadium (V)	2017/10/26		90	%
			Zinc (Zn)	2017/10/26		94	%
1850793	EMA	Method Blank	Antimony (Sb)	2017/10/26	<0.1		ug
			Silver (Ag)	2017/10/26	<0.5		ug
			Arsenic (As)	2017/10/26	<0.1		ug
			Barium (Ba)	2017/10/26	<0.05		ug
			Beryllium (Be)	2017/10/26	<0.05		ug
			Cadmium (Cd)	2017/10/26	<0.05		ug
			Chromium (Cr)	2017/10/26	0.2, RDL=0.1		ug
			Copper (Cu)	2017/10/26	0.8, RDL=0.1		ug
			Manganese (Mn)	2017/10/26	0.3, RDL=0.1		ug
			Mercury (Hg)	2017/10/26	<0.05		ug
			Nickel (Ni)	2017/10/26	0.4, RDL=0.1		ug
			Lead (Pb)	2017/10/26	<0.5		ug
			Thallium (Tl)	2017/10/26	<0.1		ug
			Vanadium (V)	2017/10/26	<0.2		ug
			Zinc (Zn)	2017/10/26	1.7, RDL=0.1		ug
1852547	RNP	Spiked Blank	Antimony (Sb)	2017/11/01		99	%
			Silver (Ag)	2017/11/01		92	%
			Arsenic (As)	2017/11/01		90	%
			Barium (Ba)	2017/11/01		91	%
			Beryllium (Be)	2017/11/01		92	%
			Cadmium (Cd)	2017/11/01		90	%
			Chromium (Cr)	2017/11/01		88	%
			Copper (Cu)	2017/11/01		88	%
			Manganese (Mn)	2017/11/01		89	%
			Mercury (Hg)	2017/11/01		94	%
			Nickel (Ni)	2017/11/01		89	%
			Lead (Pb)	2017/11/01		97	%

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Maxxam Job #: B757680
Report Date: 2017/11/09

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUSTFALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JG

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Thallium (Tl)	2017/11/01		98	%
			Vanadium (V)	2017/11/01		88	%
			Zinc (Zn)	2017/11/01		90	%
1852547	RNP	Method Blank	Antimony (Sb)	2017/11/01	<0.1		ug
			Silver (Ag)	2017/11/01	<0.5		ug
			Arsenic (As)	2017/11/01	<0.1		ug
			Barium (Ba)	2017/11/01	<0.05		ug
			Beryllium (Be)	2017/11/01	<0.05		ug
			Cadmium (Cd)	2017/11/01	<0.05		ug
			Chromium (Cr)	2017/11/01	<0.1		ug
			Copper (Cu)	2017/11/01	<0.1		ug
			Manganese (Mn)	2017/11/01	0.4, RDL=0.1		ug
			Mercury (Hg)	2017/11/01	<0.05		ug
			Nickel (Ni)	2017/11/01	<0.1		ug
			Lead (Pb)	2017/11/01	<0.5		ug
			Thallium (Tl)	2017/11/01	<0.1		ug
			Vanadium (V)	2017/11/01	<0.2		ug
			Zinc (Zn)	2017/11/01	0.4, RDL=0.1		ug
1853732	FS	Spiked Blank	Antimony (Sb)	2017/11/05		105	%
			Silver (Ag)	2017/11/05		99	%
			Arsenic (As)	2017/11/05		99	%
			Barium (Ba)	2017/11/05		98	%
			Beryllium (Be)	2017/11/05		106	%
			Cadmium (Cd)	2017/11/05		93	%
			Chromium (Cr)	2017/11/05		101	%
			Copper (Cu)	2017/11/05		103	%
			Manganese (Mn)	2017/11/05		98	%
			Mercury (Hg)	2017/11/05		100	%
			Nickel (Ni)	2017/11/05		99	%
			Lead (Pb)	2017/11/05		104	%
			Thallium (Tl)	2017/11/05		102	%
			Vanadium (V)	2017/11/05		98	%
			Zinc (Zn)	2017/11/05		99	%
1853732	FS	Method Blank	Antimony (Sb)	2017/11/05	<0.1		ug
			Silver (Ag)	2017/11/05	<0.5		ug
			Arsenic (As)	2017/11/05	<0.1		ug
			Barium (Ba)	2017/11/05	<0.05		ug
			Beryllium (Be)	2017/11/05	<0.05		ug
			Cadmium (Cd)	2017/11/05	0.09, RDL=0.05		ug
			Chromium (Cr)	2017/11/05	<0.1		ug
			Copper (Cu)	2017/11/05	<0.1		ug
			Manganese (Mn)	2017/11/05	0.2, RDL=0.1		ug
			Mercury (Hg)	2017/11/05	<0.05		ug
			Nickel (Ni)	2017/11/05	<0.1		ug
			Lead (Pb)	2017/11/05	1.3, RDL=0.5		ug

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Maxxam Job #: B757680
Report Date: 2017/11/09

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUSTFALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JG

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Thallium (Tl)	2017/11/05	<0.1		ug
			Vanadium (V)	2017/11/05	<0.2		ug
			Zinc (Zn)	2017/11/05	0.6, RDL=0.1		ug

RDL = Reportable Detection Limit

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.

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Report Date: 2017/11/09

TATA STEEL MINERALS CANADA
Client Project #: DSO3-4 DUSTFALL
Site Location: DUST FALL
Your P.O. #: 2200001778
Sampler Initials: JG

VALIDATION SIGNATURE PAGE

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

Dochka Koleva Hristova, B.Sc., Chemist

Erum Mansuri
Membre OCQ #2016-122

Erum Mansuri, Analyst II

Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics

Miryam Assayag

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Your P.O. #: 2200001778
Your Project #: DUSTFALL
Site#: TSMC
Site Location: DSO 3 AND 4
Your C.O.C. #: 127755-01-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/03/28
Report #: R2360347
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B774810
Received: 2017/12/19, 08:30

Sample Matrix: WATER
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Weight of particles (1)*	8	2018/01/02	2018/01/02	STL SOP-00020	MA100–Part. 1.0 R4 m
Extractable Metals in Impinger (1)***	3	2018/02/07	2018/02/08	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Extractable Metals in Impinger (1)***	3	2018/03/01	2018/03/01	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Extractable Metals in Impinger (1)***	2	2018/03/27	2018/03/28	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

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Your P.O. #: 2200001778
Your Project #: DUSTFALL
Site#: TSMC
Site Location: DSO 3 AND 4
Your C.O.C. #: 127755-01-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/03/28
Report #: R2360347
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B774810
Received: 2017/12/19, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

==========

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Maxxam Job #: B774810
Report Date: 2018/03/28

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO 3 AND 4
Your P.O. #: 2200001778
Sampler Initials: JC

METALS (WATER)

Maxxam ID		EZ3396		EZ3397		EZ3398		
Sampling Date		2017/10/20 17:15		2017/10/20 16:30		2017/10/20 16:05		
COC Number		127755-01-01		127755-01-01		127755-01-01		
	Units	DSO4-AQS1-DF-5	QC Batch	DSO4-AQS2-DF-6	QC Batch	DSO4-AQS3-DF-6	RDL	QC Batch
METALS								
Antimony (Sb)	ug	<0.1	1877681	<0.1	1887541	<0.1	0.1	1882469
Silver (Ag)	ug	<0.5	1877681	<0.5	1887541	<0.5	0.5	1882469
Arsenic (As)	ug	<0.1	1877681	0.2	1887541	0.2	0.1	1882469
Barium (Ba)	ug	11.7	1877681	34.2	1887541	31.2	0.05	1882469
Beryllium (Be)	ug	<0.05	1877681	<0.05	1887541	<0.05	0.05	1882469
Cadmium (Cd)	ug	<0.05	1877681	<0.05	1887541	<0.05	0.05	1882469
Chromium (Cr)	ug	0.9	1877681	1.2	1887541	1.2	0.1	1882469
Copper (Cu)	ug	2.1	1877681	3.8	1887541	2.2	0.1	1882469
Manganese (Mn)	ug	61.0	1877681	58.1	1887541	90.9	0.1	1882469
Mercury (Hg)	ug	<0.05	1877681	<0.05	1887541	0.29	0.05	1882469
Nickel (Ni)	ug	0.6	1877681	3.5	1887541	2.9	0.1	1882469
Lead (Pb)	ug	3.0	1877681	8.4	1887541	3.8	0.5	1882469
Thallium (Tl)	ug	<0.1	1877681	<0.1	1887541	<0.1	0.1	1882469
Vanadium (V)	ug	<0.2	1877681	<0.2	1887541	<0.2	0.2	1882469
Zinc (Zn)	ug	10.0	1877681	20.4	1887541	8.7	0.1	1882469

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B774810
Report Date: 2018/03/28

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO 3 AND 4
Your P.O. #: 2200001778
Sampler Initials: JC

METALS (WATER)

Maxxam ID		EZ3399	EZ3400		EZ3401		EZ3402		
Sampling Date		2017/10/20 15:15	2017/10/19 17:30		2017/10/21 16:30		2017/10/19 16:00		
COC Number		127755-01-01	127755-01-01		127755-01-01		127755-01-01		
	Units	DSO4-AQS4-DF-6	DSO3-AQS6-DF-6	QC Batch	DSO3-AQS7-DF-6	QC Batch	DSO3-AQS8-DF-6	RDL	QC Batch
METALS									
Antimony (Sb)	ug	<0.1	<0.1	1877681	0.2	1882469	<0.1	0.1	1887541
Silver (Ag)	ug	<0.5	<0.5	1877681	<0.5	1882469	<0.5	0.5	1887541
Arsenic (As)	ug	0.4	0.2	1877681	1.5	1882469	0.1	0.1	1887541
Barium (Ba)	ug	12.7	13.2	1877681	26.0	1882469	4.44	0.05	1887541
Beryllium (Be)	ug	<0.05	<0.05	1877681	0.05	1882469	<0.05	0.05	1887541
Cadmium (Cd)	ug	<0.05	0.08	1877681	<0.05	1882469	<0.05	0.05	1887541
Chromium (Cr)	ug	1.0	1.7	1877681	2.1	1882469	0.4	0.1	1887541
Copper (Cu)	ug	0.8	4.6	1877681	3.1	1882469	1.0	0.1	1887541
Manganese (Mn)	ug	54.0	52.1	1877681	252	1882469	33.2	0.1	1887541
Mercury (Hg)	ug	<0.05	0.09	1877681	0.12	1882469	0.12	0.05	1887541
Nickel (Ni)	ug	1.2	2.0	1877681	2.9	1882469	2.8	0.1	1887541
Lead (Pb)	ug	2.8	9.7	1877681	3.7	1882469	2.4	0.5	1887541
Thallium (Tl)	ug	<0.1	<0.1	1877681	<0.1	1882469	<0.1	0.1	1887541
Vanadium (V)	ug	0.2	<0.2	1877681	1.0	1882469	<0.2	0.2	1887541
Zinc (Zn)	ug	9.1	13.7	1877681	18.0	1882469	16.3	0.1	1887541

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B774810
Report Date: 2018/03/28

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO 3 AND 4
Your P.O. #: 2200001778
Sampler Initials: JC

METALS (WATER)

Maxxam ID		EZ3403		
Sampling Date		2017/10/19 15:00		
COC Number		127755-01-01		
	Units	DSO3-AQS9-DF-6	RDL	QC Batch
METALS				
Antimony (Sb)	ug	<0.1	0.1	1882469
Silver (Ag)	ug	<0.5	0.5	1882469
Arsenic (As)	ug	0.1	0.1	1882469
Barium (Ba)	ug	4.95	0.05	1882469
Beryllium (Be)	ug	<0.05	0.05	1882469
Cadmium (Cd)	ug	<0.05	0.05	1882469
Chromium (Cr)	ug	1.2	0.1	1882469
Copper (Cu)	ug	2.2	0.1	1882469
Manganese (Mn)	ug	32.8	0.1	1882469
Mercury (Hg)	ug	0.09	0.05	1882469
Nickel (Ni)	ug	2.8	0.1	1882469
Lead (Pb)	ug	4.8	0.5	1882469
Thallium (Tl)	ug	<0.1	0.1	1882469
Vanadium (V)	ug	<0.2	0.2	1882469
Zinc (Zn)	ug	15.6	0.1	1882469

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B774810
Report Date: 2018/03/28

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO 3 AND 4
Your P.O. #: 2200001778
Sampler Initials: JC

CONVENTIONAL PARAMETERS (WATER)

Maxxam ID		EZ3396	EZ3397	EZ3398	EZ3399	EZ3400		
Sampling Date		2017/10/20 17:15	2017/10/20 16:30	2017/10/20 16:05	2017/10/20 15:15	2017/10/19 17:30		
COC Number		127755-01-01	127755-01-01	127755-01-01	127755-01-01	127755-01-01		
	Units	DSO4-AQS1-DF-5	DSO4-AQS2-DF-6	DSO4-AQS3-DF-6	DSO4-AQS4-DF-6	DSO3-AQS6-DF-6	RDL	QC Batch
CONVENTIONALS								
Weight of particles	g	0.034	0.050	0.020	0.017	0.023	0.0010	1870690

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		EZ3401	EZ3402	EZ3403		
Sampling Date		2017/10/21 16:30	2017/10/19 16:00	2017/10/19 15:00		
COC Number		127755-01-01	127755-01-01	127755-01-01		
	Units	DSO3-AQS7-DF-6	DSO3-AQS8-DF-6	DSO3-AQS9-DF-6	RDL	QC Batch
CONVENTIONALS						
Weight of particles	g	0.12	0.021	0.0098	0.0010	1870690

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B774810
Report Date: 2018/03/28

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO 3 AND 4
Your P.O. #: 2200001778
Sampler Initials: JC

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (WATER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B774810
Report Date: 2018/03/28

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO 3 AND 4
Your P.O. #: 2200001778
Sampler Initials: JC

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1870690	KHO	Spiked Blank	Weight of particles	2018/01/02		114	%
1870690	KHO	Spiked Blank DUP	Weight of particles	2018/01/02		112	%
1870690	KHO	Method Blank	Weight of particles	2018/01/02	<0.0010		g
1877681	AK5	Spiked Blank	Antimony (Sb)	2018/02/08		96	%
			Silver (Ag)	2018/02/08		91	%
			Arsenic (As)	2018/02/08		91	%
			Barium (Ba)	2018/02/08		91	%
			Beryllium (Be)	2018/02/08		93	%
			Cadmium (Cd)	2018/02/08		92	%
			Chromium (Cr)	2018/02/08		89	%
			Copper (Cu)	2018/02/08		91	%
			Manganese (Mn)	2018/02/08		89	%
			Mercury (Hg)	2018/02/08		93	%
			Nickel (Ni)	2018/02/08		91	%
			Lead (Pb)	2018/02/08		94	%
			Thallium (Tl)	2018/02/08		94	%
			Vanadium (V)	2018/02/08		89	%
			Zinc (Zn)	2018/02/08		90	%
1877681	AK5	Method Blank	Antimony (Sb)	2018/02/08	<0.1		ug
			Silver (Ag)	2018/02/08	<0.5		ug
			Arsenic (As)	2018/02/08	<0.1		ug
			Barium (Ba)	2018/02/08	<0.05		ug
			Beryllium (Be)	2018/02/08	<0.05		ug
			Cadmium (Cd)	2018/02/08	<0.05		ug
			Chromium (Cr)	2018/02/08	<0.1		ug
			Copper (Cu)	2018/02/08	<0.1		ug
			Manganese (Mn)	2018/02/08	<0.1		ug
			Mercury (Hg)	2018/02/08	<0.05		ug
			Nickel (Ni)	2018/02/08	<0.1		ug
			Lead (Pb)	2018/02/08	<0.5		ug
			Thallium (Tl)	2018/02/08	<0.1		ug
			Vanadium (V)	2018/02/08	<0.2		ug
			Zinc (Zn)	2018/02/08	<0.1		ug
1882469	RNP	Spiked Blank	Antimony (Sb)	2018/03/01		108	%
			Silver (Ag)	2018/03/01		107	%
			Arsenic (As)	2018/03/01		99	%
			Barium (Ba)	2018/03/01		98	%
			Beryllium (Be)	2018/03/01		105	%
			Cadmium (Cd)	2018/03/01		98	%
			Chromium (Cr)	2018/03/01		95	%
			Copper (Cu)	2018/03/01		96	%
			Manganese (Mn)	2018/03/01		96	%
			Mercury (Hg)	2018/03/01		101	%
			Nickel (Ni)	2018/03/01		96	%
			Lead (Pb)	2018/03/01		103	%
			Thallium (Tl)	2018/03/01		100	%
			Vanadium (V)	2018/03/01		95	%
			Zinc (Zn)	2018/03/01		98	%
1882469	RNP	Method Blank	Antimony (Sb)	2018/03/01	<0.1		ug
			Silver (Ag)	2018/03/01	<0.5		ug

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Maxxam Job #: B774810
Report Date: 2018/03/28

TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO 3 AND 4
Your P.O. #: 2200001778
Sampler Initials: JC

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Arsenic (As)	2018/03/01	<0.1		ug
			Barium (Ba)	2018/03/01	<0.05		ug
			Beryllium (Be)	2018/03/01	<0.05		ug
			Cadmium (Cd)	2018/03/01	<0.05		ug
			Chromium (Cr)	2018/03/01	<0.1		ug
			Copper (Cu)	2018/03/01	<0.1		ug
			Manganese (Mn)	2018/03/01	<0.1		ug
			Mercury (Hg)	2018/03/01	<0.05		ug
			Nickel (Ni)	2018/03/01	<0.1		ug
			Lead (Pb)	2018/03/01	<0.5		ug
			Thallium (Tl)	2018/03/01	<0.1		ug
			Vanadium (V)	2018/03/01	<0.2		ug
			Zinc (Zn)	2018/03/01	0.4, RDL=0.1		ug
1887541	EHA	Spiked Blank	Antimony (Sb)	2018/03/28		98	%
			Silver (Ag)	2018/03/28		97	%
			Arsenic (As)	2018/03/28		92	%
			Barium (Ba)	2018/03/28		93	%
			Beryllium (Be)	2018/03/28		94	%
			Cadmium (Cd)	2018/03/28		94	%
			Chromium (Cr)	2018/03/28		91	%
			Copper (Cu)	2018/03/28		92	%
			Manganese (Mn)	2018/03/28		90	%
			Mercury (Hg)	2018/03/28		96	%
			Nickel (Ni)	2018/03/28		90	%
			Lead (Pb)	2018/03/28		95	%
			Thallium (Tl)	2018/03/28		95	%
			Vanadium (V)	2018/03/28		90	%
			Zinc (Zn)	2018/03/28		92	%
1887541	EHA	Method Blank	Antimony (Sb)	2018/03/28	<0.1		ug
			Silver (Ag)	2018/03/28	<0.5		ug
			Arsenic (As)	2018/03/28	<0.1		ug
			Barium (Ba)	2018/03/28	<0.05		ug
			Beryllium (Be)	2018/03/28	<0.05		ug
			Cadmium (Cd)	2018/03/28	<0.05		ug
			Chromium (Cr)	2018/03/28	<0.1		ug
			Copper (Cu)	2018/03/28	<0.1		ug
			Manganese (Mn)	2018/03/28	<0.1		ug
			Mercury (Hg)	2018/03/28	<0.05		ug
			Nickel (Ni)	2018/03/28	<0.1		ug
			Lead (Pb)	2018/03/28	<0.5		ug
			Thallium (Tl)	2018/03/28	<0.1		ug
			Vanadium (V)	2018/03/28	<0.2		ug
			Zinc (Zn)	2018/03/28	0.6, RDL=0.1		ug

RDL = Reportable Detection Limit

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.

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Maxxam Job #: B774810
Report Date: 2018/03/28

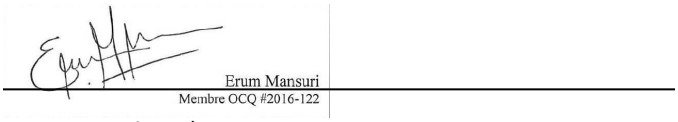
TATA STEEL MINERALS CANADA
Client Project #: DUSTFALL
Site Location: DSO 3 AND 4
Your P.O. #: 2200001778
Sampler Initials: JC

VALIDATION SIGNATURE PAGE

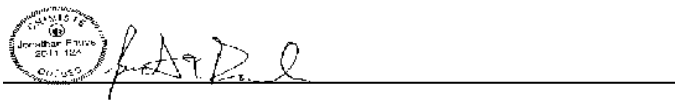
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Dochka Koleva Hristova, B.Sc., Chemist



Erum Mansuri, Analyst II



Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics



Veronic Beausejour, B.Sc., Chemist, Supervisor

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Your P.O. #: 2200001372
Your Project #: DSO3 AIR MONITORING
Site#: TSMC
Site Location: DSO3 1A
Your C.O.C. #: 157354-13-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/08/21
Report #: R2311712
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B747159
Received: 2017/08/08, 09:30

Sample Matrix: FILTER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Particulate (1)*	2	2017/08/21	2017/08/21	STL SOP-00045	MA100– Part 1.0 R4 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

* Maxxam is accredited as per the MDDELCC program.

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Your P.O. #: 2200001372
Your Project #: DSO3 AIR MONITORING
Site#: TSMC
Site Location: DSO3 1A
Your C.O.C. #: 157354-13-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/08/21
Report #: R2311712
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B747159
Received: 2017/08/08, 09:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

==========

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Maxxam Job #: B747159
Report Date: 2017/08/21

TATA STEEL MINERALS CANADA
Client Project #: DSO3 AIR MONITORING
Site Location: DSO3 1A
Your P.O. #: 2200001372
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (FILTER)

Maxxam ID		EJ7638	EJ7640		
Sampling Date		2017/07/23 18:36	2017/07/31 08:00		
COC Number		157354-13-01	157354-13-01		
	Units	**DSO3-AQS7-PM2.5-1 DY9829-**	**DSO3-AQS9-PM2.5-1 DY9830-**	**RDL**	**QC Batch**
CONVENTIONALS					
Weight of filter	g	0.1529	0.1508	0.0002	1827479
Weight of filter and sample	g	0.1533	0.1511	0.0002	1827479
Total particles	g	0.0004	0.0003	0.0002	1827479

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B747159
Report Date: 2017/08/21

TATA STEEL MINERALS CANADA
Client Project #: DSO3 AIR MONITORING
Site Location: DSO3 1A
Your P.O. #: 2200001372
Sampler Initials: JFD

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (FILTER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

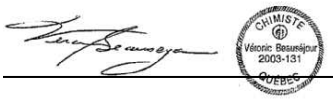
Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B747159
Report Date: 2017/08/21

TATA STEEL MINERALS CANADA
Client Project #: DSO3 AIR MONITORING
Site Location: DSO3 1A
Your P.O. #: 2200001372
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Veronic Beausejour, B.Sc., Chemist, Supervisor

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Your P.O. #: 2200001778
Your Project #: AIR MONITORING
Site#: TSMC
Site Location: PM2.5 MONITORING
Your C.O.C. #: 157354-13-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/09/11
Report #: R2317838
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B753646
Received: 2017/09/05, 08:30

Sample Matrix: FILTER
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Particulate (1)*	8	2017/09/07	2017/09/07	STL SOP-00045	MA100– Part 1.0 R4 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent

* Maxxam is accredited as per the MDDELCC program.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200001778
Your Project #: AIR MONITORING
Site#: TSMC
Site Location: PM2.5 MONITORING
Your C.O.C. #: 157354-13-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/09/11
Report #: R2317838
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B753646
Received: 2017/09/05, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

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Maxxam Job #: B753646
Report Date: 2017/09/11

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: PM2.5 MONITORING
Your P.O. #: 2200001778
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (FILTER)

Maxxam ID		EN0478	EN0479	EN0480	EN0481		
Sampling Date		2017/09/02 16:15	2017/08/20 12:30	2017/08/27 17:00	2017/08/25 17:30		
COC Number		157354-13-01	157354-13-01	157354-13-01	157354-13-01		
	Units	**AQS2-PM2.5-2 DY9850-01R**	**AQS2-PM2.5-1 DY9831-01R**	**AQS3-PM2.5-1 DY9834-01R**	**AQS4-PM2.5-1 DY9844-01R**	**RDL**	**QC Batch**
CONVENTIONALS							
Weight of filter	g	0.1512	0.1540	0.1507	0.1531	0.0002	1834522
Weight of filter and sample	g	0.1509	0.1542	0.1513	0.1535	0.0002	1834522
Total particles	g	0.0003	0.0002	0.0006	0.0004	0.0002	1834522

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		EN0482	EN0483	EN0484	EN0485		
Sampling Date		2017/08/23 15:30	2017/08/28 19:00	2017/08/30 09:15	2017/08/31 16:30		
COC Number		157354-13-01	157354-13-01	157354-13-01	157354-13-01		
	Units	**AQS5-PM2.5-1 DY9845-01R**	**AQS6-PM2.5-1 DY9856-01R**	**AQS8-PM2.5-1 DY9842-01R**	**AQS9-PM2.5-1 DY9839-01R**	**RDL**	**QC Batch**
CONVENTIONALS							
Weight of filter	g	0.1520	0.1541	0.1529	0.1529	0.0002	1834522
Weight of filter and sample	g	0.1520	0.1543	0.1534	0.1529	0.0002	1834522
Total particles	g	<0.0002	0.0002	0.0005	<0.0002	0.0002	1834522

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B753646
Report Date: 2017/09/11

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: PM2.5 MONITORING
Your P.O. #: 2200001778
Sampler Initials: JFD

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (FILTER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B753646
Report Date: 2017/09/11

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: PM2.5 MONITORING
Your P.O. #: 2200001778
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Dochka Koleva Hristova, B.Sc., Chemist

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Your P.O. #: 2200001778
Your Project #: DSO4 AIR MONITORING
Site Location: DO4
Your C.O.C. #: 157354-13-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/09/26
Report #: R2322546
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B757693
Received: 2017/09/21, 11:00

Sample Matrix: FILTER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Particulate (1)*	1	2017/09/25	2017/09/25	STL SOP-00045	MA100– Part 1.0 R4 m

Remarks:

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Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

* Maxxam is accredited as per the MDDELCC program.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200001778
Your Project #: DSO4 AIR MONITORING
Site Location: DO4
Your C.O.C. #: 157354-13-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/09/26
Report #: R2322546
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B757693
Received: 2017/09/21, 11:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

==========

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Maxxam Job #: B757693
Report Date: 2017/09/26

TATA STEEL MINERALS CANADA
Client Project #: DSO4 AIR MONITORING
Site Location: DO4
Your P.O. #: 2200001778
Sampler Initials: JG

CONVENTIONAL PARAMETERS (FILTER)

Maxxam ID		EP3137		
Sampling Date		2017/09/09 09:15		
COC Number		157354-13-01		
	Units	**AQS4-PM2.5-2 DY9835-01R**	**RDL**	**QC Batch**
CONVENTIONALS				
Weight of filter	g	0.1524	0.0002	1841132
Weight of filter and sample	g	0.1525	0.0002	1841132
Total particles	g	<0.0002	0.0002	1841132

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B757693
Report Date: 2017/09/26

TATA STEEL MINERALS CANADA
Client Project #: DSO4 AIR MONITORING
Site Location: DO4
Your P.O. #: 2200001778
Sampler Initials: JG

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (FILTER)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

Results relate only to the items tested.

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Maxxam Job #: B757693
Report Date: 2017/09/26

TATA STEEL MINERALS CANADA
Client Project #: DSO4 AIR MONITORING
Site Location: DO4
Your P.O. #: 2200001778
Sampler Initials: JG

VALIDATION SIGNATURE PAGE

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



Dochka Koleva Hristova, B.Sc., Chemist

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Your P.O. #: 2200001372
Your Project #: SNOW SAMPLING
Site#: TSMC
Site Location: DSO 314
Your C.O.C. #: 148171-01-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/07/06
Report #: R2296504
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B719348
Received: 2017/04/13, 09:00

Sample Matrix: Waste - Snow
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Weight of particles (1)*	7	2017/04/20	2017/04/20	STL SOP-00020	MA100–Part. 1.0 R4 m
Extractable Metals in Impinger (1)***	7	2017/05/19	2017/05/20	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Miscellaneous Analyses (1)	7	N/A	N/A		

Remarks:

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Results relate to samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

* Maxxam is accredited as per the MDDELCC program.
*** This analysis is not subject to MDDELCC accreditation.

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Your P.O. #: 2200001372
Your Project #: SNOW SAMPLING
Site#: TSMC
Site Location: DSO 314
Your C.O.C. #: 148171-01-01

Attention:Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2017/07/06
Report #: R2296504
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B719348
Received: 2017/04/13, 09:00

Encryption Key

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Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:6201

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Maxxam Job #: B719348
Report Date: 2017/07/06

TATA STEEL MINERALS CANADA
Client Project #: SNOW SAMPLING
Site Location: DSO 314
Your P.O. #: 2200001372
Sampler Initials: JFD

METALS (WASTE - SNOW)

Maxxam ID		DV5444	DV5462	DV5463	DV5465		
Sampling Date		2017/04/06 14:22	2017/04/09 09:55	2017/04/09 09:55	2017/04/09 09:55		
COC Number		148171-01-01	148171-01-01	148171-01-01	148171-01-01		
	Units	DSO4-AQ53-SN2017	DSO4-AQ54-SN2017-A	DSO4-AQ54-SN2017-B	DSO4-AQ54-SN2017-C	RDL	QC Batch
METALS							
Antimony (Sb)	ug	<0.1	<0.1	<0.1	0.1	0.1	1779375
Silver (Ag)	ug	<0.5	<0.5	<0.5	<0.5	0.5	1779375
Arsenic (As)	ug	<0.1	0.2	0.4	0.3	0.1	1779375
Barium (Ba)	ug	1.23	1.51	2.29	1.87	0.05	1779375
Beryllium (Be)	ug	<0.05	<0.05	<0.05	<0.05	0.05	1779375
Cadmium (Cd)	ug	<0.05	<0.05	0.05	<0.05	0.05	1779375
Chromium (Cr)	ug	0.2	0.3	0.5	0.5	0.1	1779375
Copper (Cu)	ug	2.7	2.4	3.8	2.6	0.1	1779375
Manganese (Mn)	ug	11.6	53.2	75.5	69.9	0.1	1779375
Mercury (Hg)	ug	<0.05	<0.05	<0.05	<0.05	0.05	1779375
Nickel (Ni)	ug	0.5	0.4	0.7	0.5	0.1	1779375
Lead (Pb)	ug	<0.5	<0.5	<0.5	<0.5	0.5	1779375
Vanadium (V)	ug	<0.2	<0.2	0.3	0.2	0.2	1779375
Zinc (Zn)	ug	3.7	5.8	7.3	7.1	0.1	1779375

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B719348
Report Date: 2017/07/06

TATA STEEL MINERALS CANADA
Client Project #: SNOW SAMPLING
Site Location: DSO 314
Your P.O. #: 2200001372
Sampler Initials: JFD

METALS (WASTE - SNOW)

Maxxam ID		DV5466	DV5467	DV5468		
Sampling Date		2017/04/10 17:24	2017/04/08 14:58	2017/04/09 15:42		
COC Number		148171-01-01	148171-01-01	148171-01-01		
	Units	DSO3-AQ57-SN2017	DSO3-AQ58-SN2017	DSO3-AQ59-SN2017	RDL	QC Batch
METALS						
Antimony (Sb)	ug	<0.1	<0.1	<0.1	0.1	1779375
Silver (Ag)	ug	<0.5	<0.5	<0.5	0.5	1779375
Arsenic (As)	ug	0.4	0.3	0.1	0.1	1779375
Barium (Ba)	ug	2.21	3.13	0.88	0.05	1779375
Beryllium (Be)	ug	<0.05	<0.05	<0.05	0.05	1779375
Cadmium (Cd)	ug	<0.05	<0.05	0.06	0.05	1779375
Chromium (Cr)	ug	0.3	0.6	0.3	0.1	1779375
Copper (Cu)	ug	2.4	2.9	1.8	0.1	1779375
Manganese (Mn)	ug	101	46.9	23.8	0.1	1779375
Mercury (Hg)	ug	<0.05	<0.05	<0.05	0.05	1779375
Nickel (Ni)	ug	0.4	4.3	0.7	0.1	1779375
Lead (Pb)	ug	7.5	<0.5	<0.5	0.5	1779375
Vanadium (V)	ug	<0.2	<0.2	<0.2	0.2	1779375
Zinc (Zn)	ug	3.8	9.3	7.2	0.1	1779375

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B719348
Report Date: 2017/07/06

TATA STEEL MINERALS CANADA
Client Project #: SNOW SAMPLING
Site Location: DSO 314
Your P.O. #: 2200001372
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (WASTE - SNOW)

Maxxam ID		DV5444	DV5462	DV5463	DV5465		
Sampling Date		2017/04/06 14:22	2017/04/09 09:55	2017/04/09 09:55	2017/04/09 09:55		
COC Number		148171-01-01	148171-01-01	148171-01-01	148171-01-01		
	Units	DSO4-AQ53-SN2017	DSO4-AQ54-SN2017-A	DSO4-AQ54-SN2017-B	DSO4-AQ54-SN2017-C	RDL	QC Batch
CONVENTIONALS							
Weight of particles	g	0.012	0.023	0.036	0.025	0.0010	1751324

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		DV5466	DV5467	DV5468		
Sampling Date		2017/04/10 17:24	2017/04/08 14:58	2017/04/09 15:42		
COC Number		148171-01-01	148171-01-01	148171-01-01		
	Units	DSO3-AQ57-SN2017	DSO3-AQ58-SN2017	DSO3-AQ59-SN2017	RDL	QC Batch
CONVENTIONALS						
Weight of particles	g	0.036	0.044	0.022	0.0010	1751324

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B719348
Report Date: 2017/07/06

TATA STEEL MINERALS CANADA
Client Project #: SNOW SAMPLING
Site Location: DSO 314
Your P.O. #: 2200001372
Sampler Initials: JFD

GENERAL COMMENTS

METALS (WASTE - SNOW)

Please note that the results have not been corrected for QC recoveries nor for the method blank results.

CONVENTIONAL PARAMETERS (WASTE - SNOW)

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Maxxam Job #: B719348
Report Date: 2017/07/06

TATA STEEL MINERALS CANADA
Client Project #: SNOW SAMPLING
Site Location: DSO 314
Your P.O. #: 2200001372
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1751324	FSI	Spiked Blank	Weight of particles	2017/04/20		100	%
1751324	FSI	Spiked Blank DUP	Weight of particles	2017/04/20		98	%
1751324	FSI	Method Blank	Weight of particles	2017/04/20	<0.0010		g
1779375	OZP	Spiked Blank	Antimony (Sb)	2017/05/20		112	%
			Silver (Ag)	2017/05/20		101	%
			Arsenic (As)	2017/05/20		97	%
			Barium (Ba)	2017/05/20		98	%
			Beryllium (Be)	2017/05/20		105	%
			Cadmium (Cd)	2017/05/20		104	%
			Chromium (Cr)	2017/05/20		96	%
			Copper (Cu)	2017/05/20		96	%
			Manganese (Mn)	2017/05/20		128 (1)	%
			Mercury (Hg)	2017/05/20		103	%
			Nickel (Ni)	2017/05/20		94	%
			Lead (Pb)	2017/05/20		106	%
			Vanadium (V)	2017/05/20		95	%
			Zinc (Zn)	2017/05/20		98	%
1779375	OZP	Method Blank	Antimony (Sb)	2017/05/20	<0.1		ug
			Silver (Ag)	2017/05/20	<0.5		ug
			Arsenic (As)	2017/05/20	<0.1		ug
			Barium (Ba)	2017/05/20	<0.05		ug
			Beryllium (Be)	2017/05/20	<0.05		ug
			Cadmium (Cd)	2017/05/20	<0.05		ug
			Chromium (Cr)	2017/05/20	<0.1		ug
			Copper (Cu)	2017/05/20	<0.1		ug
			Manganese (Mn)	2017/05/20	6.1, RDL=0.1		ug
			Mercury (Hg)	2017/05/20	<0.05		ug
			Nickel (Ni)	2017/05/20	<0.1		ug
			Lead (Pb)	2017/05/20	<0.5		ug
			Vanadium (V)	2017/05/20	<0.2		ug
			Zinc (Zn)	2017/05/20	0.3, RDL=0.1		ug

RDL = Reportable Detection Limit

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.

(1) Recovery or relative percent difference (RPD) for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria

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Maxxam Job #: B719348
Report Date: 2017/07/06

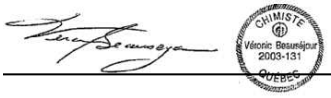
TATA STEEL MINERALS CANADA
Client Project #: SNOW SAMPLING
Site Location: DSO 314
Your P.O. #: 2200001372
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Miryam Assayag



Veronic Beausejour, B.Sc., Chemist, Supervisor

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D. Air Quality

2018

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Your P.O. #: 2200002147
Your Project #: PASSIVE NO2 / DS03-4
Site#: 2018/09/08 - 2018/10/28
Site Location: Timmins, Newfoundland

Attention: Loic Didillon

Tata Steel Mineral Canada
1000, Sherbrooke St West
Montreal, QC
CANADA H3A 3G4

Report Date: 2018/11/07
Report #: R2647348
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B896703
Received: 2018/11/02, 14:13

Sample Matrix: Air
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	6	2018/11/06	2018/11/07	PTC SOP-00148	Passive NO2 in ATM

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Results relate only to the items tested.

* 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.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B896703
Report Date: 2018/11/07

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: LJ

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UR9204	UR9205	UR9199	UR9200	UR9201		
Sampling Date		2018/09/08 10:10	2018/09/08 08:37	2018/09/12 12:03	2018/09/12 12:30	2018/09/08 14:28		
	UNITS	DS04-AQS2-NO2	DS04-AQS4-NO2	DS03-AQS6-NO2	DS03-AQS7-NO2	DS03-AQS8-NO2	RDL	QC Batch
Passive Monitoring								
Calculated NO2	ppb	<0.1	<0.1	0.4	0.3	<0.1	0.1	9216282
RDL = Reportable Detection Limit								

Maxxam ID		UR9202		
Sampling Date		2018/08/08 15:21		
	UNITS	DS03-AQS9-NO2	RDL	QC Batch
Passive Monitoring				
Calculated NO2	ppb	0.3	0.1	9216282
RDL = Reportable Detection Limit				

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B896703
Report Date: 2018/11/07

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: LJ

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B896703
Report Date: 2018/11/07

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: LJ

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9216282	YL6	Spiked Blank	Calculated NO2			99	%	90 - 110
9216282	YL6	Method Blank	Calculated NO2		<0.1		ppb	

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.

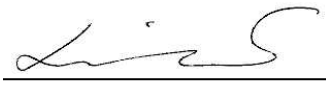
Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B896703
Report Date: 2018/11/07

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: LJ

VALIDATION SIGNATURE PAGE

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Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam
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Success Through Science®

Your P.O. #: 2200002147
Your Project #: PASSIVE NO2 / DS03-4
Site#: 2018/08/05 - 2018/0
Site Location: Timmins, Newfoundland

Attention: Loic Didillon

Tata Steel Mineral Canada
1000, Sherbrooke St West
Montreal, QC
CANADA H3A 3G4

Report Date: 2018/09/25
Report #: R2624562
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B880707
Received: 2018/09/19, 10:47

Sample Matrix: Air
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	6	2018/09/20	2018/09/25	PTC SOP-00148	Passive NO2 in ATM

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Results relate only to the items tested.

* 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.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

==========

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Maxxam Job #: B880707
Report Date: 2018/09/25

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: LJ

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UI7956	UI7957	UI7951	UI7952	UI7953		
Sampling Date		2018/08/05 13:32	2018/08/05 16:17	2018/08/12 11:14	2018/08/12 18:05	2018/08/12 09:48		
	UNITS	DS04-AQS2-NO2	DS04-AQS4-NO2	DS03-AQS6-NO2	DS03-AQS7-NO2	DS03-AQS8-NO2	RDL	QC Batch
Passive Monitoring								
Calculated NO2	ppb	0.5	0.3	0.7	0.8	0.2	0.1	9150784
RDL = Reportable Detection Limit								

Maxxam ID		UI7954		
Sampling Date		2018/08/12 07:42		
	UNITS	DS03-AQS9-NO2	RDL	QC Batch
Passive Monitoring				
Calculated NO2	ppb	1.2	0.1	9150784
RDL = Reportable Detection Limit				

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Maxxam Job #: B880707
Report Date: 2018/09/25

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: LJ

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B880707
Report Date: 2018/09/25

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: LJ

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9150784	YL6	Spiked Blank	Calculated NO2			100	%	90 - 110
9150784	YL6	Method Blank	Calculated NO2		<0.1		ppb	

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.

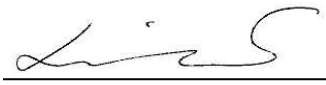
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Maxxam Job #: B880707
Report Date: 2018/09/25

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: LJ

VALIDATION SIGNATURE PAGE

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



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 2200002147
Your Project #: PASSIVE NO2 / DS03-4
Site#: 2018/07/01 - 2018/08/05
Site Location: Timmins, Newfoundland

Attention: Loic Didillon

Tata Steel Mineral Canada
1000, Sherbrooke St West
Montreal, QC
CANADA H3A 3G4

Report Date: 2018/08/28
Report #: R2610250
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B871243
Received: 2018/08/23, 09:38

Sample Matrix: Air
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	6	2018/08/27	2018/08/28	PTC SOP-00148	Passive NO2 in ATM

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* 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.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B871243
Report Date: 2018/08/28

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: JD

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UD3540	UD3541	UD3529	UD3530	UD3531		
Sampling Date		2018/07/01 10:15	2018/07/01 13:55	2018/07/01 16:23	2018/07/01 17:35	2018/07/01 17:05		
	UNITS	DS04-AQS2-NO2	DS04-AQS4-NO2	DS03-AQS6-NO2	DS03-AQS7-NO2	DS03-AQS8-NO2	RDL	QC Batch
Passive Monitoring								
Calculated NO2	ppb	0.3	0.2	0.3	0.3	0.3	0.1	9118288
RDL = Reportable Detection Limit								

Maxxam ID		UD3532		
Sampling Date		2018/07/02 10:05		
	UNITS	DS03-AQS9-NO2	RDL	QC Batch
Passive Monitoring				
Calculated NO2	ppb	0.9	0.1	9118288
RDL = Reportable Detection Limit				

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Maxxam Job #: B871243
Report Date: 2018/08/28

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: JD

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B871243
Report Date: 2018/08/28

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: JD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9118288	YL6	Spiked Blank	Calculated NO2			99	%	90 - 110
9118288	YL6	Method Blank	Calculated NO2		<0.1		ppb	

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.

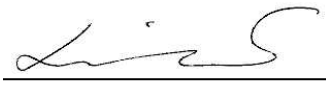
Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B871243
Report Date: 2018/08/28

Tata Steel Mineral Canada
Client Project #: PASSIVE NO2 / DS03-4
Site Location: Timmins, Newfoundland
Your P.O. #: 2200002147
Sampler Initials: JD

VALIDATION SIGNATURE PAGE

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



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 2200002147
Your Project #: AIR MONITORING
Site#: TSMC
Site Location: DUSTFALL
Your C.O.C. #: 151354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/11/22
Report #: R2413545
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B843896
Received: 2018/10/02, 09:30

Sample Matrix: N/A
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Weight of particles (1)	8	2018/10/04	2018/10/04	STL SOP-00020	MA100–Part. 1.0 R4 m
Extractable Metals in Impinger (1)	8	2018/11/17	2018/11/17	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: AIR MONITORING
Site#: TSMC
Site Location: DUSTFALL
Your C.O.C. #: 151354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/11/22
Report #: R2413545
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B843896
Received: 2018/10/02, 09:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Job #: B843896
Report Date: 2018/11/22

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: AC

METALS (N/A)

Maxxam ID		FV2960	FV2987	FV2988	FV2989	FV2990		
Sampling Date		2018/09/29 13:35	2018/09/29 12:51	2018/09/29 12:13	2018/09/29 11:35	2018/09/29 15:38		
COC Number		151354-13-01	151354-13-01	151354-13-01	151354-13-01	151354-13-01		
	Units	DSO4-AQS1-DF-3	DSO4-AQS2-DF-3	DSO4-AQS3-DF-3	DSO4-AQS4-DF-3	DSO3-AQS6-DF-3	RDL	QC Batch
METALS								
Antimony (Sb) †	ug	<0.1	0.1	0.1	<0.1	<0.1	0.1	1953675
Silver (Ag) †	ug	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	1953675
Arsenic (As) †	ug	0.1	0.2	0.2	0.1	<0.1	0.1	1953675
Barium (Ba) †	ug	7.58	17.2	5.60	39.6	5.58	0.05	1953675
Beryllium (Be) †	ug	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1953675
Cadmium (Cd) †	ug	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1953675
Chromium (Cr) †	ug	0.8	1.2	1.9	0.6	0.3	0.1	1953675
Copper (Cu) †	ug	11.8	11.5	14.4	7.4	2.5	0.1	1953675
Manganese (Mn) †	ug	36.6	20.3	30.6	25.4	15.2	0.1	1953675
Mercury (Hg) †	ug	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1953675
Nickel (Ni) †	ug	1.4	1.5	2.9	2.2	1.5	0.1	1953675
Lead (Pb) †	ug	2.3	2.5	1.4	1.6	0.9	0.5	1953675
Thallium (Tl) †	ug	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	1953675
Vanadium (V) †	ug	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	1953675
Zinc (Zn) †	ug	36.2	9.3	12.4	7.3	3.6	0.1	1953675

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B843896
Report Date: 2018/11/22

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: AC

METALS (N/A)

Maxxam ID		FV2991	FV2992	FV2993		
Sampling Date		2018/09/29 16:27	2018/09/29 16:05	2018/09/29 15:00		
COC Number		151354-13-01	151354-13-01	151354-13-01		
	Units	DSO3-AQS7-DF-3	DSO3-AQS8-DF-3	DSO3-AQS9-DF-3	RDL	QC Batch
METALS						
Antimony (Sb) †	ug	0.1	0.2	<0.1	0.1	1953675
Silver (Ag) †	ug	<0.5	<0.5	<0.5	0.5	1953675
Arsenic (As) †	ug	0.6	0.2	0.2	0.1	1953675
Barium (Ba) †	ug	5.80	11.1	9.73	0.05	1953675
Beryllium (Be) †	ug	<0.05	<0.05	<0.05	0.05	1953675
Cadmium (Cd) †	ug	<0.05	<0.05	<0.05	0.05	1953675
Chromium (Cr) †	ug	0.6	0.5	0.7	0.1	1953675
Copper (Cu) †	ug	4.3	5.2	4.8	0.1	1953675
Manganese (Mn) †	ug	69.1	50.4	25.2	0.1	1953675
Mercury (Hg) †	ug	<0.05	<0.05	<0.05	0.05	1953675
Nickel (Ni) †	ug	2.0	2.4	2.6	0.1	1953675
Lead (Pb) †	ug	1.7	0.6	1.5	0.5	1953675
Thallium (Tl) †	ug	<0.1	<0.1	<0.1	0.1	1953675
Vanadium (V) †	ug	0.5	<0.2	<0.2	0.2	1953675
Zinc (Zn) †	ug	7.2	9.9	8.8	0.1	1953675

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B843896
Report Date: 2018/11/22

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: AC

CONVENTIONAL PARAMETERS (N/A)

Maxxam ID		FV2960	FV2987	FV2988	FV2989	FV2990		
Sampling Date		2018/09/29 13:35	2018/09/29 12:51	2018/09/29 12:13	2018/09/29 11:35	2018/09/29 15:38		
COC Number		151354-13-01	151354-13-01	151354-13-01	151354-13-01	151354-13-01		
	Units	DSO4-AQS1-DF-3	DSO4-AQS2-DF-3	DSO4-AQS3-DF-3	DSO4-AQS4-DF-3	DSO3-AQS6-DF-3	RDL	QC Batch
CONVENTIONALS								
Weight of particles †	g	0.071	0.044	0.047	0.039	0.026	0.0010	1940897

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

Maxxam ID		FV2991	FV2992	FV2993		
Sampling Date		2018/09/29 16:27	2018/09/29 16:05	2018/09/29 15:00		
COC Number		151354-13-01	151354-13-01	151354-13-01		
	Units	DSO3-AQS7-DF-3	DSO3-AQS8-DF-3	DSO3-AQS9-DF-3	RDL	QC Batch
CONVENTIONALS						
Weight of particles †	g	0.045	0.023	0.024	0.0010	1940897

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B843896
Report Date: 2018/11/22

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: AC

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B843896
Report Date: 2018/11/22

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: AC

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1940897	AHK	Spiked Blank	Weight of particles	2018/10/04		101	%
1940897	AHK	Spiked Blank DUP	Weight of particles	2018/10/04		102	%
1940897	AHK	Method Blank	Weight of particles	2018/10/04	<0.0010		g
1953675	EHA	Spiked Blank	Antimony (Sb)	2018/11/17		97	%
			Silver (Ag)	2018/11/17		121	%
			Arsenic (As)	2018/11/17		98	%
			Barium (Ba)	2018/11/17		93	%
			Beryllium (Be)	2018/11/17		97	%
			Cadmium (Cd)	2018/11/17		92	%
			Chromium (Cr)	2018/11/17		95	%
			Copper (Cu)	2018/11/17		100	%
			Manganese (Mn)	2018/11/17		95	%
			Mercury (Hg)	2018/11/17		110	%
			Nickel (Ni)	2018/11/17		96	%
			Lead (Pb)	2018/11/17		101	%
			Thallium (Tl)	2018/11/17		96	%
			Vanadium (V)	2018/11/17		94	%
			Zinc (Zn)	2018/11/17		93	%
1953675	EHA	Method Blank	Antimony (Sb)	2018/11/17	<0.1		ug
			Silver (Ag)	2018/11/17	<0.5		ug
			Arsenic (As)	2018/11/17	<0.1		ug
			Barium (Ba)	2018/11/17	<0.05		ug
			Beryllium (Be)	2018/11/17	<0.05		ug
			Cadmium (Cd)	2018/11/17	<0.05		ug
			Chromium (Cr)	2018/11/17	0.4, RDL=0.1		ug
			Copper (Cu)	2018/11/17	0.2, RDL=0.1		ug
			Manganese (Mn)	2018/11/17	<0.1		ug
			Mercury (Hg)	2018/11/17	<0.05		ug
			Nickel (Ni)	2018/11/17	0.3, RDL=0.1		ug
			Lead (Pb)	2018/11/17	<0.5		ug
			Thallium (Tl)	2018/11/17	<0.1		ug
			Vanadium (V)	2018/11/17	<0.2		ug
			Zinc (Zn)	2018/11/17	<0.1		ug

RDL = Reportable Detection Limit

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.

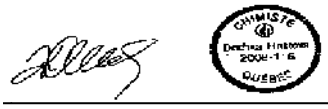
Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B843896
Report Date: 2018/11/22

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: AC

VALIDATION SIGNATURE PAGE

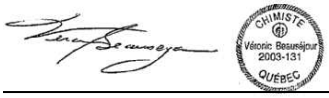
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Dochka Koleva Hristova, B.Sc., Chemist



Miryam Assayag



Veronic Beausejour, B.Sc., Chemist, Supervisor

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Maxxam
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Success Through Science®

Your P.O. #: 2200002147
Your Project #: AIR MONITORING
Site#: TSMC
Site Location: DUST FALL
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/10/16
Report #: R2404643
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B841240
Received: 2018/09/18, 09:00

Sample Matrix: N/A
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Weight of particles (1)	8	2018/09/26	2018/09/26	STL SOP-00020	MA100–Part. 1.0 R4 m
Extractable Metals in Impinger (1)	8	2018/10/11	2018/10/14	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: AIR MONITORING
Site#: TSMC
Site Location: DUST FALL
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/10/16
Report #: R2404643
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B841240
Received: 2018/09/18, 09:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B841240
Report Date: 2018/10/16

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUST FALL
Your P.O. #: 2200002147
Sampler Initials: LJ

METALS (N/A)

Maxxam ID		FT7017	FT7019	FT7020	FT7021		
Sampling Date		2018/09/08 11:00	2018/09/08 10:00	2018/09/08 09:30	2018/09/08 08:37		
COC Number		157354-13-01	157354-13-01	157354-13-01	157354-13-01		
	Units	DSO4-AQS1-DF-2-2018	DSO4-AQS2-DF-2-2018	DSO4-AQS3-DF-2-2018	DSO4-AQS4-DF-2-2018	RDL	QC Batch
METALS							
Antimony (Sb) †	ug	<0.1	<0.1	<0.1	0.1	0.1	1942324
Silver (Ag) †	ug	0.8	<0.5	<0.5	<0.5	0.5	1942324
Arsenic (As) †	ug	1.5	0.4	1.0	<0.1	0.1	1942324
Barium (Ba) †	ug	7.88	102	23.7	60.2	0.05	1942324
Beryllium (Be) †	ug	<0.05	<0.05	<0.05	<0.05	0.05	1942324
Cadmium (Cd) †	ug	<0.05	0.06	<0.05	<0.05	0.05	1942324
Chromium (Cr) †	ug	0.5	0.3	0.4	0.5	0.1	1942324
Copper (Cu) †	ug	4.5	24.1	23.0	5.0	0.1	1942324
Manganese (Mn) †	ug	3.7	16.6	19.4	3.6	0.1	1942324
Mercury (Hg) †	ug	<0.05	<0.05	<0.05	<0.05	0.05	1942324
Nickel (Ni) †	ug	0.7	1.2	1.3	1.1	0.1	1942324
Lead (Pb) †	ug	0.7	5.6	6.4	<0.5	0.5	1942324
Thallium (Tl) †	ug	<0.1	<0.1	<0.1	<0.1	0.1	1942324
Vanadium (V) †	ug	<0.2	<0.2	<0.2	0.4	0.2	1942324
Zinc (Zn) †	ug	2.5	4.2	13.5	8.5	0.1	1942324

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

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Maxxam Job #: B841240
Report Date: 2018/10/16

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUST FALL
Your P.O. #: 2200002147
Sampler Initials: LJ

METALS (N/A)

Maxxam ID		FT7022	FT7023	FT7024	FT7025		
Sampling Date		2018/09/12 11:58	2018/09/12 12:26	2018/09/12 14:25	2018/09/12 15:21		
COC Number		157354-13-01	157354-13-01	157354-13-01	157354-13-01		
	Units	DSO4-AQS6-DF-2-2018	DSO4-AQS7-DF-2-2018	DSO4-AQS8-DF-2-2018	DSO4-AQS9-DF-2-2018	RDL	QC Batch
METALS							
Antimony (Sb) †	ug	<0.1	<0.1	<0.1	<0.1	0.1	1942324
Silver (Ag) †	ug	<0.5	<0.5	<0.5	<0.5	0.5	1942324
Arsenic (As) †	ug	0.7	<0.1	0.7	0.8	0.1	1942324
Barium (Ba) †	ug	15.8	9.44	25.8	58.4	0.05	1942324
Beryllium (Be) †	ug	<0.05	<0.05	<0.05	<0.05	0.05	1942324
Cadmium (Cd) †	ug	<0.05	<0.05	<0.05	<0.05	0.05	1942324
Chromium (Cr) †	ug	0.3	0.2	0.4	0.3	0.1	1942324
Copper (Cu) †	ug	4.0	2.8	51.5	19.6	0.1	1942324
Manganese (Mn) †	ug	19.1	35.4	1.6	8.3	0.1	1942324
Mercury (Hg) †	ug	<0.05	<0.05	<0.05	<0.05	0.05	1942324
Nickel (Ni) †	ug	1.1	0.9	0.9	0.7	0.1	1942324
Lead (Pb) †	ug	0.8	0.6	9.7	6.1	0.5	1942324
Thallium (Tl) †	ug	<0.1	<0.1	<0.1	<0.1	0.1	1942324
Vanadium (V) †	ug	<0.2	<0.2	<0.2	<0.2	0.2	1942324
Zinc (Zn) †	ug	2.4	1.5	2.2	2.2	0.1	1942324

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

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Maxxam Job #: B841240
Report Date: 2018/10/16

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUST FALL
Your P.O. #: 2200002147
Sampler Initials: LJ

CONVENTIONAL PARAMETERS (N/A)

Maxxam ID		FT7017	FT7019	FT7020		
Sampling Date		2018/09/08 11:00	2018/09/08 10:00	2018/09/08 09:30		
COC Number		157354-13-01	157354-13-01	157354-13-01		
	Units	DSO4-AQS1-DF-2-2018	DSO4-AQS2-DF-2-2018	DSO4-AQS3-DF-2-2018	RDL	QC Batch
CONVENTIONALS						
Weight of particles †	g	0.017	0.019	0.013	0.0010	1938406

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

Maxxam ID		FT7021	FT7022	FT7023		
Sampling Date		2018/09/08 08:37	2018/09/12 11:58	2018/09/12 12:26		
COC Number		157354-13-01	157354-13-01	157354-13-01		
	Units	DSO4-AQS4-DF-2-2018	DSO4-AQS6-DF-2-2018	DSO4-AQS7-DF-2-2018	RDL	QC Batch
CONVENTIONALS						
Weight of particles †	g	0.028	0.0082	0.0072	0.0010	1938406

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

Maxxam ID		FT7024	FT7025		
Sampling Date		2018/09/12 14:25	2018/09/12 15:21		
COC Number		157354-13-01	157354-13-01		
	Units	DSO4-AQS8-DF-2-2018	DSO4-AQS9-DF-2-2018	RDL	QC Batch
CONVENTIONALS					
Weight of particles †	g	0.011	0.012	0.0010	1938406

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

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Maxxam Job #: B841240
Report Date: 2018/10/16

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUST FALL
Your P.O. #: 2200002147
Sampler Initials: LJ

GENERAL COMMENTS

Version 2: Ajout métaux tel que demandé par le client

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B841240
Report Date: 2018/10/16

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUST FALL
Your P.O. #: 2200002147
Sampler Initials: LJ

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1938406	AHK	Spiked Blank	Weight of particles	2018/09/26		99	%
1938406	AHK	Spiked Blank DUP	Weight of particles	2018/09/26		99	%
1938406	AHK	Method Blank	Weight of particles	2018/09/26	<0.0010		g
1942324	EHA	Spiked Blank	Antimony (Sb)	2018/10/14		109	%
			Silver (Ag)	2018/10/14		89	%
			Arsenic (As)	2018/10/14		104	%
			Barium (Ba)	2018/10/14		109	%
			Beryllium (Be)	2018/10/14		107	%
			Cadmium (Cd)	2018/10/14		106	%
			Chromium (Cr)	2018/10/14		101	%
			Copper (Cu)	2018/10/14		101	%
			Manganese (Mn)	2018/10/14		104	%
			Mercury (Hg)	2018/10/14		104	%
			Nickel (Ni)	2018/10/14		99	%
			Lead (Pb)	2018/10/14		108	%
			Thallium (Tl)	2018/10/14		107	%
			Vanadium (V)	2018/10/14		102	%
			Zinc (Zn)	2018/10/14		104	%
1942324	EHA	Spiked Blank DUP	Antimony (Sb)	2018/10/14		107	%
			Silver (Ag)	2018/10/14		87	%
			Arsenic (As)	2018/10/14		101	%
			Barium (Ba)	2018/10/14		104	%
			Beryllium (Be)	2018/10/14		104	%
			Cadmium (Cd)	2018/10/14		104	%
			Chromium (Cr)	2018/10/14		97	%
			Copper (Cu)	2018/10/14		96	%
			Manganese (Mn)	2018/10/14		100	%
			Mercury (Hg)	2018/10/14		102	%
			Nickel (Ni)	2018/10/14		97	%
			Lead (Pb)	2018/10/14		105	%
			Thallium (Tl)	2018/10/14		105	%
			Vanadium (V)	2018/10/14		98	%
			Zinc (Zn)	2018/10/14		98	%
1942324	EHA	Method Blank	Antimony (Sb)	2018/10/14	<0.1		ug
			Silver (Ag)	2018/10/14	<0.5		ug
			Arsenic (As)	2018/10/14	<0.1		ug
			Barium (Ba)	2018/10/14	2.58, RDL=0.05		ug
			Beryllium (Be)	2018/10/14	<0.05		ug
			Cadmium (Cd)	2018/10/14	<0.05		ug
			Chromium (Cr)	2018/10/14	0.1, RDL=0.1		ug
			Copper (Cu)	2018/10/14	0.7, RDL=0.1		ug
			Manganese (Mn)	2018/10/14	10.9, RDL=0.1		ug
			Mercury (Hg)	2018/10/14	<0.05		ug
			Nickel (Ni)	2018/10/14	0.1, RDL=0.1		ug
			Lead (Pb)	2018/10/14	<0.5		ug

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Maxxam Job #: B841240
Report Date: 2018/10/16

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUST FALL
Your P.O. #: 2200002147
Sampler Initials: LJ

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Thallium (Tl)	2018/10/14	<0.1		ug
			Vanadium (V)	2018/10/14	<0.2		ug
			Zinc (Zn)	2018/10/14	0.5, RDL=0.1		ug

RDL = Reportable Detection Limit

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.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B841240
Report Date: 2018/10/16

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: DUST FALL
Your P.O. #: 2200002147
Sampler Initials: LJ

VALIDATION SIGNATURE PAGE

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



Caroline Bougie, B.Sc. Chemist



Dochka Koleva Hristova, B.Sc., Chemist

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Your P.O. #: 2200002147
Your Project #: AIR MONITORING
Site Location: PM 2.5
Your C.O.C. #: 157354

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/09/11
Report #: R2395821
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B838450
Received: 2018/09/05, 13:55

Sample Matrix: FILTER
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Particulate	5	2018/09/10	2018/09/10	STL SOP-00045	MA100– Part 1.0 R4 m

Remarks:

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Your P.O. #: 2200002147
Your Project #: AIR MONITORING
Site Location: PM 2.5
Your C.O.C. #: 157354

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/09/11
Report #: R2395821
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B838450
Received: 2018/09/05, 13:55

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B838450
Report Date: 2018/09/11

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: PM 2.5
Your P.O. #: 2200002147
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (FILTER)

Maxxam ID		FS2382	FS2388	FS2389	FS2390		
Sampling Date		2018/08/18 10:45	2018/08/20 12:00	2018/08/21 15:15	2018/08/24 10:30		
COC Number		157354	157354	157354	157354		
	Units	DSO4-AQ52-PM2.5-5	DSO4-AQ54-PM2.5-4	DSO3-AQ58-PM2.5-3	DSO3-AQ51-PM2.5-3	RDL	QC Batch
CONVENTIONALS							
Weight of filter	g	0.1539	0.1536	0.1470	0.1461	0.0002	1933033
Weight of filter and sample	g	0.1537	0.1536	0.1472	0.1466	0.0002	1933033
Total particles	g	<0.0002	<0.0002	0.0002	0.0005	0.0002	1933033

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FS2391		
Sampling Date		2018/08/25 15:20		
COC Number		157354		
	Units	DSO4-AQ53-PM2.5-2	RDL	QC Batch
CONVENTIONALS				
Weight of filter	g	0.1470	0.0002	1933033
Weight of filter and sample	g	0.1470	0.0002	1933033
Total particles	g	<0.0002	0.0002	1933033

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2018/09/11 12:35

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Maxxam Job #: B838450
Report Date: 2018/09/11

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: PM 2.5
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

CONVENTIONAL PARAMETERS (FILTER)

Total Particles: Damaged filter, possible results underestimation for FS2382 and FS2388.

Results relate only to the items tested.

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Maxxam Job #: B838450
Report Date: 2018/09/11

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: PM 2.5
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Caroline Bougie, B.Sc. Chemist

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Your P.O. #: 2200002147
Your Project #: AIR MONITIRING
Site#: TSMC
Site Location: DUSTFALL
Your C.O.C. #: 157354

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/09/06
Report #: R2395015
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B835159
Received: 2018/08/17, 14:10

Sample Matrix: WATER
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Weight of particles	8	2018/08/22	2018/08/22	STL SOP-00020	MA100–Part. 1.0 R4 m
Extractable Metals in Impinger	8	2018/08/29	2018/09/04	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Your P.O. #: 2200002147
Your Project #: AIR MONITIRING
Site#: TSMC
Site Location: DUSTFALL
Your C.O.C. #: 157354

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/09/06
Report #: R2395015
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B835159
Received: 2018/08/17, 14:10

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B835159
Report Date: 2018/09/06

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITIRING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: JFD

METALS (WATER)

Maxxam ID		FQ6241	FQ6243	FQ6244	FQ6245		
Sampling Date		2018/08/11 16:22	2018/08/05 13:32	2018/08/05 14:59	2018/08/05 16:17		
COC Number		157354	157354	157354	157354		
	Units	DS04-AQS1-DF-1-2018	DS04-AQS2-DF-1-2018	DS04-AQS3-DF-1-2018	DS04-AQS4-DF-1-2018	RDL	QC Batch
METALS							
Antimony (Sb) †	ug	0.1	0.2	0.1	<0.1	0.1	1930093
Silver (Ag) †	ug	<0.5	<0.5	<0.5	<0.5	0.5	1930093
Arsenic (As) †	ug	0.2	0.2	0.3	0.2	0.1	1930093
Barium (Ba) †	ug	59.7	73.0	37.3	86.0	0.05	1930093
Beryllium (Be) †	ug	<0.05	<0.05	<0.05	<0.05	0.05	1930093
Cadmium (Cd) †	ug	<0.05	0.16	0.12	0.12	0.05	1930093
Chromium (Cr) †	ug	1.1	1.9	1.2	1.1	0.1	1930093
Copper (Cu) †	ug	16.0	27.1	25.3	32.0	0.1	1930093
Manganese (Mn) †	ug	13.4	19.8	103	29.6	0.1	1930093
Mercury (Hg) †	ug	<0.05	<0.05	<0.05	<0.05	0.05	1930093
Nickel (Ni) †	ug	1.6	10.6	2.0	7.1	0.1	1930093
Lead (Pb) †	ug	2.9	2.9	5.1	3.8	0.5	1930093
Thallium (Tl) †	ug	<0.1	<0.1	<0.1	<0.1	0.1	1930093
Vanadium (V) †	ug	0.3	<0.2	<0.2	<0.2	0.2	1930093
Zinc (Zn) †	ug	14.4	65.0	23.0	27.8	0.1	1930093

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

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Maxxam Job #: B835159
Report Date: 2018/09/06

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITIRING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: JFD

METALS (WATER)

Maxxam ID		FQ6246	FQ6247	FQ6248	FQ6249		
Sampling Date		2018/08/12 11:14	2018/08/12 18:05	2018/08/12 09:48	2018/08/12 07:42		
COC Number		157354	157354	157354	157354		
	Units	DS03-AQS6-DF-1-2018	DS03-AQS7-DF-1-2018	DS03-AQS8-DF-1-2018	DS03-AQS9-DF-1-2018	RDL	QC Batch
METALS							
Antimony (Sb) †	ug	<0.1	<0.1	<0.1	0.1	0.1	1930093
Silver (Ag) †	ug	<0.5	<0.5	<0.5	<0.5	0.5	1930093
Arsenic (As) †	ug	0.1	0.8	0.2	0.3	0.1	1930093
Barium (Ba) †	ug	40.8	28.5	17.7	45.5	0.05	1930093
Beryllium (Be) †	ug	<0.05	<0.05	<0.05	<0.05	0.05	1930093
Cadmium (Cd) †	ug	0.07	<0.05	0.12	<0.05	0.05	1930093
Chromium (Cr) †	ug	0.9	1.5	1.2	1.2	0.1	1930093
Copper (Cu) †	ug	13.2	20.9	29.5	7.4	0.1	1930093
Manganese (Mn) †	ug	28.6	125	43.5	25.1	0.1	1930093
Mercury (Hg) †	ug	<0.05	<0.05	<0.05	<0.05	0.05	1930093
Nickel (Ni) †	ug	1.5	2.3	20.8	1.7	0.1	1930093
Lead (Pb) †	ug	1.6	4.2	4.2	3.4	0.5	1930093
Thallium (Tl) †	ug	<0.1	<0.1	<0.1	<0.1	0.1	1930093
Vanadium (V) †	ug	<0.2	0.6	<0.2	<0.2	0.2	1930093
Zinc (Zn) †	ug	9.7	12.6	25.5	15.1	0.1	1930093

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
† Parameter is not accreditable

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Maxxam Job #: B835159
Report Date: 2018/09/06

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITIRING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: JFD

CONVENTIONAL PARAMETERS (WATER)

Maxxam ID		FQ6241	FQ6243	FQ6244	FQ6245		
Sampling Date		2018/08/11 16:22	2018/08/05 13:32	2018/08/05 14:59	2018/08/05 16:17		
COC Number		157354	157354	157354	157354		
	Units	DS04-AQS1-DF-1-2018	DS04-AQS2-DF-1-2018	DS04-AQS3-DF-1-2018	DS04-AQS4-DF-1-2018	RDL	QC Batch
CONVENTIONALS							
Weight of particles	g	0.13	0.32	0.088	0.028	0.0010	1928036

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FQ6246	FQ6247	FQ6248	FQ6249		
Sampling Date		2018/08/12 11:14	2018/08/12 18:05	2018/08/12 09:48	2018/08/12 07:42		
COC Number		157354	157354	157354	157354		
	Units	DS03-AQS6-DF-1-2018	DS03-AQS7-DF-1-2018	DS03-AQS8-DF-1-2018	DS03-AQS9-DF-1-2018	RDL	QC Batch
CONVENTIONALS							
Weight of particles	g	0.023	0.062	0.036	0.042	0.0010	1928036

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B835159
Report Date: 2018/09/06

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITIRING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: JFD

GENERAL COMMENTS

Results relate only to the items tested.

2018/09/06 17:47

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Maxxam Job #: B835159
Report Date: 2018/09/06

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITIRING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
1928036	AHK	Spiked Blank	Weight of particles	2018/08/22		101	%
1928036	AHK	Spiked Blank DUP	Weight of particles	2018/08/22		100	%
1928036	AHK	Method Blank	Weight of particles	2018/08/22	<0.0010		g
1930093	KK	Spiked Blank	Antimony (Sb)	2018/09/04		110	%
			Silver (Ag)	2018/09/04		103	%
			Arsenic (As)	2018/09/04		107	%
			Barium (Ba)	2018/09/04		104	%
			Beryllium (Be)	2018/09/04		106	%
			Cadmium (Cd)	2018/09/04		104	%
			Chromium (Cr)	2018/09/04		107	%
			Copper (Cu)	2018/09/04		108	%
			Manganese (Mn)	2018/09/04		105	%
			Mercury (Hg)	2018/09/04		118	%
			Nickel (Ni)	2018/09/04		106	%
			Lead (Pb)	2018/09/04		106	%
			Thallium (Tl)	2018/09/04		103	%
			Vanadium (V)	2018/09/04		105	%
			Zinc (Zn)	2018/09/04		107	%
1930093	KK	Spiked Blank DUP	Antimony (Sb)	2018/09/04		104	%
			Silver (Ag)	2018/09/04		97	%
			Arsenic (As)	2018/09/04		101	%
			Barium (Ba)	2018/09/04		100	%
			Beryllium (Be)	2018/09/04		101	%
			Cadmium (Cd)	2018/09/04		99	%
			Chromium (Cr)	2018/09/04		103	%
			Copper (Cu)	2018/09/04		104	%
			Manganese (Mn)	2018/09/04		99	%
			Mercury (Hg)	2018/09/04		112	%
			Nickel (Ni)	2018/09/04		103	%
			Lead (Pb)	2018/09/04		102	%
			Thallium (Tl)	2018/09/04		98	%
			Vanadium (V)	2018/09/04		100	%
			Zinc (Zn)	2018/09/04		104	%
1930093	KK	Method Blank	Antimony (Sb)	2018/09/04	<0.1		ug
			Silver (Ag)	2018/09/04	<0.5		ug
			Arsenic (As)	2018/09/04	<0.1		ug
			Barium (Ba)	2018/09/04	<0.05		ug
			Beryllium (Be)	2018/09/04	<0.05		ug
			Cadmium (Cd)	2018/09/04	<0.05		ug
			Chromium (Cr)	2018/09/04	<0.1		ug
			Copper (Cu)	2018/09/04	1.2, RDL=0.1		ug
			Manganese (Mn)	2018/09/04	<0.1		ug
			Mercury (Hg)	2018/09/04	<0.05		ug
			Nickel (Ni)	2018/09/04	<0.1		ug
			Lead (Pb)	2018/09/04	<0.5		ug
			Thallium (Tl)	2018/09/04	<0.1		ug
			Vanadium (V)	2018/09/04	<0.2		ug

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Maxxam Job #: B835159
Report Date: 2018/09/06

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITIRING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: JFD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units
			Zinc (Zn)	2018/09/04	0.9, RDL=0.1		ug

RDL = Reportable Detection Limit

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.

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Maxxam Job #: B835159
Report Date: 2018/09/06

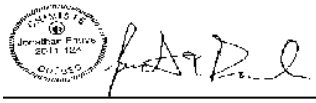
TATA STEEL MINERALS CANADA
Client Project #: AIR MONITIRING
Site Location: DUSTFALL
Your P.O. #: 2200002147
Sampler Initials: JFD

VALIDATION SIGNATURE PAGE

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



Caroline Bougie, B.Sc. Chemist



Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics

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Your P.O. #: 2200002147
Your Project #: AIR MONITORING
Site#: TSMC
Site Location: PM 2.5
Your C.O.C. #: 157354

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/23
Report #: R2392031
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B835151
Received: 2018/08/17, 13:46

Sample Matrix: FILTER
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Particulate (1)	8	2018/08/23	2018/08/23	STL SOP-00045	MA100– Part 1.0 R4 m

Remarks:

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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

(1) This test was performed by Maxxam -Ville St. Laurent

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Your P.O. #: 2200002147
Your Project #: AIR MONITORING
Site#: TSMC
Site Location: PM 2.5
Your C.O.C. #: 157354

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2018/08/23
Report #: R2392031
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B835151
Received: 2018/08/17, 13:46

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

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Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B835151
Report Date: 2018/08/23

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: PM 2.5
Your P.O. #: 2200002147
Sampler Initials: PS

CONVENTIONAL PARAMETERS (FILTER)

Maxxam ID		FQ6193	FQ6194	FQ6195	FQ6196		
Sampling Date		2018/07/26 11:25	2018/07/21 10:55	2018/08/05 10:40	2018/07/28 10:35		
COC Number		157354	157354	157354	157354		
	Units	DS04-AQS1-PM2.5-2	DS04-AQS2-PM2.5-3	DS04-AQS2-PM2.5-4	DS04-AQS4-PM2.5-2	RDL	QC Batch
CONVENTIONALS							
Weight of filter	g	0.1540	0.1528	0.1540	0.1530	0.0002	1928053
Weight of filter and sample	g	0.1544	0.1530	0.1545	0.1533	0.0002	1928053
Total particles	g	0.0004	0.0002	0.0005	0.0003	0.0002	1928053

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FQ6197	FQ6198	FQ6199	FQ6200		
Sampling Date		2018/08/07 16:30	2018/07/22 15:30	2018/08/13 08:30	2018/08/14 17:35		
COC Number		157354	157354	157354	157354		
	Units	DS04-AQS4-PM2.5-3	DS03-AQS8-PM2.5-2	DS03-AQS9-PM2.5-2	DS03-AQS6-PM2.5	RDL	QC Batch
CONVENTIONALS							
Weight of filter	g	0.1530	0.1516	0.1529	0.1533	0.0002	1928053
Weight of filter and sample	g	0.1533	0.1516	0.1531	0.1539	0.0002	1928053
Total particles	g	0.0003	<0.0002	0.0002	0.0006	0.0002	1928053

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

2018/08/23 14:46

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B835151
Report Date: 2018/08/23

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: PM 2.5
Your P.O. #: 2200002147
Sampler Initials: PS

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam Job #: B835151
Report Date: 2018/08/23

TATA STEEL MINERALS CANADA
Client Project #: AIR MONITORING
Site Location: PM 2.5
Your P.O. #: 2200002147
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

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



Alain Saint-Jean, B.Sc., Chemist, Supervisor

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Maxxam Analytics International Corporation o/a Maxxam Analytique 2690, Avenue Dalton, Sainte-Foy, Québec G1P 3S4 Tél.: (418) 658-5784 Télécopieur: (418) 658-6594

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your P.O. #: 2200002147
Your Project #: DSO03-4 AIR MONITORING
Site#: TSMC
Site Location: PM 2.5
Your C.O.C. #: 157354-13-01

Attention: Loic Didillon

TATA STEEL MINERALS CANADA
1000, RUE SHERBROOKE OUEST
BUREAU 1120
MONTRÉAL, QC
CANADA H3A 3G4

Report Date: 2019/03/18
Report #: R2430010
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B829452
Received: 2018/07/17, 10:00

Sample Matrix: FILTER
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Primary Reference
Total Particulate (1)	9	2018/07/20	2018/07/20	STL SOP-00045	MA100– Part 1.0 R4 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
Note: RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam -Ville St. Laurent

Note: All parameters included in the present certificate are accredited by the MDDELCC unless stated otherwise.

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Report Date: 2019/03/18
Report #: R2430010
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B829452
Received: 2018/07/17, 10:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Martine Lepage, Project Manager
Email: MLepage@maxxam.ca
Phone# (418)543-3788 Ext:7066201

==========

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Maxxam Job #: B829452
Report Date: 2019/03/18

TATA STEEL MINERALS CANADA
Client Project #: DSO03-4 AIR MONITORING
Site Location: PM 2.5
Your P.O. #: 2200002147

CONVENTIONAL PARAMETERS (FILTER)

Maxxam ID		FN7718	FN7720	FN7721		
Sampling Date		2018/06/10 10:00	2018/06/25 12:00	2018/06/20 10:00		
COC Number		157354-13-01	157354-13-01	157354-13-01		
	Units	DS03-AQS6-PM2.5-18-1	DS03-AQS2-PM2.5-18-1	DS03-AQS8-PM2.5-18-1	RDL	QC Batch
CONVENTIONALS						
Weight of filter	g	0.1519	0.1530	0.1514	0.0002	1918150
Weight of filter and sample	g	0.1520	0.1534	0.1521	0.0002	1918150
Total particles	g	<0.0002	0.0004	0.0007	0.0002	1918150

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FN7722	FN7723	FN7725		
Sampling Date		2018/07/07 10:15	2018/07/11 10:10	2018/07/08 12:00		
COC Number		157354-13-01	157354-13-01	157354-13-01		
	Units	DS04-AQS2-PM2.5-18-2	DS04-AQS3-PM2.5-18-1	DS04-AQS4-PM2.5-18-1	RDL	QC Batch
CONVENTIONALS						
Weight of filter	g	0.1531	0.1545	0.1523	0.0002	1918150
Weight of filter and sample	g	0.1533	0.1546	0.1525	0.0002	1918150
Total particles	g	0.0002	<0.0002	0.0002	0.0002	1918150

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FN7726	FN7727	FN7754		
Sampling Date		2018/07/12 17:15	2018/07/15 10:00	2018/07/16 12:15		
COC Number		157354-13-01	157354-13-01	157354-13-01		
	Units	DS04-AQS1-PM2.5-18-1	DS03-AQS9-PM2.5-18-1	DS03-AQS6-PM2.5-18-2	RDL	QC Batch
CONVENTIONALS						
Weight of filter	g	0.1526	0.1538	0.1539	0.0002	1918150
Weight of filter and sample	g	0.1528	0.1546	0.1547	0.0002	1918150
Total particles	g	0.0002	0.0008	0.0008	0.0002	1918150

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B829452
Report Date: 2019/03/18

TATA STEEL MINERALS CANADA
Client Project #: DSO03-4 AIR MONITORING
Site Location: PM 2.5
Your P.O. #: 2200002147

GENERAL COMMENTS

Version 2: Changement date d'échantillonnage tel que demandé par le client.

Results relate only to the items tested.

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Maxxam Job #: B829452
Report Date: 2019/03/18

TATA STEEL MINERALS CANADA
Client Project #: DSO03-4 AIR MONITORING
Site Location: PM 2.5
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VALIDATION SIGNATURE PAGE

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Miryam Assayag

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Appendix III. Goodwood Basin

A. Incident Report

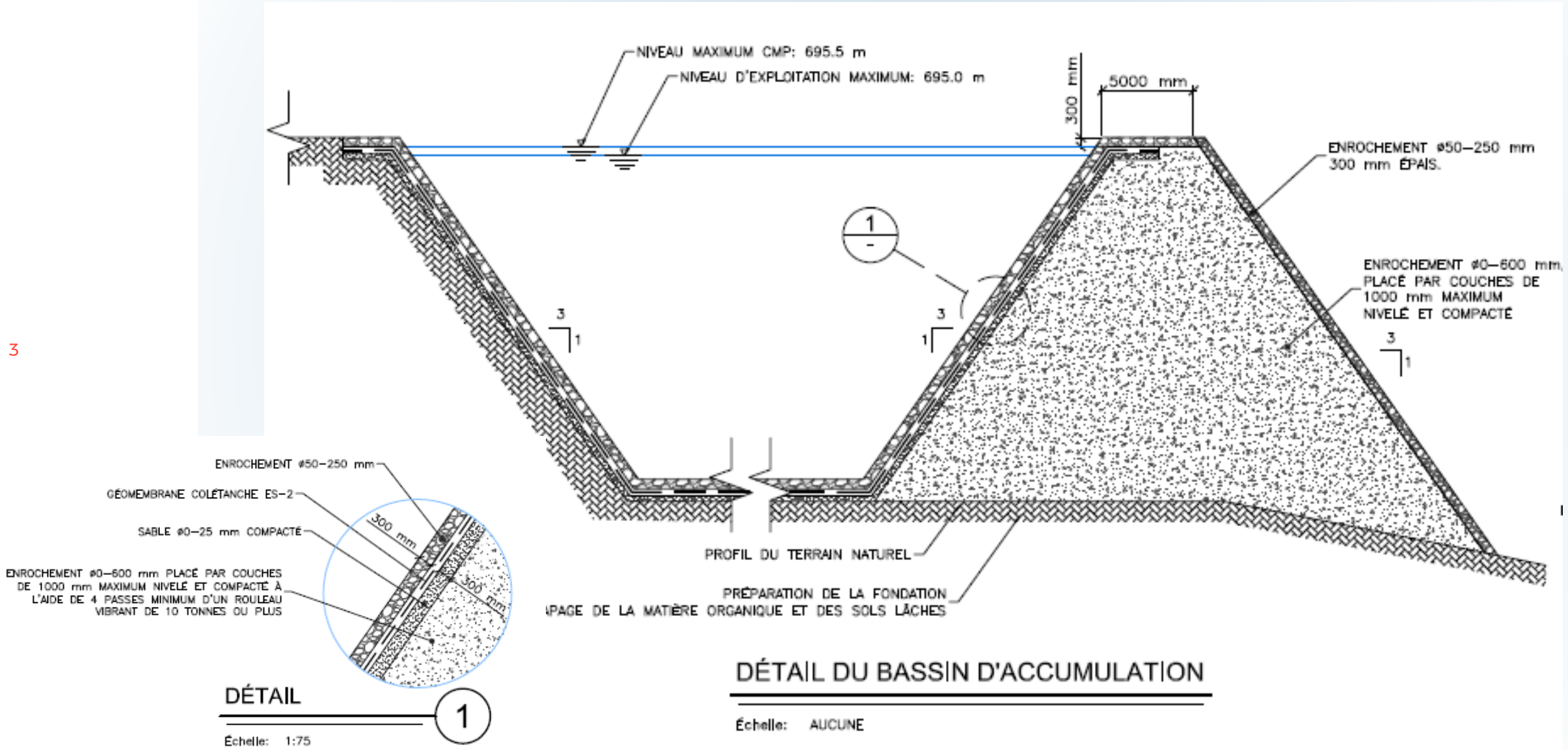
TSMC Brief 6th of November 2018

wsp

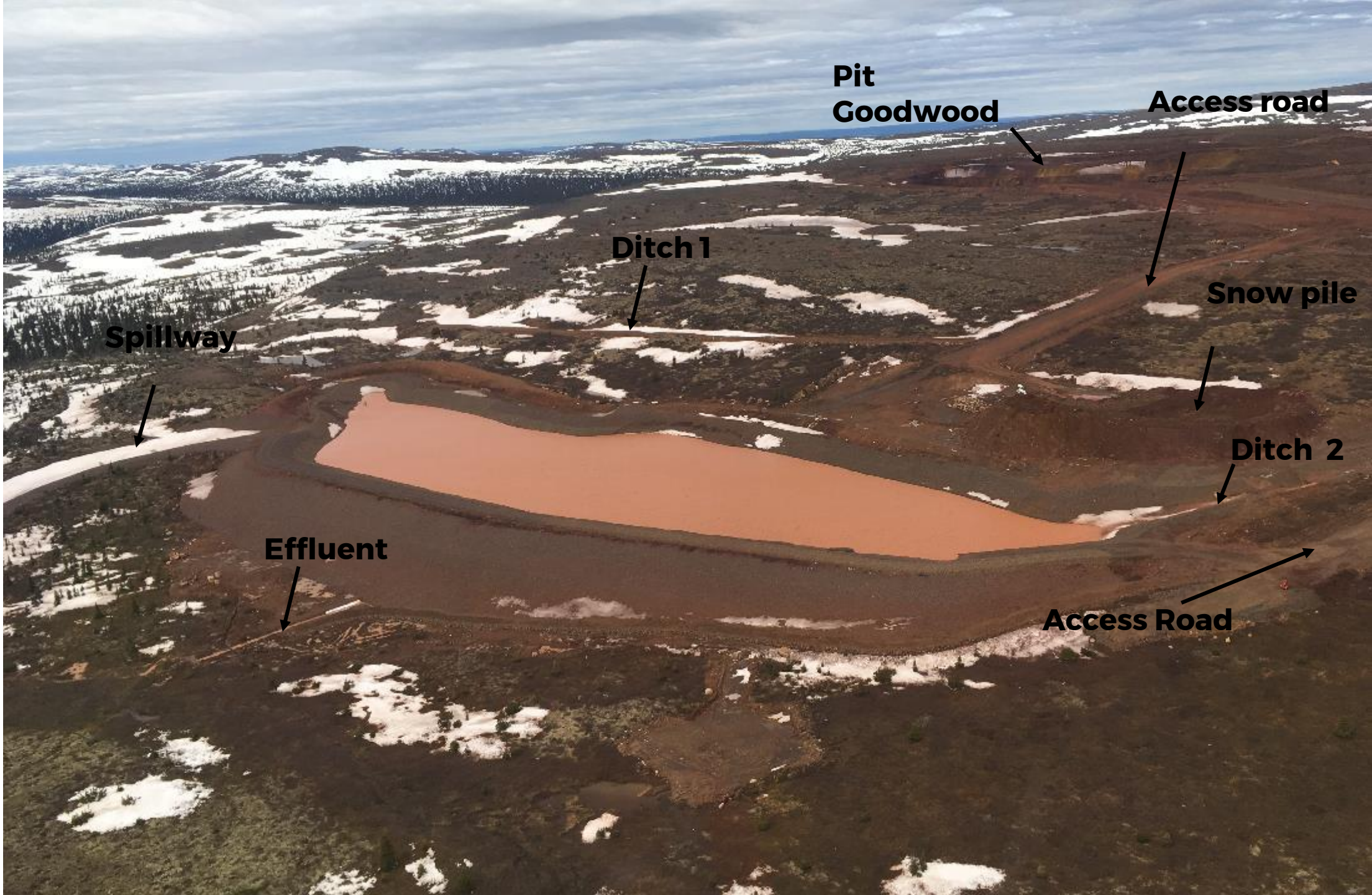
List of subjects

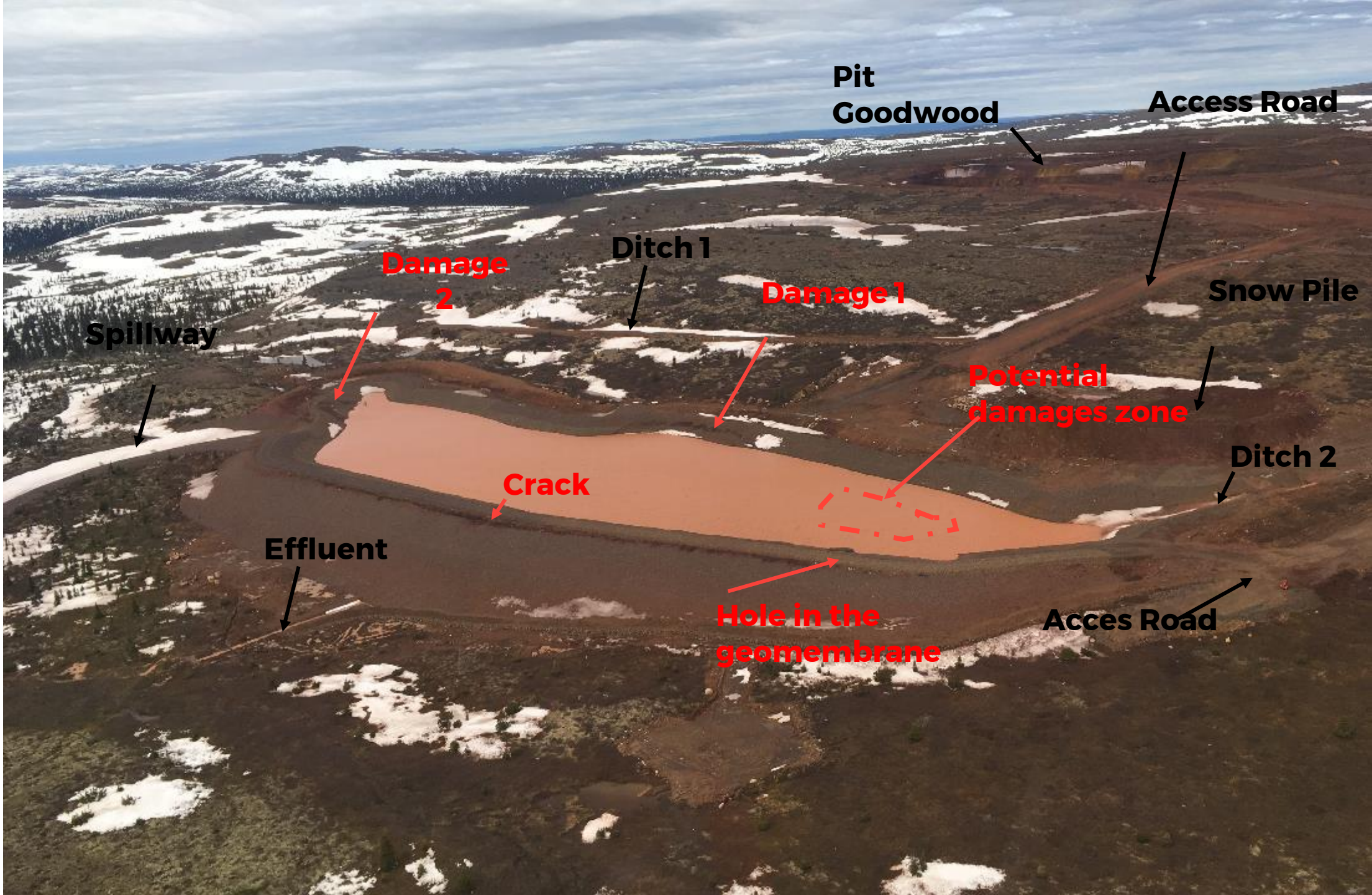
- Context
- Spring 2018 problematics
- Proposed wintering plan
  - *Drainage ditches*
  - *Temporary dike for buffer volume*
  - *Water management procedure for spring 2019*
- Risks of the wintering plan
  - *Overtopping the temporary dike*
  - *Further breaking of the geomembrane*
  - *Waterproofness of the temporary bassin*
- Questions and comments

Accumulation basin – As-built detail



Problematics


Pit
Goodwood
Access road
Ditch 1
Snow pile
Spillway
Ditch 2
Effluent
Access Road


Pit
Goodwood
Access Road
Ditch 1
Damage
2
Damage 1
Snow Pile
Spillway
Potential
damages zone
Ditch 2
Crack
Effluent
Hole in the
geomembrane
Acces Road

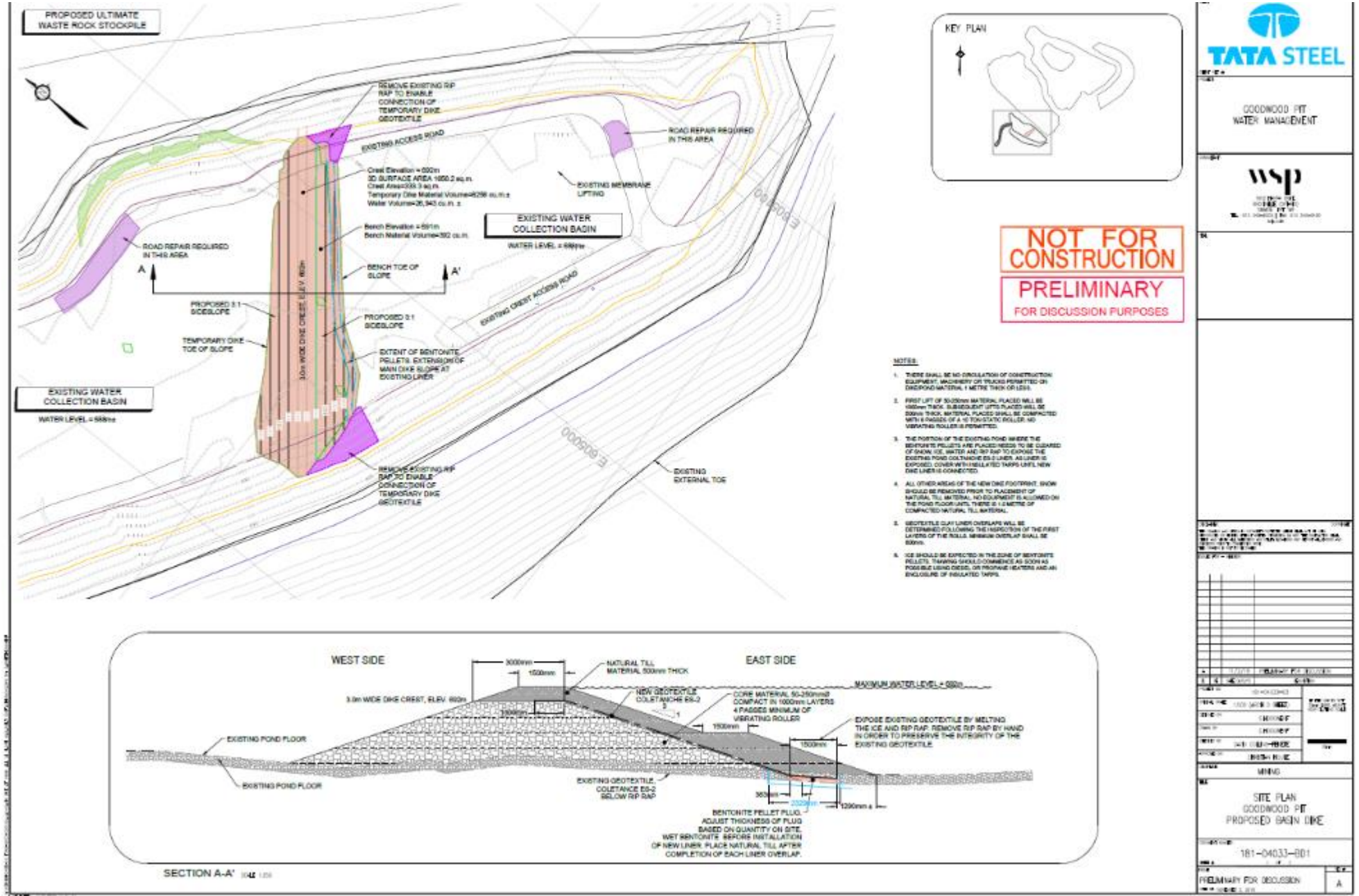
Wintering plan

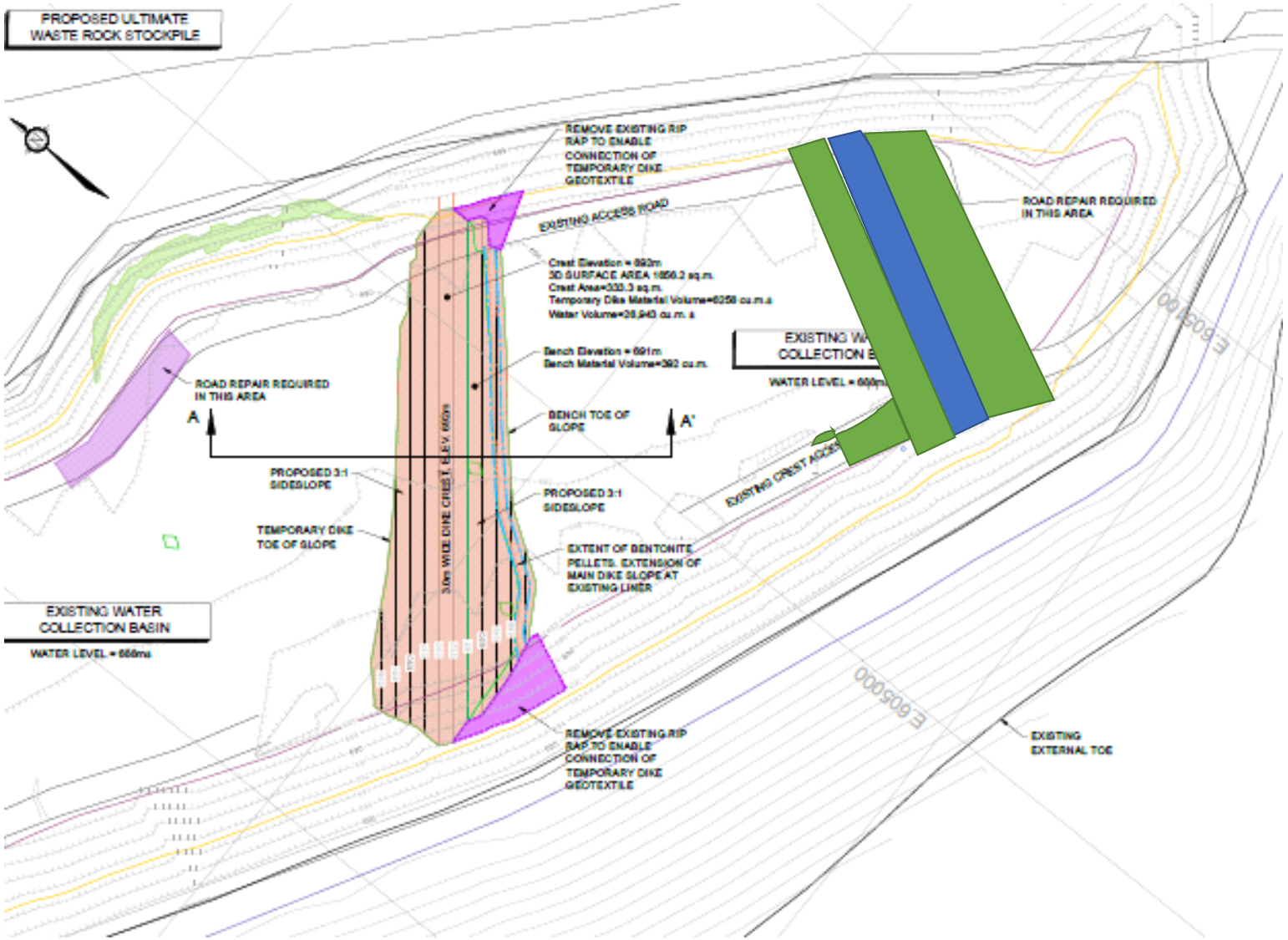
General concept

- Temporary dike
- Drainage ditches



Temporary dike




PROPOSED ULTIMATE WASTE ROCK STOCKPILE
REMOVE EXISTING RIP RAP TO ENABLE CONNECTION OF TEMPORARY DIKE GEOTEXTILE
EXISTING ACCESS ROAD
ROAD REPAIR REQUIRED IN THIS AREA
Crest Elevation = 693m
3D SURFACE AREA 1856.2 sq.m.
Crest Area=330.3 sq.m.
Temporary Dike Material Volume=6258 cu.m.s
Water Volume=26,640 cu.m. s
Bench Elevation = 691m
Bench Material Volume=392 cu.m.
EXISTING WATER COLLECTION BASIN
WATER LEVEL = 666m
ROAD REPAIR REQUIRED IN THIS AREA
A
A'
BENCH TOE OF SLOPE
PROPOSED 3:1 SIDESLOPE
PROPOSED 3:1 SIDESLOPE
TEMPORARY DIKE TOE OF SLOPE
3.0m WIDE DIKE CREST ELEV 693m
EXTENT OF BENTONITE PELLETS. EXTENSION OF MAIN DIKE SLOPE AT EXISTING LINER
EXISTING WATER COLLECTION BASIN
WATER LEVEL = 666m
REMOVE EXISTING RIP RAP TO ENABLE CONNECTION OF TEMPORARY DIKE GEOTEXTILE
EXISTING EXTERNAL TOE
E 605000







Technical brief for the procedure of spring 2019

- Snow management in the water management infrastructures before the spring thaw
- Pumping system between the Goodwood accumulation basin and K1C
- Water levels management in the temporary dike
- Dewatering of the Goodwood pit.
- Identification of a suitable location for snow piling

Management of risk

Hydrological balance summary

- Volume required before May 15th : 24 000 m^3
- Volume required before June 1st : 47 000 m^3
- Based on average meteorological conditions at Schefferville
- Does not consider Pit Dewatering
- Does not consider Water treatment or pumping out
- Numbers are conservative as there is no existing waste dump. Water is therefore conveyed to the environment for that section.

Key take away :

- Not the required capacity in the temporary pond for snowmelt and runoff - > Needs pumping
- Pumping installation need to be ready to work as soon as possible (As soon as the snow start melting)
- Volume required in temporary pond is function of pumping capacity and of pit dewatering management
- Objectives of the temporary dike :
  - Small retention capacity – Gives a buffer for the operators of the pump (balance)
  - Separation : Gives two different zones to repair in a dry environment
  - Increase the chance to retain and treat red water by reducing the footprint allowable for retention, thus, reducing potential water exfiltration
  - Give a buffer volume in case of pumps malfunctions

Water trucks impact on water management

- 50 m^3 per water truck
- A water truck takes approximately 30 minutes to fill
- 48 water trucks / day equates to 2400 m^3
- Dewatering last year at Goodwood pit = 480 m^3 / hr.

The water trucks definitely have an impact but a pump is better suited to manage water. If pumps are available, those should be preferred.

Risks associated with the wintering plan

Risk	Mitigation measure
Overtopping of the temporary dyke could lead to its failure	Overtopping water will still be confined in the basin Pumping infrastructures available on site Needs surveillance
Damages to the geomembrane, even considering the drainage ditches	***Removing snow from the ditches 1, 1A, 1B, 1C in priority
Water tightness of the temporary dike - Use of GCL - Bentonite Pellets Plug - Bentonite Pellets Powder	- Inspection of GCL - Bentonite Pellets testing - Polymer ? - Use of powder to enhance plug ?

Supplementary work / Concerns

Supplementary works / Concerns

- Existing crack on the dike
  - *Needs surveying to know if the dike is moving*
  - *Geotechnical studies (including surveys, boreholes and more as required)*
  - *Based on information that we have right now, probably a surface problem in a zone of snow accumulation during construction.*

- Holes in the geomembrane
  - *One hole corresponds to a puncture by machinery in the geomembrane*
  - *Two holes corresponds to holes undertaken during the site expertise visit to inspect underlying material*
  - *Can be repaired this year with Colétanche ES-2 or GCL. If you have expertise on site for Colétanche, this is the way to go.*

Thank you !

wsp.com

B. 2019 Wintering Plan

6108000 606000 6107000 607000 6106000 608000 6105000

Contingency Plan
If pumping from the temporary pond to K1C using the continuous line is not producing the desired results, the line will be broken again and the initial setup utilized in FY19 will be used where water is pumped from the temporary pond to the natural intermediate pond then to K1C.

Pump Locations
#1 - Point of exfiltration
#2 - Temporary pond
#3 - Natural intermediate pond - Contingency Plan
#4 - Goodwood pit

Note:
- All pumps are Godwin 6" CD150M Dri-Prime models
- There will be a 5th Godwin 6" CD150M Dri-Prime pump available in Goodwood as a backup.

Québec

Goodwood

4

Temporary Pond
Volume: 2650 m³

3

HDPE Pipe (Length: 3.18 Km)

Kivivic 1C

2

1

12" HDPE will be connected to make a continuous line from temporary pond to K1C pit. The line will be connected using spare 12" HDPE pipe in the Goodwood area and the work will be done in sequence with snow removal activities.

Newfoundland & Labrador

6108000 605000 6107000 604000

608000 6104000

604000 6106000 605000 6105000 606000 6104000 607000

- Dyke
- Sedimentation Pond
- FY19 Goodwood Pit Limit
- Haul Road
- Ultimate OB Dump Limit
- Ultimate Waste Dump Limit
- Ditch
- HDPE Pipe
- Road/Chemin
- Border: Québec - Labrador
- Pump Locations

Goodwood Water Management Area 4

0 150 300 600
Meters

SCALE:
1:12,000

UTM 19N NAD 83

FILE, VERSION, DATE, AUTHOR/
FICHIER, VERSION, DATE, AUTEUR:

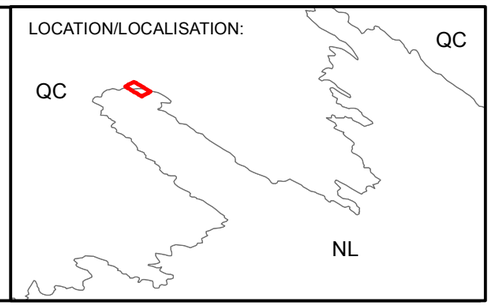
GIS-DEV-83 , 2019-03-18, E.F.

SOURCES:

TATA STEEL MINERALS CANADA

CONFIDENTIAL & COMMERCIALLY PROTECTED
CONFIDENTIEL & PROTÉGÉ COMMERCIALEMENT

LOCATION/LOCALISATION:



605000

606000

6108000

6106000

Pump 4 will be used to pump water from the pit to the temporary pond. Pumping from pit will not begin until June at earliest, this pump can be used as a backup in April/May.

Note:
FY20 plan is to mine from the upper benches which will reduce the amount of water required to be pumped from the pit.

In the event that the temporary pond cannot contain the volume of water bein pumped from the pit, ALL pumping from pit to temporary pond will stop and plan will be re-assessed.

Goodwood

4

Connect 12" HDPE pipe at natural intermediate pond.

3

Temporary Pond
Volume: 2650 m^3

Contingency Plan
Break the continuous line at the natural intermediate pond and use pump 3 to pump from the intermediate pond to K1C.

2

Pump 2 will pump water from the temporary pond directly to K1C.

Option:
If volume of water cannot be pump with a single pump, a second pump will be installed in parallel at temporary pond where both pumps would discharge into a common header before going to K1C.

1

Pump 1 will capture any water exfiltration from the dyke and pump it into the temporary pond

Note:
A backup Godwin 6" CD150M Dri-Prime pump will be available and ready to use at Goodwood in the event any other pump fails.

QC

NL

604000

606000

6107000 604000

6106000 605000

- Dyke
- Sedimentation Pond
- FY19 Goodwood Pit Limit
- Haul Road
- Ultimate OB Dump Limit
- Ultimate Waste Dump Limit
- Ditch
- HDPE Pipe
- Road/Chemin
- Border: Québec - Labrador

Goodwood Water Management Area 4

0 110 220 440
Meters

SCALE:
1:7,500

UTM 19N NAD 83

FILE, VERSION, DATE, AUTHOR/
FICHIER, VERSION, DATE, AUTEUR:

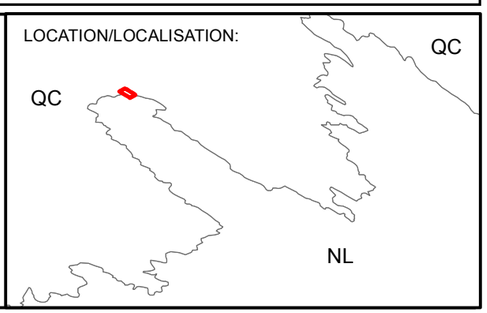
GIS-DEV-83-01 , 2019-03-18, E.F.

SOURCES:

TATA STEEL MINERALS CANADA

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CONFIDENTIEL & PROTÉGÉ COMMERCIALEMENT

LOCATION/LOCALISATION:



ENGINEERING BRIEF

RECIPIENT(S):	Mrs. Mariana Trindade, Tata Steel Minerals Canada
SENDER:	Mr. Christian Houle, Eng., WSP Canada Inc.
COPY:	Mr. Carl Gauthier, WSP Canada Inc.
DATE:	2018-11-30
SUBJECT:	**Goodwood Mining Site – Assessment Report and Winterization Plan – Preliminary Version** **WSP Ref.: 181-04013-03**

1. CONTEXT

Tata Steel Minerals Canada (TSMC) is developing a Direct Shipping iron-Ore (DSO) project with several mining pits established within a radius of 50 km. The project is situated 20 km north-west of the city of Schefferville with deposits in the province of Quebec, and in the province of Newfoundland and Labrador. As part of this project, the Goodwood deposit is part of the DSO4 mining pit group, and of project 2A, in the province of Quebec.

During its development, the Goodwood deposit has been through two different applications for certificates of authorization under section 22 of the Environmental Quality Act (EQA)[1]:

- Application for a certificate of authorization for the first year of exploitation of the Goodwood deposit under section 22 of the EQA, emitted in February 2017; and
- Application for a certificate of authorization for the exploitation of the Goodwood deposit under section 22 of the EQA emitted in February 2018.

The first certificate of authorization was obtained and the construction of the haulage road and of water management infrastructures began in May 2017. The exploitation of the deposit began later in July 2017, concomitantly with the construction work until the end of the exploitation season, in December 2017. The construction of the water accumulation basin was the last activity ongoing on the site of the Goodwood deposit and it was finalized in mid-December. Following winter 2017-2018, the site was reopened and exploitation activities were continued. During spring thaw in 2018, damages were observed to the accumulation basin which rendered the basin inoperant. As part of these damages were geomembrane punctures and failures, as well as uplifting areas. An exfiltration was observed on the downstream toe of the dike of the basin and this exfiltration was reported by TSMC to the environmental authorities of Quebec's government. A government inspector was then sent to the mining site to assess the situation and to assist the mining company in the management of this situation.

The following note intends to:

1. present the design and construction aspects of the water management plan of the Goodwood deposit;
2. present the conclusion and findings of the site expertise undertaken by WSP in September 2018;
3. explain the concepts and designs of the temporary winterization measures built in November 2018; and
4. present the risks and associated mitigation measures of the temporary water management plan.

1 Loi sur la qualité de l'environnement" (LQE).

1135 Lebourgneuf Blvd.
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2. GOODWOOD DEPOSIT WATER MANAGEMENT PLAN

2.1 LEGISLATIVE ASPECTS SUMMARY – WATER MANAGEMENT PLAN

The exploitation of a mining deposit is subject to several legislative aspects. Of those, the “Directive 019 sur l’industrie minière” manages the aspects pertaining to the water management and has the following objectives:

- To present the environmental limits retained and the basic requirements for different types of mining activities, to prevent the deterioration of the environment; and
- To provide the mining sector stakeholders with the necessary information for the preparation of the environmental impact assessment or impact study prior to an application for a certificate of authorization for a new project or for the modification of an existing project.

This document states all requirements for the management of water used for the processes of minerals or water that runs off from mining infrastructures. To collect these, a water collection network must be constructed around mining infrastructures and collected water must be accumulated and treated before being released to the environment. An accumulation basin is therefore generally required to retain runoff water in prevision of its treatment. The Goodwood deposit water management plan includes the following infrastructures:

- The red water collection network (for runoff water that has been in contact with mining infrastructures);
- The blue water collection network (to deviate clean water from mining infrastructures);
- A water treatment plant; and
- The red water accumulation basin.

Water management infrastructures for the first year of exploitation of the Goodwood mining deposit are shown on drawings at Appendix A. Water management infrastructures for the remaining years of the Goodwood mining deposit are shown at Appendix B.

2.2 DESIGN OF THE WATER MANAGEMENT INFRASTRUCTURES

Design of the water management infrastructures was undertaken by WSP from September 2016 to April 2017. The design process was mostly undertaken using LiDAR data for topography, and boreholes and test pits for stratigraphy. Surveyed data were limited and the overall plan had to be adjusted on field during construction.

2.2.1 WATER COLLECTION NETWORK

The water collection network consists of two different set of ditches, the blue water collection network and the red water collection network. Red water refers to runoff water that has been in contact with mining infrastructures or materials, and blue water refers to clean water, which has not been in contact with the mining infrastructures or materials. For the ditches, the standard for design is the flood associated with a 100-year return period. An additional 0.5 m of freeboard was considered in the design of ditches to provide a supplementary margin for construction purposes.

Considering the expanding nature of the mining pit, some ditches are permanent and some are temporary. As such, it was decided to put an erosion protection layer in the permanent ditches consisting of geotextile liner and rip rap, and to not apply this protection on the temporary ditches.

2.2.2 ACCUMULATION BASIN

2.2.2.1 VOLUME

The calculation of the required volume for the accumulation basin was undertaken using an hydrological balance over one year. The design standard for an accumulation basin is that it needs to be able to retain the following inputs:

- The runoff generated by the thawing of a snow cover associated with a 100-year return period; and
- The runoff from a precipitation associated with a 1,000-year return period.

The volumes of water that were considered as inputs to the accumulation basin are runoff volumes from liquid precipitation and snowmelt, as well as water volumes pumped from the mining pit. The volumes that were considered as outputs are the ones related to evaporation in the pond as well as volumes withdrawn by the water treatment plant (at the rate of 215 m^3/h). The maximum volume for the accumulation pond design standard is 154,480 m^3.

2.2.2.2 GEOTECHNICAL INPUTS

Five test pits were completed during the summer of 2016 under TSMC representatives' supervision in the proposed area for the construction of the accumulation pond. Table 1 summarizes the observations made within these pits.

Table 1 Observed stratigraphy within the test pits

STRATIGRAPHY	TEST PIT (DEPTH (m))				
	TP-01	TP-02	TP-03	TP-04	TP-05
Glacial till	0.00-1.30	0.00-3.00	0.00-4.00	0.00-2.70	0.00-4.00
Disaggregated bedrock within a till matrix	1.30-2.60	--	--	--	--
Probable bedrock	2.60	--	--	--	--

The natural soil in place is a brown to dark brown glacial till with rusty colors in some areas. The till is composed of a silty sand and gravel with traces of clay. The presence of pebbles and boulders has also been observed inside this soil.

Five particle size analyses were performed on samples taken within TP-02 (sample S1), TP-03 (sample S2), TP-4 (samples S1 and S2) and TP-05 (sample S2) pits. The results are presented in Table 2. The natural water content of the till varies between 6.3 and 18.4% (based on the completion of 10 laboratory tests on samples taken inside the wells TP 02 at TP 05). Natural soil has a well-graded grain size distribution.

Table 2 Grain size analysis results

SOIL COMPONENT	TEST PIT – SAMPLE – DEPTH (m)				
	TP-02 S1 0.00-1.50	TP-03 S2 1.50-3.00	TP-04 S1 0.00-1.20	TP-04 S2 1.20-2.70	TP-05 S1 0.00-1.50
Gravel	38.0%	19.7%	42.0%	30.8%	32.0%
Sand	27.0%	43.5%	25.8%	31.7%	32.0%
Silt	26.5%	28.7%	27.9%	25.3%	26.6%
Clay	8.5%	8.1%	4.3%	12.2%	9.4%

Based on the almost vertical walls of the test pits (observations by photography) and on several observations reporting the difficulty to excavate the material with the excavator, it could be assumed that the material is in a compact to dense state.

A disaggregated rock layer within a till matrix was observed at the TP-01 bottom. The probable bedrock (refusal during excavation) was encountered in TP-01, at a depth of 2.6 m. No observations of bedrock nature were reported on test pits reports. However, according to Quebec's geological map, the rock in the area is a mudrock.

Finally, two boreholes (2016-Gdw-P01 and 2016-Gdw-P02) were drilled by WSP (2017) in the vicinity of the accumulation pond reaching 65 m and 80 m deep, respectively. The soil thickness observed during the drilling was 1.52 m and 0.91 m in 2016-Gdw-P01 and 2016-Gdw-P02 respectively (shallow soil thickness in the area).

2.2.2.3 HYDROGEOLOGY

No water table was observed in the boreholes 2016-Gdw-P01 and 2016-Gdw-P02 in October 2016 (dry). Therefore, it was assumed in the design that no permanent water table would be present during the pond lifespan. However, a saturated natural soil condition was considered for the stability analysis to account for potential soil saturation during the snow melt.

2.2.2.4 STABILITY ANALYSES

Stability analyses were undertaken for the proposed accumulation pond typical section to ensure that the proposed earthwork satisfy the minimal factor of safety prescribed by the Canadian Dam Association. These factors of safety are considered as a common practice in the current dam engineering. The following loading cases were verified:

- End of construction;
- Long term stability with the maximum operation water level within the pond;
- Earthquake stability using the pseudo-static approach; and
- Stability under the design water flood.

Analysis results show that the minimal safety factor is met for each loading case for the proposed typical section of the accumulation basin.

2.2.2.5 GEOMEMBRANE SELECTION

The geomembrane is the waterproof element of the accumulation basin. The initial design of the pond included a linear low density polyethylene geomembrane (LLDPE) between two granular material layers for protection against puncture. A high puncture resistant geotextile above the upper granular layer was also part of the design.

Delay in the construction process of the pond (out of WSP’s control) and administrative problems between the contractor and Tata Steel representatives postponed the anticipated installation period of the geomembrane.

Fusion between LLDPE geomembrane panels required temperature above the freezing point to ensure a good quality of the joints. It became clear during the construction process that the geomembrane installation within the pond would occur late in Fall 2017 and, therefore, an adjustment in the geomembrane selection was required to ensure the feasibility of the project.

Coletanche bituminous geomembrane are known to be applicable in extreme weather conditions. Therefore, WSP selected this product as a replacement for the initially selected LLDPE geomembrane. Bituminous geomembrane also has the advantage of an increased resistance to puncture allowing the placement (with caution) of riprap directly on the product. The latest properties enable the elimination of the upper side granular layer and geotextile, thus reducing the time for construction considering the small window anticipated for the installation of the geomembrane.

Coletanche ES-2 is a bituminous geomembrane composed of a combination of a non-woven geotextile reinforced structure (providing its mechanical resistance) and an elastomeric bitumen (providing its water tightness). The geomembrane has a sanded upper face to provide an high interface friction angle with the cover soil/riprap. On the lower side, the geomembrane is covered with an anti-root film to be placed against the bedding soil. The geomembrane is delivered with a removable polyethylene interleaving separating film.

The bedding was a sandy soil used to ensure a smooth surface and to avoid geomembrane puncture by angular rock exposed by the natural soil excavation or by the 0-600 mm material of the dyke.

2.2.2.6 STABILITY OF THE SOIL/RIPRAP COVER (VENEER SLOPE STABILITY)

Slope stability of the soil/rip-rap cover was analysed using an interface friction angle between the protective riprap and the sandy surface of the geomembrane, on which the material is placed. The interface friction angle was provided by the manufacturer of the Coletanche geomembrane. Adequate safety factors were met for the stability of the soil cover over the geomembrane.

2.2.2.7 TENSION IN THE GEOMEMBRANE

Usual design with geosynthetic recommends to verify that no tension is developed in the geomembrane to ensure equilibrium of the system. Therefore, the driving force was compared with the resisting force along the potential sliding plan between the filmed surface under the geomembrane and the bedding sand. Again, the interface friction angle between these plans was provided by the manufacturer. Results of our analysis demonstrate that no tension from the geomembrane is required to ensure equilibrium of the driving and resisting forces along this sliding surface.

2.2.2.8 ANCHOR DESIGN

The anchor tension capacity was design to sustain the allowable tensile strength of the geomembrane.

2.3 CONSTRUCTION – JUNE TO DECEMBER 2017

Construction of the water management infrastructures was performed from June to December 2017 under site supervision by WSP. As limited and inaccurate data were used by WSP during the design phase of the water management plan, the ditches centerlines had to be adjusted on field in order to be efficient. All the adjustments were done under site supervision by WSP.

2.3.1 EXCAVATION OF THE DITCHES

The excavation of the ditches was done between July 2017 and September 2017. No obstacle was encountered during the excavation and lining of the ditches.

2.3.2 EXCAVATION OF THE BASIN

The excavation and shaping of the basin took place from June to December 2017. Throughout the excavation process, which included a 6 m cut on a 3H:1V slope, no water percolating through the walls and/or slopes of the excavation was observed as expected based on the geotechnical investigation results (i.e. showing no water table in the soil during the test pits).

2.3.3 CONSTRUCTION OF THE MAIN DIKE

The construction of the main dike took place from August to December 2017. The core is built with a 0-600 mm blasted rock produced in a quarry approximately 3 km away from the Goodwood deposit. The core was constructed in lifts of 1 m thick layers. Each layer was compacted with a minimum of 4 passes of a 10T vibrating compacter, thus achieving at least 92-95% Modified Proctor density.

2.3.4 GEOMEMBRANE INSTALLATION

The geomembrane installation began in rough winter conditions in November 2017, with temperatures lower than 0 °C down to -25 °C. Construction lasted until mid-December 2018.

3. SPRING 2018 – REMAINING CONSTRUCTION WORK, EXFILTRATION AND SITE ASSESSMENT

At the beginning of spring thaw 2018, remaining work for the water management plan was being undertaken under site supervision by WSP. During the spring thaw, damages occurred to the accumulation pond including geomembrane failure in two areas, punctures and uplifted areas. An exfiltration was observed downstream of the toe of the dike and the rate at which the water was exiting the basin was a concern for the stability of the infrastructures. As such, the zone was determined unsafe by WSP and the exfiltration was reported to environmental authorities by TSMC. An environmental inspector from the government was sent on site to assess the situation and assist the mining company in the management of the emergency. Following the assessment of the situation by a geotechnical engineer from WSP, the zone was reopened with restriction to allow the setup of a temporary pumping infrastructure to enable the emptying of the accumulation basin.

3.1 DAMAGES TO THE ACCUMULATION BASIN

Two damaged areas on which the geomembrane was torn near the top of the slope were observed on the north side and the west side of the accumulation basin. These damaged areas are located where the geomembrane has been placed against the natural soil excavation. The length of the damaged areas are respectively 70 m and 51 m.

When the water level in the accumulation pond got low enough, a hole (puncture) in the geomembrane at the toe of the upstream slope of the dike (interior portion of the pond) was found. Furthermore, WSP found a portion of the pond, where evidences of uplifting were observed (north-east side of the pond). In that area, WSP found that the geomembrane was covered with a minimal amount of the protective riprap layer shown on construction drawings.

Finally, a longitudinal fissure on the dike's crest on the downstream side was also noted. A plan showing the location of defect in the accumulation basin can be found in Appendix C.

3.2 OTHER OBSERVATIONS

Natural ground above the accumulation pond dike crest (to the north of the pond), near the two geomembrane failures, was saturated with water during WSP's representative presence on site in June and July 2018. Very loose soils in these areas were encountered during site visit. The fill within the geomembrane key trench was also found to be saturated and in a loose state in these areas. Due to saturated conditions in the terrain near the accumulation, the zone was considered unsafe for workers and the access was closed by TSMC on the recommendations of WSP.

An important stockpile of snow (from the snow clearing required for the pit operation) was placed by TSMC upstream of the accumulation pond (north-east side) and water runoff coming from this stockpile, as well as from the slope to the north, was directed towards the excavated portion of the pond, thus saturating the native soils. Also, runoff water coming from ditch No. 4 to ditch No. 2 was blocked by a road fill used for the construction works. It was apparent to WSP that ditch No. 2 was inefficient and was not connected adequately with the accumulation pond. One should note that the pond was designed considering that all water would enter the accumulation basin using ditch 2. During year 1 following the construction of the basin, the dewatering operations did not do so.

Finally, two different sources of riprap were used to build the protective layer of the pond. One of the sources, which makes out an important portion of the protective layer inside the pond, is composed of low strength rock characterized by a low density. Some rocks from that source can be easily crushed by hand. Rock coming from the other source seems to be of better quality and with adequate density for civil construction. This good quality rock is mainly located in ditch No. 2, on the downstream face of the dam and in the spillway canal. Difference between the sources can be identified on site by the color of the crushing product.

3.3 TEMPORARY WATER MANAGEMENT SOLUTIONS

Although work could have been undertaken to minimize the impacts of the exfiltration on the environment, WSP was concerned by the safety of workers and therefore advised TSMC to restrain the access to the zone. Following the assessment by a geotechnical engineer from WSP, the zone was reopened and a secure access procedure was put in place to ensure the safety of workers. Work was then undertaken to setup the temporary water management solution.

Two pipelines were installed: one running between the accumulation basin and the mining pit Kivivic 1 (located in Newfoundland and Labrador) and another one running between the exfiltration and the accumulation basin. The effluent was pumped in the accumulation basin and the red water in the accumulation pond was pumped towards the mining pit Kivivic 1. During the time required for the setup of these installations, a sump was dug at the downstream toe of the accumulation basin and water trucks, usually required for dust control, were used to catch the water.

At the toe of the downstream slope of the dike, filtering berms were also constructed downstream of the sump, to catch the sediments in the water that could not be captured by the pumping system. The effluent was also monitored throughout the pumping operations. This temporary action did help in stopping red water in the pond to be evacuated in the environment.

3.4 MONITORING OF THE DIKE

To monitor the behavior of the dike and to ensure the workers' safety, temporary landmarks were installed on the downstream slope of the dike and were surveyed on a constant basis. A daily inspection of the accumulation pond was also made by WSP on-site representative to note visual changes, unusual water accumulations or runoffs of water.

3.5 EXPERTISE VISIT – SEPTEMBER 2018

The expertise visit reports are attached in Appendix D. This visit reaffirmed prior observations made in June and July 2018 pertaining to:

- The area of geomembrane damages;
- The presence of water seepage under the membrane;
- The poor material quality for the protective layer and the presence of instability;
- The presence of punctures in the geomembrane;
- The evidence of important water runoffs;
- The presence of plastic film in the waste cleared out; and
- The existing fissure on the dike.

4. DAMAGES TO THE ACCUMULATION BASIN – CAUSES AND EFFECTS

4.1 GEOMEMBRANE FAILURE

Although no one was on site to witness it first hand, it is WSP strong belief that two events are the cause of the geomembrane failures observed on the west and north sides of the pond:

1. the reduction of the resisting force along the sliding plane; and
2. the excessive downward force.

The combination of these two events induced a tension in the geomembrane that exceeded its ultimate capacity. The following section entails a summary of the causes for geomembrane failure.

4.1.1 REDUCTION OF THE RESISTING FORCE ALONG THE SLIDING PLANE

The first major factor contributing to the reduction in resistance is water accumulation at the top of the slope. At the failure locations, forced water seepage underneath the geomembrane resulted in a reduction of the interface angle between the geomembrane and the bedding soil. The water accumulations were caused by:

- An important and quick income of water from the natural ground to the north caused by the late snow melt of 2018 associated with rainy weather.
- The runoff water income from the north side of the pond especially along the access road (which is directly aligned with one of the geomembrane failures).
- The non-functional ditch No. 1 due to snow accumulation, leading to additional amounts of water in the areas of the failures.
- The presence of an important snow stockpile from the Goodwood pit that melted and saturated the area in the vicinity of the failure to the north and the slope of ditch No. 2 near the entrance of the pond.
- An important water income from the Goodwood pit dewatering operation along the access road of the slope to the north instead of coming through ditch No. 2 (as normally expected).
- An important water accumulation at the western part of the basin. Occurrence seems exceptional in an important snowmelt event.
- The presence of an overburden pile near the failure to the west increased water flow concentration and retention in low points near the crest of basin.

All these causes led to an important water income entering the accumulation basin directly by the north and west side instead of entering by ditch No. 2, as designed.

The second factor to consider in the reduction of the interface friction angle is the presence of snow and ice under the geomembrane during the installation. The melting process has more than likely contributed to lower the interface friction angle at spring thaw.

The third cause is the presence of waste plastic film under the geomembrane. This film is a protective layer and is meant to be striped and thrown away during installation. Several patches of plastic were observed under the geomembrane at the failures locations.

4.1.2 EXCESSIVE DOWNWARD DRIVING FORCE

The presence of an important amount of low quality bedrock inside the pond (i.e. the protective layer), combined with the presence of an important quantity of snow and ice, may have caused movement within this layer, during the spring melt. Downward forces caused by these movements would have increased tension in the geomembrane.

4.2 GEOMEMBRANE PUNCTURE (HOLE NO. 1) AND DIKE UPSTREAM SLOPE MOVEMENT

The geomembrane puncture observed was either done by machinery or from a rock puncture during construction. Water flow through this opening provoked water seepage in the dam material. This led to the washout of the fine content of the granular fill. Subsequent movement may have been provoked by the coarser component of the fill rearrangement.

4.3 GEOMEMBRANE UPLIFT AREA

The water runoff under the geomembrane has more than likely caused the geomembrane uplifted area observed. It should be noted that in this area WSP found that the geomembrane was covered with a minimal amount of the protective riprap layer shown on drawings.

4.4 FISSURE ON THE CREST OF THE SOUTH EDGE

During the construction of this part of the dike, a lot of snow had accumulated. The snow was always plowed over this edge, thus allowing the construction to progress. It is unknown if at the final stage of the construction the edge was filled with the required riprap or simply forgotten under the accumulation of snow. The effect is still the same, the washout of the granular fill under the protective riprap causes the movement of the material, resulting in the expansion of the crack.

5. DEVELOPMENT OF THE ACTION PLAN

Following the management of the environmental emergency, and the emptying of the accumulation basin, TSMC mandated WSP to elaborate an action plan to repair the accumulation basin. Considering the time of the year and the difficulty to build a permanent solution in proper field conditions, the action plan was proposed in two parts:

- Winterization measures, to be built in fall 2018 and winter/spring 2019; and
- Permanent solution (summer 2019).

The design of the winterization measures was undertaken in the summer-fall 2018 and the construction was done in fall 2018. The construction was finished by mid-November 2018.

5.1 WINTERIZATION MEASURES

The main winterization measures initially proposed and subsequently built are the following:

- The construction of a proper surface water drainage to the north and west sides of the basin by the excavation of ditches. With respect to the water quality (blue water being discharged directly in the environment and red water towards the accumulation pond), the water runoff is derived around the pond instead of ponding at the crest.
- The re-establishment of the connection between red water from ditch No. 4 to ditch No. 2 to allow water seepage to enter the pond at the right place.
- The construction of a temporary dike within the accumulation pond to allow a water storage volume coming from ditch No. 2 during the spring thaw.
- The reparation of the major punctures in the geomembrane and of the area where the geomembrane has lifted using geomembrane and granular fill already on site.
- The definition of a proper snow melt management area for the Goodwood site.
- The definition of a close monitoring system of any exfiltration during the spring thaw.

5.2 PERMANENT SOLUTION

The design of the permanent solution will be undertaken during winter 2019 to be built during summer 2019 in optimal field conditions. It will comprise the study of the following aspects:

- The inspection of all works undertaken in November 2018;
- The reparations of the accumulation basin;
- The evaluation and rework of the drainage around the accumulation basin;
- The installation of a flow measurement device downstream of the toe of the accumulation basin dike; and
- The definition and installation details of a pumping system. This system is to be designed so that the pumping capacity exceeds the runoff and dewatering inputs to the accumulation basin. The system in place that has been used for the temporary solution has been left in place and maintained to be ready for usage in spring 2019.

6. WINTERIZATION PLAN 2018

The winterization plan proposed by WSP to TSMC has the objective of protecting the accumulation basin from further damages during spring thaw 2019. It is comprised of the following aspects:

1. the design and construction of ditches to evacuate surface water and drain accumulated runoffs from the crest of the accumulation basin; and
2. the design and construction of a temporary dike in the accumulation basin, to isolate the damaged area from the undamaged area, thus creating a volume to accumulate mining water within the existing basin for spring 2019 snow thaw.

Along these designs, other works were to be completed on the Goodwood mining site:

1. the excavation of ditch F2 to capture runoff from the overburden pile;
2. the installation of culverts in ditches Nos. 4 and 7; and
3. the repair works in ditch No. 2.

Considering that weather conditions in October 2018 were not favorable for construction works, TSMC mobilized its construction contractor early to perform work. Important engineering efforts were put by WSP in order to deliver concepts and designs in advance to accommodate efforts on the field and therefore minimize budgetary impacts. Strong technical support was also provided through this expedited construction. Considering the time and climate constraints, there is a discrepancy between the concepts and designs presented by WSP and the construction work undertaken on field. The adjustments made on field, at the request of TSMC, are associated with risks. The risks and measures to mitigate those risks are presented in chapter 7.

6.1 DESIGN PROPOSED BY WSP

The design proposed by WSP to TSMC consisted mainly in the excavation of 3 ditches (1A, 1B and 1C) and the building of a temporary dike within the accumulation basin. The design by WSP is presented in Appendix E.

6.1.1 DITCHES 1A, 1B AND 1C

The objective of ditches 1A, 1B and 1C is to capture and drain any surface water surrounding the crest of the water accumulation basin. The intent is that ditches 1A and 1C capture clean water and deviate it towards the natural environment, and that ditch 1B captures red water and deviates it towards ditch 2, which leads to the accumulation basin. The new ditches would need to be within an offset of 5 to 7 m from the crest of the basin. Over the footprint of the proposed ditches lied piles of overburden that were excavated from the road surrounding the accumulation basin. Considering the fact that the surrounding overburden piles are a source of red water, it was necessary to transfer them to the overburden pile. Table 3 presents a summary for the design parameters of the ditches.

Table 3 Ditches proposed by WSP

NAME	LENGTH (m)	MINIMAL DEPTH (m)	BOTTOM WIIDTH (m)	SIDE SLOPE (H:V)	MINIMAL LONGITUDINAL SLOPE (%)	STARTING ELEVATION (m)	FINAL ELEVATION (m)
1A	452	1.5	1.0	2:1	0.5	696.82	693.40
1B	160	1.5	1.0	2:1	0.5	697.43	696.33
1C	105	1.5	1.0	2:1	0.5	695.46	694.97

6.1.2 TEMPORARY DIKE IN THE ACCUMULATION BASIN

The design of the temporary dike within the accumulation basin had two main objectives:

1. Retention capacity: The initial crest elevation of the temporary dike was 693 m. The design intended to minimize the footprint of the dike inside the basin, rendering construction and further repairs easier. The dike would have created a temporary basin of a volume of 29,000 m³. This volume would have served the purpose of providing a buffer between the inputs of water (runoff from snowmelt and rainfall, pit dewatering operations and recirculation of the exfiltration) and the outputs (pumping to Kivivic 1C and pumping in the water trucks). It would also have provided a relief in case of pump malfunctions or other mechanical failure.
2. Separation: The temporary dike created a dry zone and a wet zone. The dry zone would eventually facilitate reparation works in summer 2019.

6.2 MODIFIED, FIELD FIT AND ADAPTED DESIGNS

Many factors affected the outcome of original designs set forth by WSP such as: material availability, natural or artificial on-site obstacles, construction capability and budgets. It is not the purpose of this technical brief to comment individually these factors. It is sufficient to be cognisant of them and that every effort was made by WSP to adapt to these factors, to restraints that they generated and to expose the risk associated with these modifications. The as-built drawings are in Appendix F. t is important to note that as the constructed dike differs greatly from the designed one, WSP is not going to stamp the as-built plans.

6.2.1 DITCHES (AS-BUILT)

In general, the construction contractor used the concepts for the ditches proposed by WSP. Some field adjustments, especially pertaining to the alignment of ditches, were done and validated by the site supervisor from WSP. Table 4 presents a summary for the as-built dimensions of the ditches.

Table 4 Ditches as-built by the construction contractor

NAME	LENGTH (m)	MINIMAL DEPTH (m)	BOTTOM WIIDTH (m)	SIDE SLOPE (H:V)	MINIMAL LONGITUDINAL SLOPE (%)	STARTING ELEVATION (m)	FINAL ELEVATION (m)
1A	428	1.5	1.0	2:1	0.5	695.51	692.78
1B	148	1.5	1.0	2:1	0.5	698.51	697.02
1C	102	1.5	1.0	2:1	0.5	695.15	693.32

6.2.2 AS-BUILT TEMPORARY DIKE INSIDE THE ACCUMULATION BASIN

Although efforts were made by WSP to supply TSMC with readily information on cross-section, bill of materials, volumes and footprints of the proposed dike, the as-built dike was greatly modified from the original concept. Availability and quality of material, timetable and economical constraints impacted the construction of the dike.

During the construction phase, TSMC requested that WSP send a technical representative to work along with them and the contractor. A different concept was presented by the contractor to WSP which responded by explaining the risks and mitigation measures of the proposed concept. Those risks and mitigation measures are presented in chapter 7, and the presentation that was delivered by WSP to TSMC is available in Appendix G. Once the risk was understood by TSMC and that they accepted to put in place the required mitigation measures in spring 2019, WSP accepted to give advice to the contractor for the construction of the dike and to provide TSMC with as-built details of the temporary dike. The difference in the buffer volume created by the as-built dike and that of the designed dike is 26,350 m³, meaning a reduction of the buffer volume by 90%.

7. RISKS AND MITIGATION MEASURES ASSOCIATED WITH THE AS-BUILT WINTERIZATION PLAN

The temporary dike constructed in the accumulation basin creates a pond with a volume of 2,650 m³. The water inputs in this temporary basin are the following:

- Runoff water from precipitation;
- Runoff water from spring thaw; and
- Mining pit dewatering operations.

The water output from this temporary basin is the pumping system that will be put in place before the spring thaw 2019 by TSMC. Further details on the pumping system will be provided to TSMC during winter 2019 by WSP. The principal risks identified by WSP are the following:

1. Overtopping of the temporary dike: The overtopping of the temporary dike could lead to its failure.
2. Further damages to the accumulation basin: The proposed winterization plan aims at lowering this but cannot eliminate it completely.
3. Percolation of water through the temporary dike: The water retaining element at the core of the temporary dike is till, a permeable material, and due to the weeather conditions during its placement and compaction, , water could percolate through the dike.

The following section is a summary of principal risks associated with the as-built winterization plan and mitigation measures associated with these risks.

7.1 OVERTOPPING OF THE TEMPORARY DIKE

RISK

The only water output from the temporary basin is the pumping system that will be put in place before the spring thaw 2019 by TSMC. As such, the pumping capacity must minimally amount to the sum of all the inputs. A bad management of water levels in the temporary basin could lead to its overtopping, which in turn could lead to its failure. Since the volume available in the temporary basin is small in comparison with the forecasted inputs, it is crucial that an uninterrupted surveillance shift be put in place.

MITIGATION MEASURES

The management of the water levels in the temporary basin with adequate pumping infrastructures is essential to the success of the water management operations. The pumping infrastructures imply the pumps, connectors, pipes and all other accessory required for the proper functioning of the system. These infrastructures should be maintained, prepared and ready for operation prior to the spring thaw 2019. The water level should be under constant surveillance by a crew member.

7.2 FURTHER DAMAGES TO THE ACCUMULATION BASIN

RISK

The proposed winterization plan aims at lowering the risks of further accumulation basin but cannot eliminate it completely. Further damages to the overall water management plan or to the accumulation basin could occur during the next spring thaw.

MITIGATION MEASURES

The mitigation measures associated with this risk are numerous, but the general idea is to enable the water management plan to operate at its full capacity. The following measures are some examples of works that have to be undertaken by TSMC to lower the risk of further damages to the accumulation basin or to the overall water management plan:

1. Snow removal in the ditches: The ditches cannot flow at full capacity if there is snow blocking the section of the ditch. The snow removal from ditches and culvert is an important part of the preparation for snowmelt on a mining site.
2. Inspection of infrastructures: The inspection of infrastructures before the snowmelt will enable TSMC to localize any defect and undertake reparation work where needed.
3. Pit dewatering: The pit dewatering water should be conveyed through ditches Nos. 4 and 2, towards the temporary pond in the accumulation basin. Ditch 4 is the only one having the sufficient capacity to convey pit dewatering waters safely to the accumulation basin. A close follow-up of water levels in the temporary pond should be put in place and the pit dewatering operations should be coordinated with the follow-up.

7.3 PERCOLATION OF WATER THROUGH THE TEMPORARY DIKE

RISK

The percolation of water through the temporary dike is likely to happen, considering that the till core is a permeable material. The water that percolated through the dike will end up in the accumulation basin. This is considered a minimal risk since water will still be confined in the accumulation basin and should therefore not end in the environment at this point.

MITIGATION MEASURE

The percolation of water through the temporary dike should be expected, and a pump should be ready to pump this water back in the temporary basin.

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Appendices

A Goodwood Water Management – Year 1
B End of Exploitation – Overall View
C Location of Defects in the Pond Area and Site Expertise Pictures
D Expertise Report – Days 1 and 2
E Action Plan – Winterization Measures
F Designs Proposed by WSP
G As-built Drawings

APPENDIX A

GOODWOOD WATER MANAGEMENT PLAN – YEAR 1

Gestion des eaux
Secteur Goodwood

Plan de gestion des eaux de l'an 1

Plans finaux

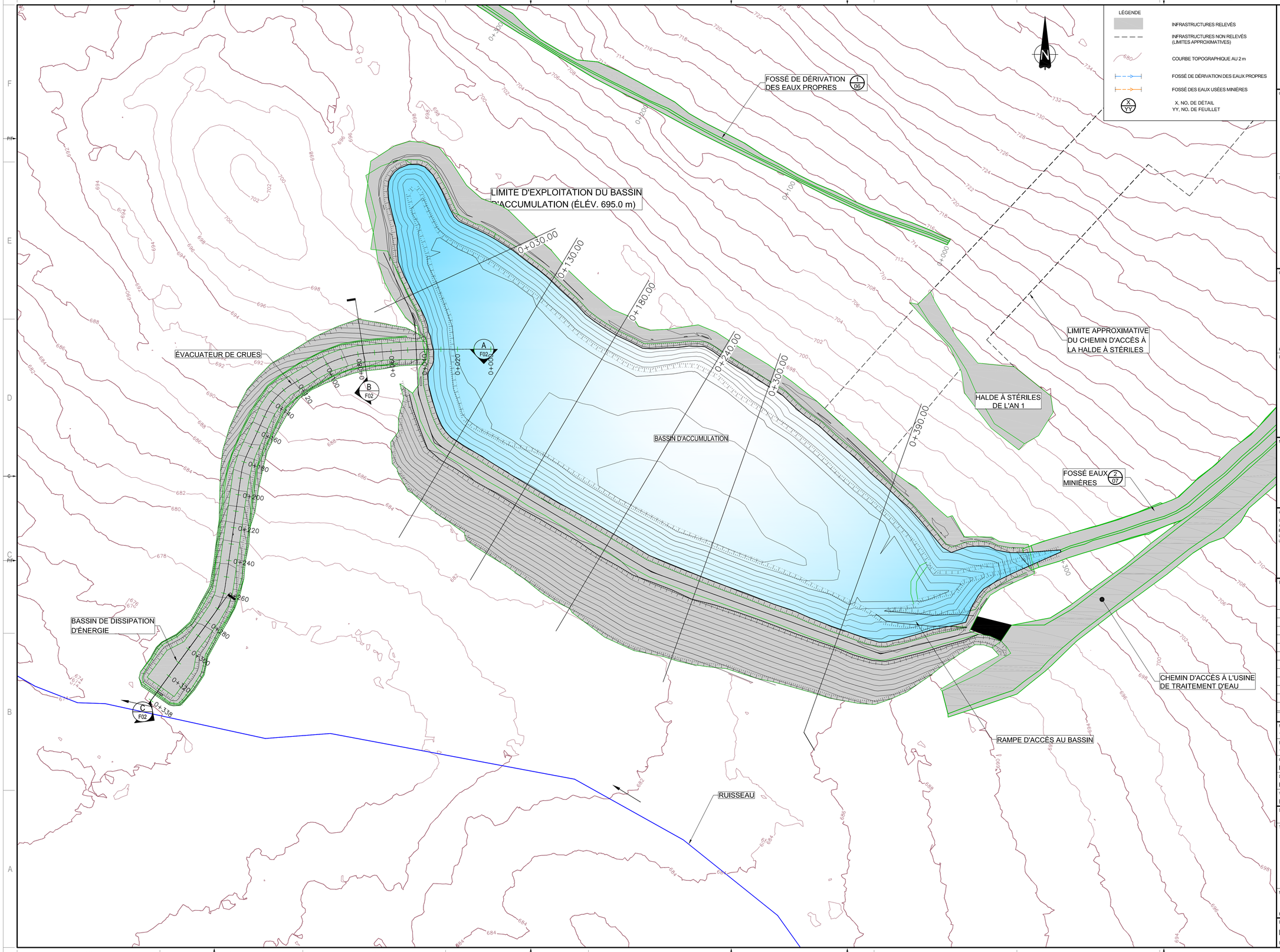
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LISTE DES PLANS

No. PLAN	TITRE
--	PAGE TITRE
F01/15	PLAN DE GESTION DES EAUX DE L'AN 1 BASSIN D'ACCUMULATION VUE EN PLAN
F02/15	PLAN DE GESTION DES EAUX DE L'AN 1 BASSIN D'ACCUMULATION PROFILS EN LONG, COUPES ET DÉTAILS
F03/15	PLAN DE GESTION DES EAUX DE L'AN 1 BASSIN D'ACCUMULATION COUPES TRANSVERSALES
F04/15	PLAN DE GESTION DES EAUX DE L'AN 1 VUE EN PLAN GÉNÉRALE
F05/15	PLAN DE GESTION DES EAUX DE L'AN 1 COUPES ET DÉTAILS
F06/15	PLAN DE GESTION DES EAUX DE L'AN 1 FOSSÉ 1 PLAN ET PROFIL
F07/15	PLAN DE GESTION DES EAUX DE L'AN 1 FOSSÉ 2 - PLAN ET PROFIL
F08/15	PLAN DE GESTION DES EAUX DE L'AN 1 FOSSÉ 3 - PLAN ET PROFIL
F09/15	PLAN DE GESTION DES EAUX DE L'AN 1 FOSSÉ 4 - PLAN ET PROFIL
F10/15	PLAN DE GESTION DES EAUX DE L'AN 1 FOSSÉ 5 - PLAN ET PROFIL
F11/15	PLAN DE GESTION DES EAUX DE L'AN 1 FOSSÉ 6 - PLAN ET PROFIL
F12/15	PLAN DE GESTION DES EAUX DE L'AN 1 FOSSÉ 7- PLAN ET PROFIL
F13/15	PLAN DE GESTION DES EAUX DE L'AN 1 BASSINS DE DIFFUSION DU FOSSÉ 1 BASSIN DE DISSIPATION D'ÉNERGIE DES FOSSÉS1A ET 2 DÉTAILS TYPIQUES



wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :

À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :

CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING). WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02

DATE : 2018-04-05

ÉCHELLE ORIGINALE : 1 : 1000

SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.

25mm

CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.
David Collins-Fekete, ing, M.Sc.

DESSINÉ PAR : Étienne Bilodeau, dessinateur

VÉRIFIÉ PAR : François Groux, ing. Master génie de l'eau

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX DE L'AN 1
BASSIN D'ACCUMULATION
VUE EN PLAN

NUMÉRO DU FEUILLET :

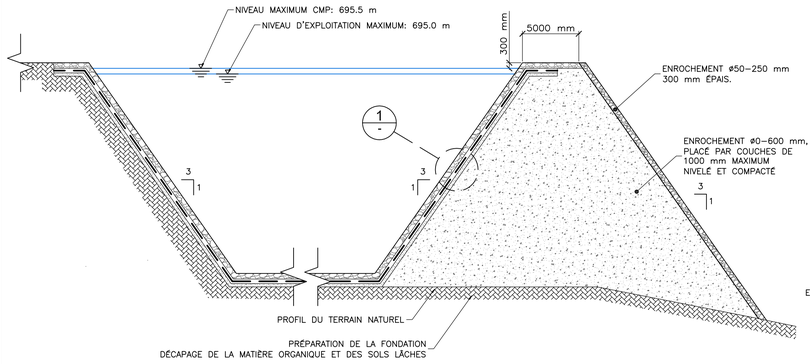
131-21244-02_F01

FEUILLET # : **01** DE **15**

ÉMISSION : **PLANS FINAUX**

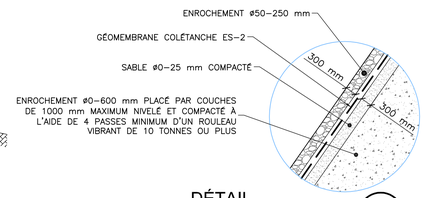
EN DATE DU : **2018-04-26**

RV. : **0**



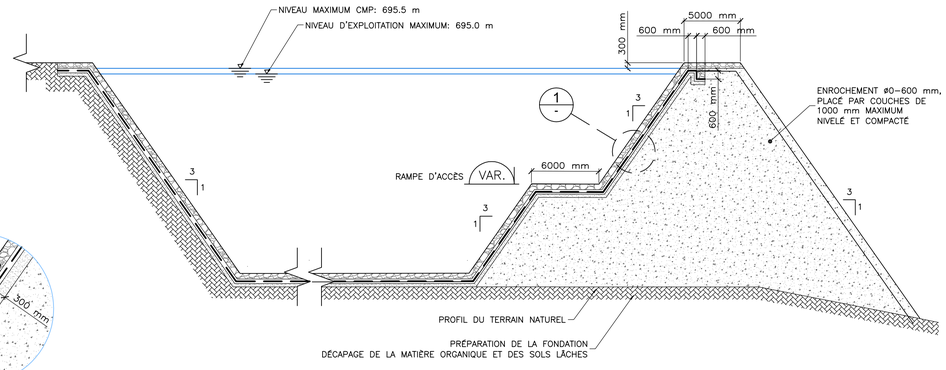
DÉTAIL DU BASSIN D'ACCUMULATION

Échelle: AUCUNE



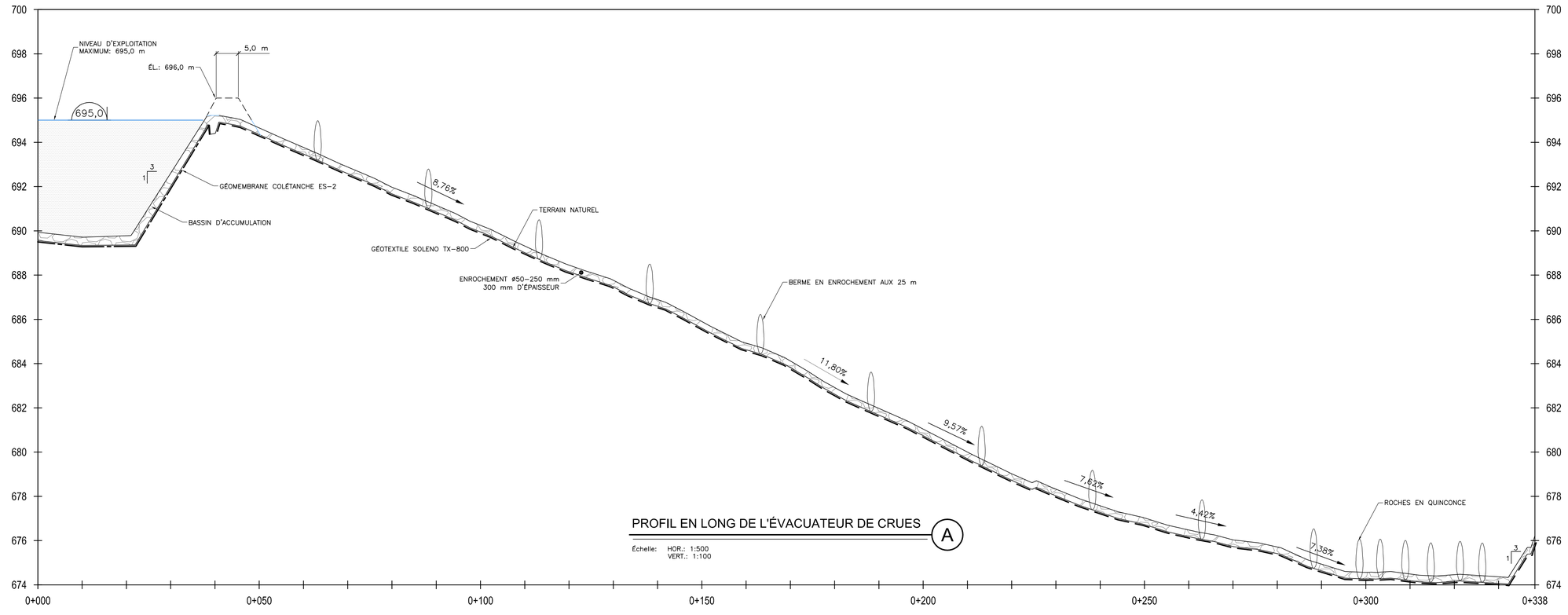
DÉTAIL 1

Échelle: 1:75



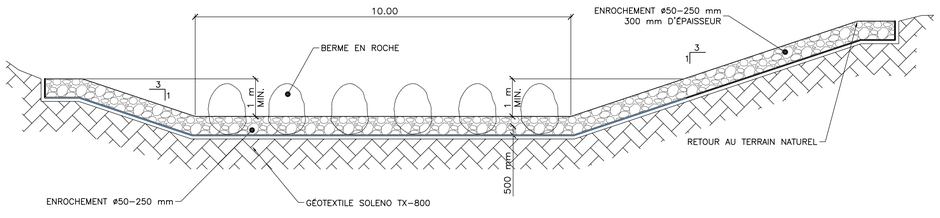
DÉTAIL DU BASSIN D'ACCUMULATION AVEC RAMPE D'ACCÈS

Échelle: AUCUNE



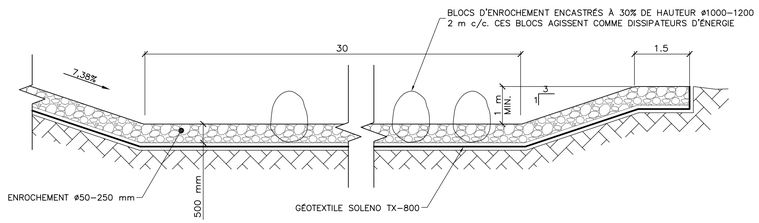
PROFIL EN LONG DE L'ÉVACUATEUR DE CRUES A

Échelle: HOR.: 1:500
VERT.: 1:100



COUPE TYPE DU CANAL DE FUITE B

Échelle: 1:75



PROFIL EN LONG (DÉTAIL) DU BASSIN DE DISSIPATION C

Échelle: 1:75

wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :
À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ). SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :
CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING), WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02
DATE : 2018-04-05
ÉCHELLE ORIGINALE : INDIQUÉE
SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.
25mm
CONÇU PAR : Pierre-Olivier Maltais, ing. M. Sc.
David Collins-Fekete, ing. M.Sc.
DESSINÉ PAR : Étienne Bilodeau, dessinateur
VÉRIFIÉ PAR : Pierre-Olivier Maltais, ing. M. Sc.
François Groux, ing. Master génie de l'eau

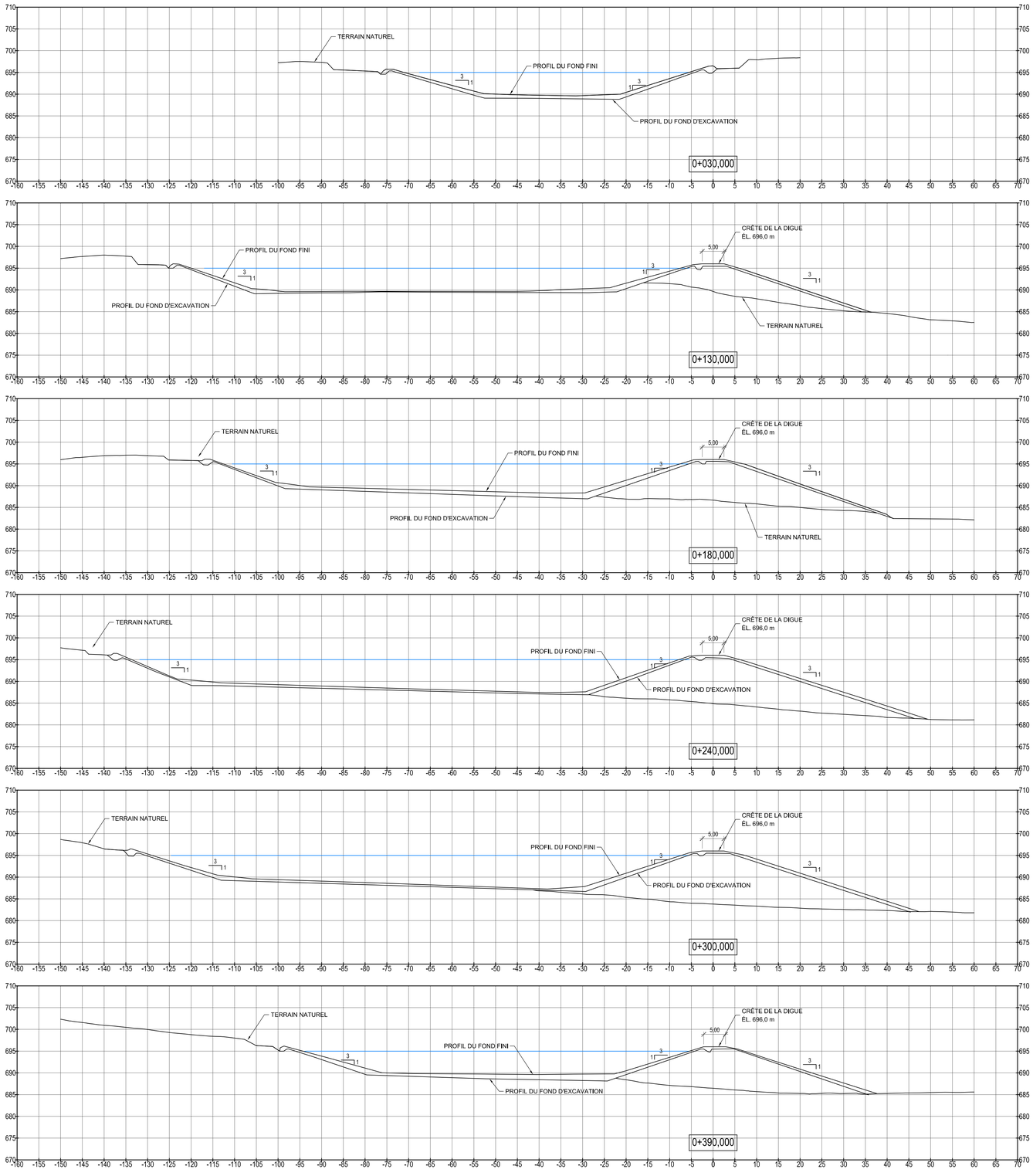
DISCIPLINE : ENVIRONNEMENT

TITRE :
PLAN DE GESTION DES EAUX DE L'AN 1
BASSIN D'ACCUMULATION
PROFILS EN LONG, COUPES ET DÉTAILS

NUMÉRO DU FEUILLET :
131-21244-02_F02

FEUILLET # : 02 DE 15

ÉMISSION : PLANS FINAUX
EN DATE DU : 2018-04-26
RV. : 0



5355, BOULEVARD DES GRADINS
QUÉBEC (QUÉBEC) CANADA G2J 1C8
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :
À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :

CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING). WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-00
DATE : 2017-02-21
ÉCHELLE ORIGINALE : 1 ; 500
CONÇU PAR : Pierre-Olivier Maltais, ing. M. Sc.
David Collins-Fekete, ing.jr M.sc
DESSINÉ PAR : Étienne Bilodeau, dessinateur
Gail Godmaire, tech
VÉRIFIÉ PAR : Pierre-Olivier Maltais, ing. M. Sc.
François Groux, ing. Master génie de l'eau

SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.
25mm

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

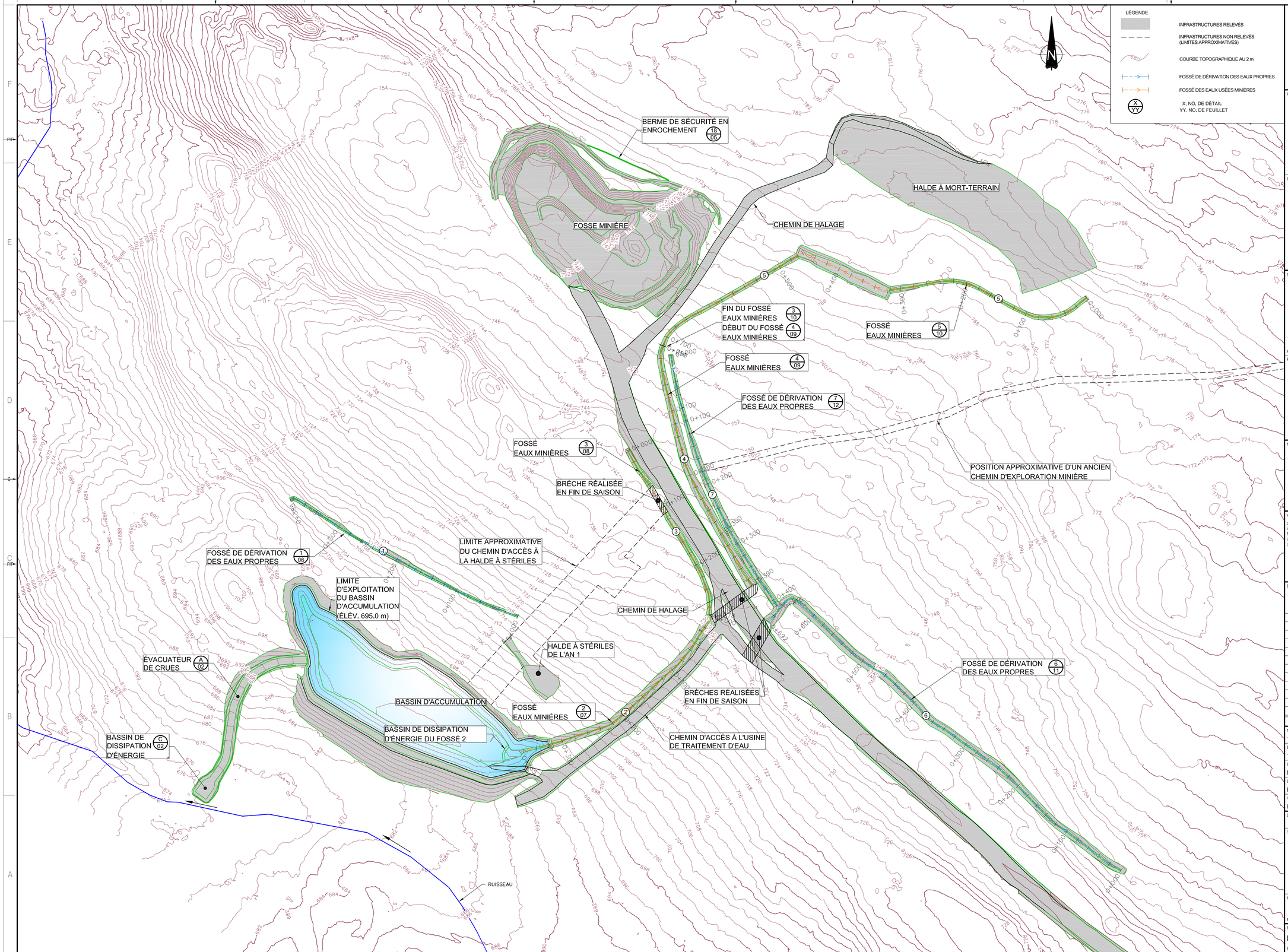
PLAN DE GESTION DES EAUX DE L'AN 1
BASSIN D'ACCUMULATION
COUPES TRANSVERSALES

NUMÉRO DU FEUILLET : **131-21244-00_F03**

FEUILLET # : 03 DE 15

ÉMISSION : **PLANS FINAUX**
EN DATE DU : 2018-04-26

RV. : **0**



wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :

À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :
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L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02
DATE : 2018-04-05
ÉCHELLE ORIGINALE : 1 : 2500
SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.
25mm
CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.
David Collins-Fekete, ing. M.Sc.
DESSINÉ PAR : Étienne Bilodeau, dessinateur
VÉRIFIÉ PAR : François Groux, ing. Master génie de l'eau

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX DE L'AN 1
VUE EN PLAN GÉNÉRALE

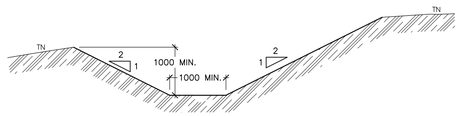
NUMÉRO DU FEUILLET : **131-21244-02_F04**

FEUILLET # : 07 DE 15

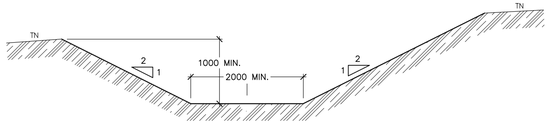
ÉMISSION : **PLANS FINAUX** EN DATE DU : 2018-04-26

RV. : **0**

NOTE:
1. DES BERMES EN ENROCHEMENT ONT ÉTÉ PLACÉES AUX 25 m DANS LES FOSSÉS SPÉCIFIÉS POUR AGIR EN TANT QUE DISSIPATEURS D'ÉNERGIE

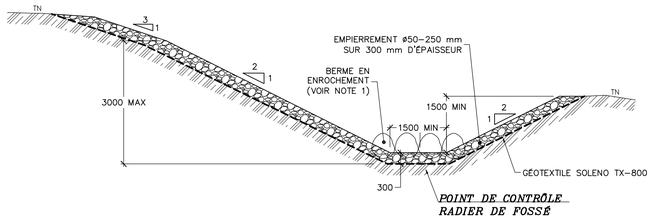


148_D01 **COUPE TYPIQUE** 11
FOSSÉ SANS PROTECTION - TYPE 1
Échelle: Aucune

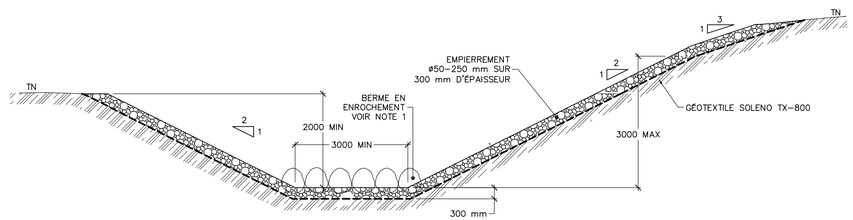


148_D02 **COUPE TYPIQUE** 12
FOSSÉ SANS PROTECTION - TYPE 2
Échelle: Aucune

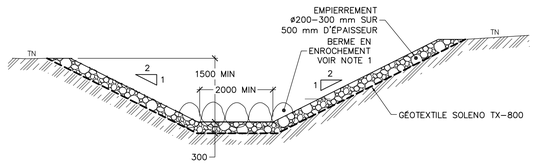
148_D03 **DÉTAIL TYPIQUE** 13
FOSSÉ EMPIERRÉ - TYPE 3
Échelle: Aucune



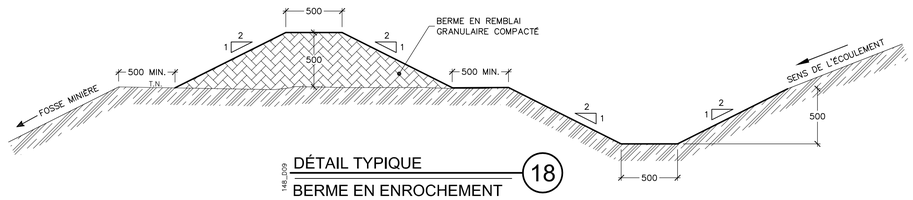
148_D04 **DÉTAIL TYPIQUE** 14
FOSSÉ EMPIERRÉ - TYPE 4
Échelle: Aucune



148_D05 **DÉTAIL TYPIQUE** 15
FOSSÉ EMPIERRÉ - TYPE 5
Échelle: Aucune



148_D06 **DÉTAIL TYPIQUE** 16
FOSSÉ EMPIERRÉ - TYPE 6
Échelle: Aucune



148_D09 **DÉTAIL TYPIQUE** 18
BERME EN ENROCHEMENT
Échelle: Aucune

wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :
TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :
À MOINS D'INDICATIONS CONTRAIRES LES UNITÉS DE MESURES SONT EN MILLIMÈTRES.

NOTE:

POUR FINS DE REPRÉSENTATION CLAIRES DES DIFFÉRENTES COUCHES DES GÉOSYNTHÉTIQUES, LA PROPORTION VERTICALE DE CERTAINS DÉTAILS A FORTEMENT ÉTÉ EXAGÉRÉE.

AVERTISSEMENT : DROIT D'AUTEUR :
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L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

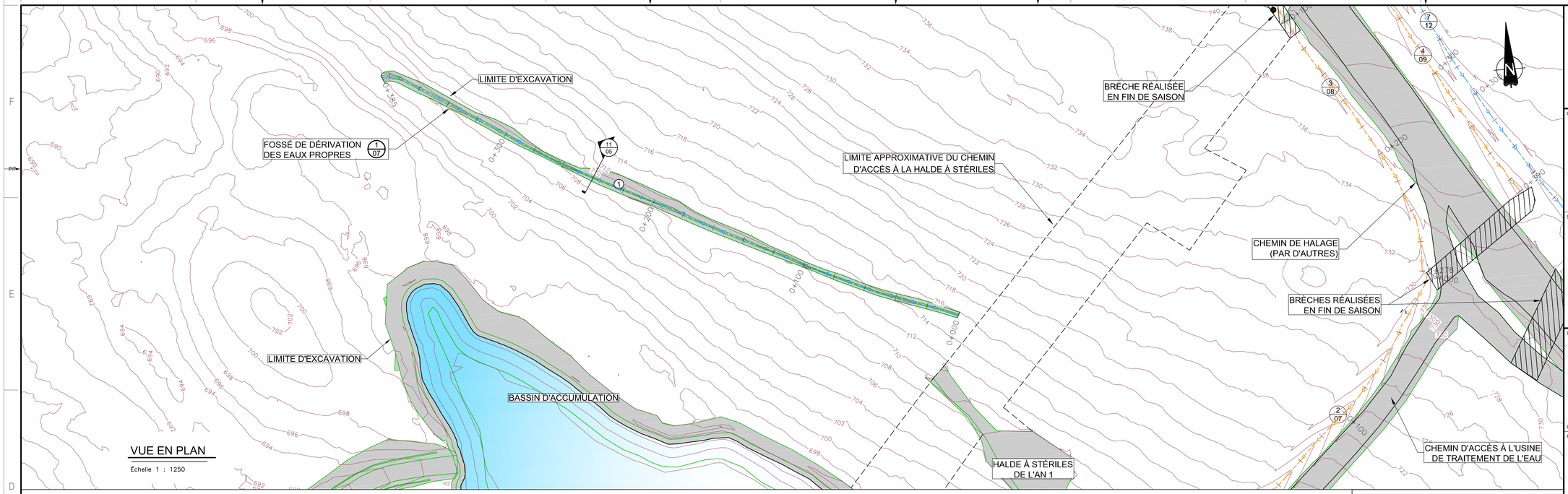
ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02
DATE : 2018-04-05
ÉCHELLE ORIGINALE : Indiquée
SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.
25mm
CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.
David Collins-Fekete, ing, M.Sc.
DESSINÉ PAR : Étienne Bilodeau, dessinateur
VÉRIFIÉ PAR : François Groux, ing. Master génie de l'eau
DISCIPLINE : **ENVIRONNEMENT**

TITRE :
PLAN DE GESTION DES EAUX DE L'AN 1
COUPES ET DÉTAILS

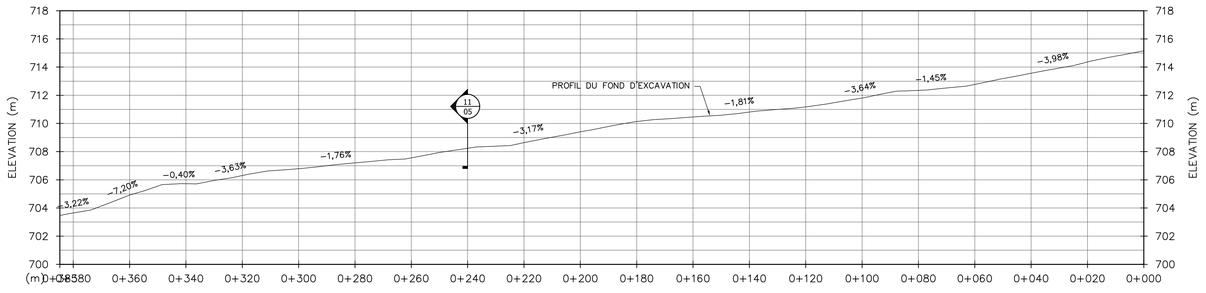
NUMÉRO DU FEUILLET :
131-21244-02_F05
FEUILLET # : 05 DE 15

ÉMISSION : **PLANS FINAUX**
EN DATE DU : 2018-04-26
RV. : **0**



VUE EN PLAN

Échelle 1 : 1250



PROFIL DU FOSSÉ DE DÉRIVATION DES EAUX PROPRES — 1

Échelle HOR.: 1:1000
VERT.: 1:200

LÉGENDE

- INFRASTRUCTURES RELEVÉS
- INFRASTRUCTURES NON RELEVÉS (LIMITES APPROXIMATIVES)
- COURBE TOPOGRAPHIQUE AU 2 m
- FOSSÉ DE DÉRIVATION DES EAUX PROPRES
- FOSSÉ DES EAUX USÉES MINIÈRES
- X, NO. DE DÉTAIL YY, NO. DE FEUILLET

NOTES :
À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX SECTEUR GOODWOOD

AVERTISSEMENT : DROIT D'AUTEUR :
CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING). WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02
DATE : 2018-04-05
ÉCHELLE ORIGINALE : Indiquée
SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.
25mm
CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.
David Collins-Fekete, ing, M.Sc.
DESSINÉ PAR : Étienne Bilodeau, dessinateur
VÉRIFIÉ PAR : François Groux, ing. Master génie de l'eau

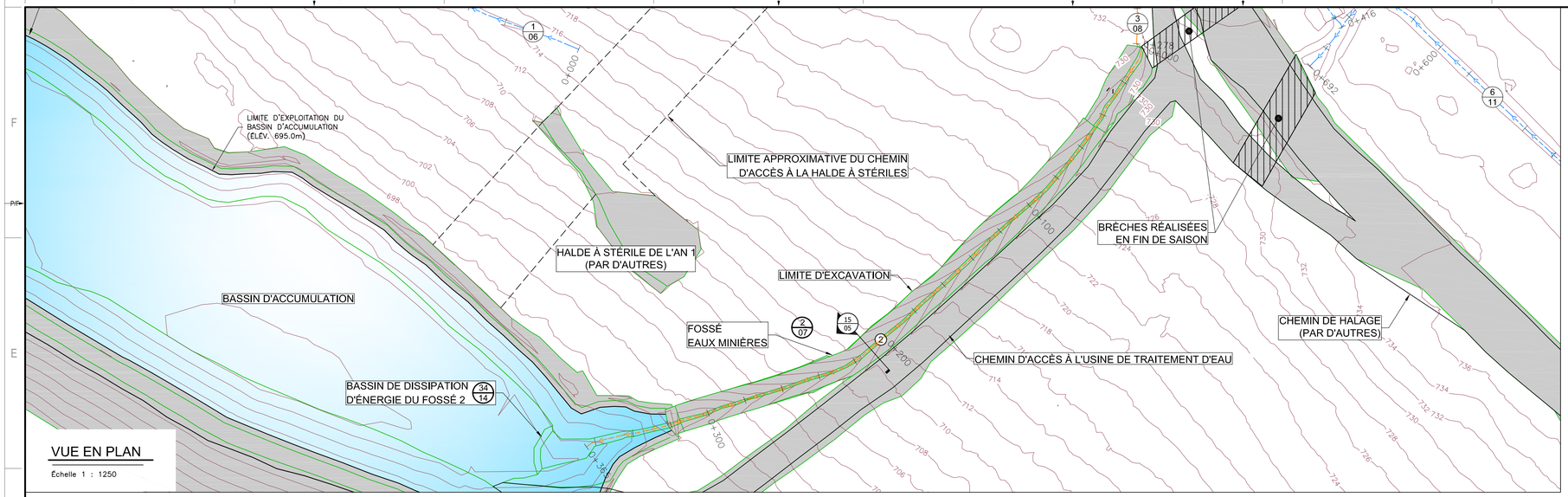
DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX DE L'AN 1
FOSSÉ 1
PLAN ET PROFIL

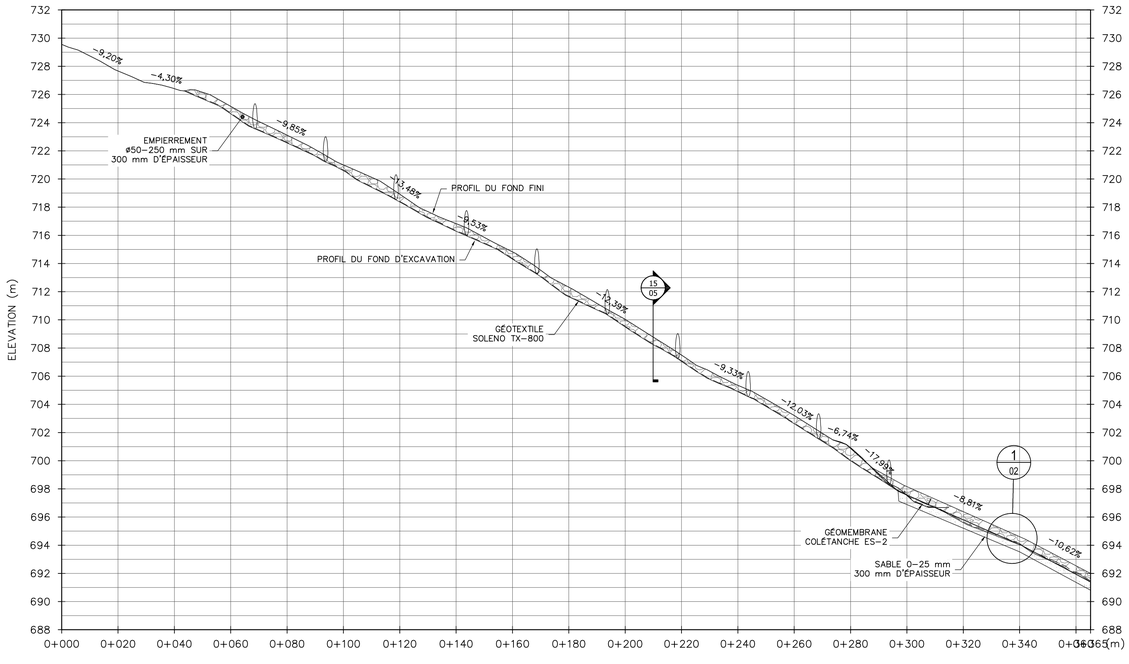
NUMÉRO DU FEUILLET : **131-21244-02_F06**
FEUILLET # : **06** DE **15**

ÉMISSION : **PLANS FINAUX**
EN DATE DU : **2018-04-26**
RV. : **0**



VUE EN PLAN

Échelle 1 : 1250



PROFIL DU FOSSÉ DES EAUX USÉES MINIÈRES 2

Échelle HOR.: 1:1000
VERT.: 1:200

LÉGENDE

- INFRASTRUCTURES RELEVÉS
- INFRASTRUCTURES NON RELEVÉS (LIMITES APPROXIMATIVES)
- COURBE TOPOGRAPHIQUE AU 2 m
- FOSSÉ DE DÉRIVATION DES EAUX PROPRES
- FOSSÉ DES EAUX USÉES MINIÈRES
- X, NO, DE DÉTAIL YY, NO. DE FEUILLET

wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :

À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :

CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP, AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING), WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02
DATE : 2018-04-05
ÉCHELLE ORIGINALE : Indiquée
SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE. 25mm
CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.
David Collins-Fekete, ing, M.Sc.
DESSINÉ PAR : Étienne Bilodeau, dessinateur
VÉRIFIÉ PAR : François Groux, ing. Master génie de l'eau

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX DE L'AN 1
FOSSÉ 2
PLAN ET PROFIL

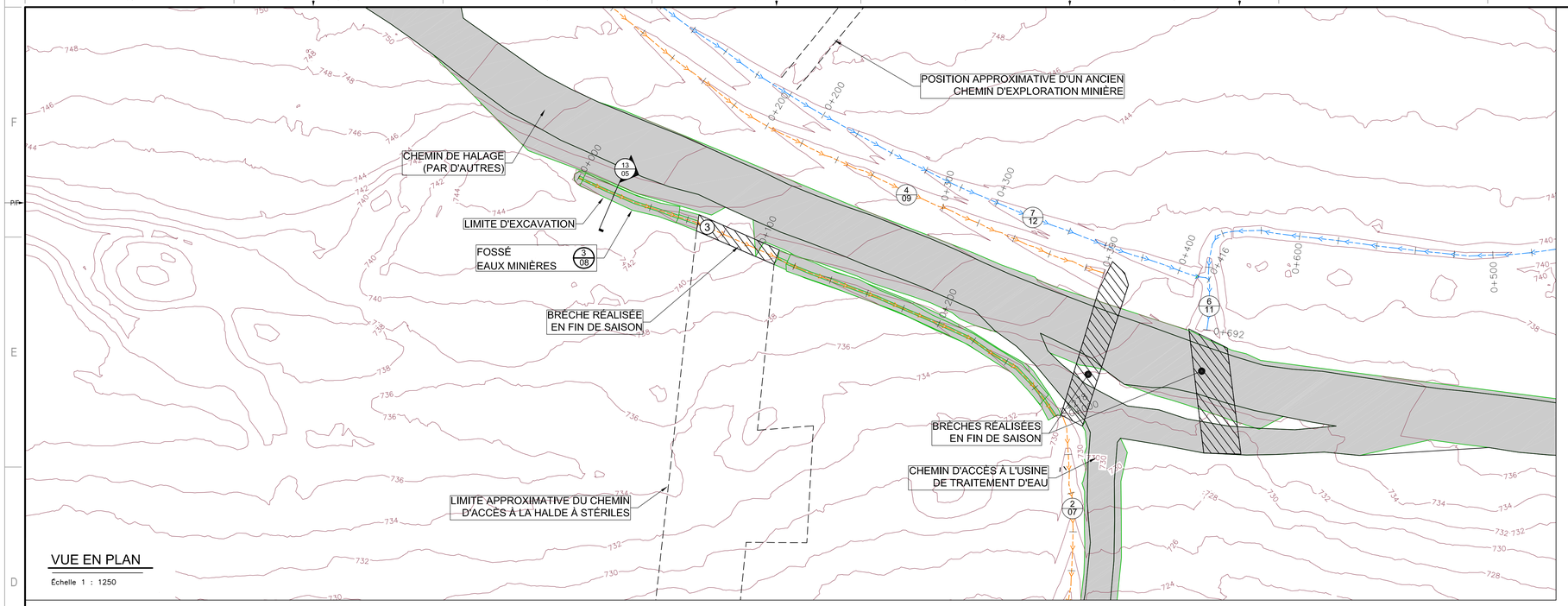
NUMÉRO DU FEUILLET :

131-21244-02_F07

FEUILLET # : 07 DE 15

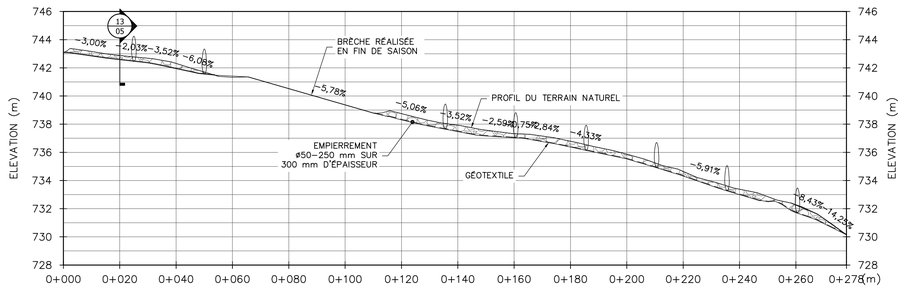
ÉMISSION : **PLANS FINAUX** EN DATE DU : **2018-04-26**

RV. : **0**



VUE EN PLAN

Échelle 1 : 1250



PROFIL DU FOSSÉ DES EAUX USÉES MINIÈRES

Échelle HOR.: 1:1000
VERT.: 1:200

3

LÉGENDE

- INFRASTRUCTURES RELEVÉS
- INFRASTRUCTURES NON RELEVÉS (LIMITES APPROXIMATIVES)
- COURBE TOPOGRAPHIQUE AU 2 m
- FOSSÉ DE DÉRIVATION DES EAUX PROPRES
- FOSSÉ DES EAUX USÉES MINIÈRES
- X, NO. DE DÉTAIL; YY, NO. DE FEUILLET

wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :

À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :

CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING). WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02
DATE : 2018-04-05
ÉCHELLE ORIGINALE : Indiquée
CONÇU PAR : Pierre-Olivier Maltais, ing. M. Sc.
David Collins-Fekete, ing. M.Sc.
DESSINÉ PAR : Étienne Bilodeau, dessinateur
VÉRIFIÉ PAR : François Groux, ing. Master génie de l'eau

SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.
25mm

DISCIPLINE : **ENVIRONNEMENT**

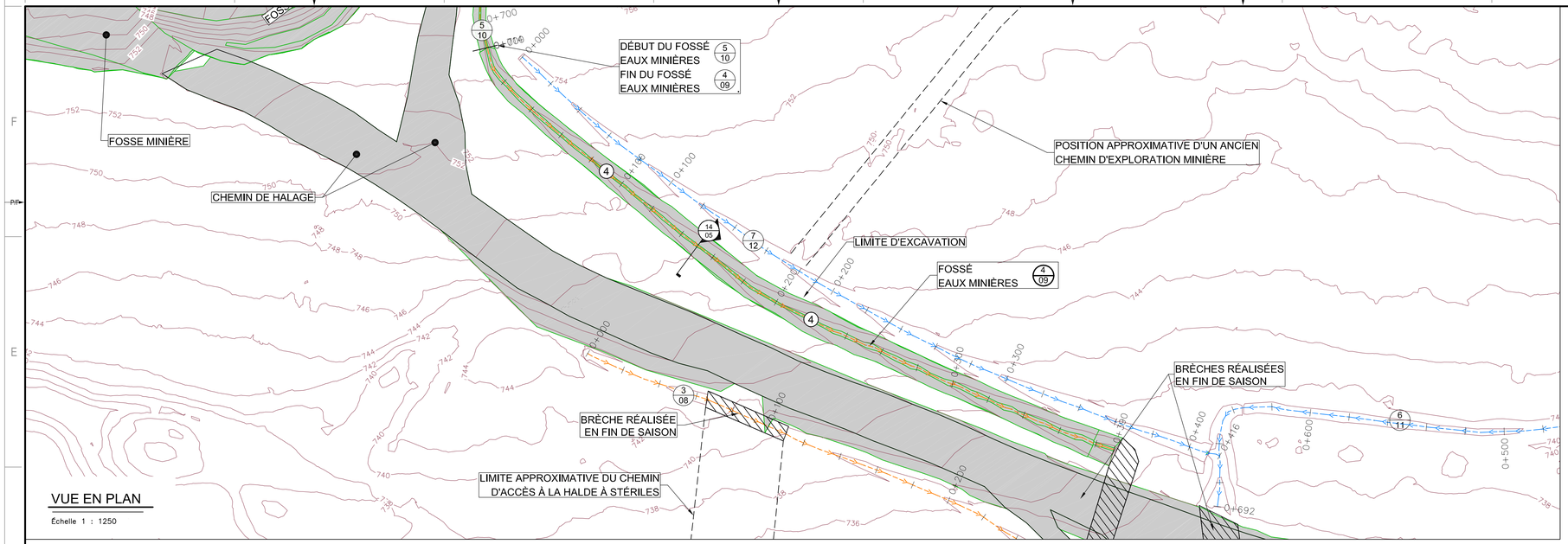
TITRE :

PLAN DE GESTION DES EAUX DE L'AN 1
FOSSÉ 3
PLAN ET PROFIL

NUMÉRO DU FEUILLET : **131-21244-02_F08**

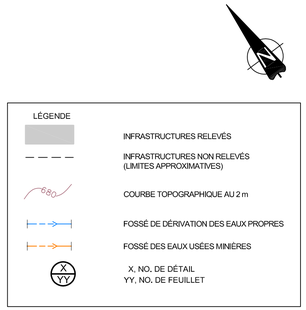
FEUILLET # : 08 DE 15

ÉMISSION : **PLANS FINAUX**
EN DATE DU : **2018-04-26**
RV. : **0**



VUE EN PLAN

Échelle 1 : 1250



PROFIL DU FOSSÉ DES EAUX USÉES MINIÈRES 4

Échelle HOR.: 1:1000
VERT.: 1:200

wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :
À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :
CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING). WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02
DATE : 2018-04-05
ÉCHELLE ORIGINALE : Indiquée
SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.
25mm
CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.
David Collins-Fekete, ing, M.Sc.
DESSINÉ PAR : Étienne Bilodeau, dessinateur
VÉRIFIÉ PAR : Charles Veilleux, ing.
François Groux, ing. Master génie de l'eau

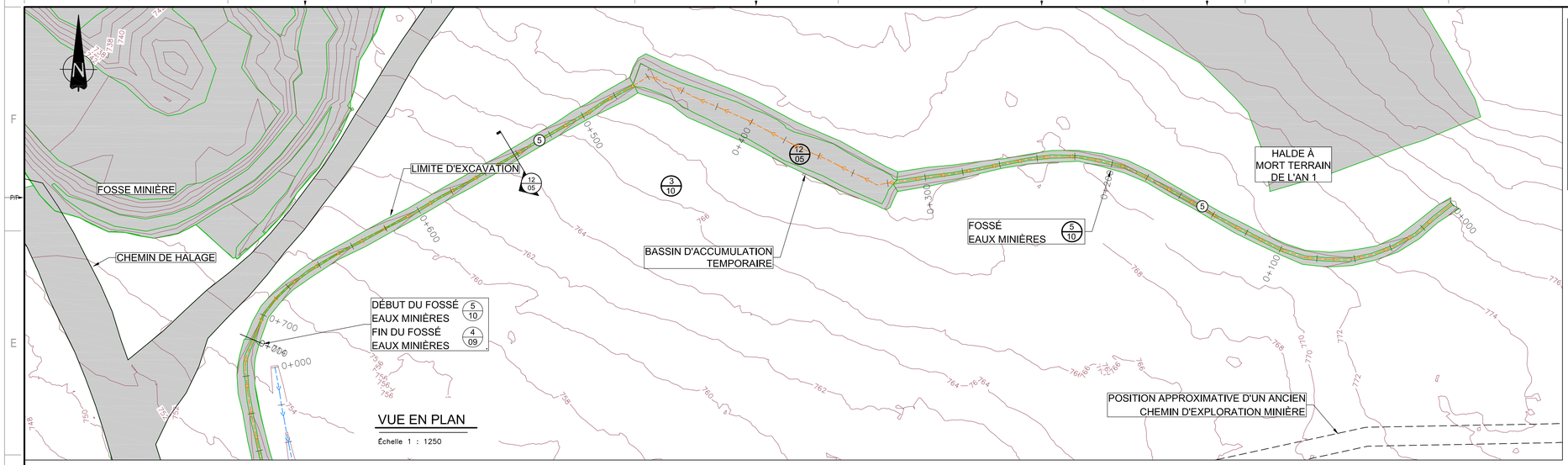
DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX DE L'AN 1
FOSSÉ 4
PLAN ET PROFIL

NUMÉRO DU FEUILLET :
131-21244-02_F09
FEUILLET # : 09 DE 15

ÉMISSION : **PLANS FINAUX** EN DATE DU : 2018-04-26
RV. : **0**

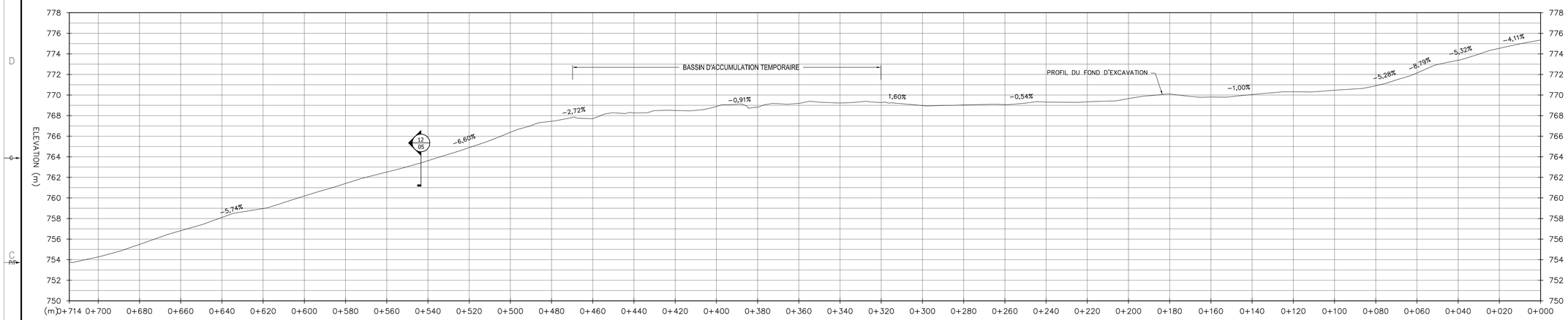


VUE EN PLAN

Échelle 1 : 1250

LÉGENDE

- INFRASTRUCTURES RELEVÉS
- INFRASTRUCTURES NON RELEVÉS (LIMITES APPROXIMATIVES)
- COURBE TOPOGRAPHIQUE AU 2 m
- FOSSÉ DE DÉRIVATION DES EAUX PROPRES
- FOSSÉ DES EAUX USÉES MINIÈRES
- X, NO. DE DÉTAIL YY, NO. DE FEUILLET



PROFILS DU FOSSÉ DES EAUX USÉES MINIÈRES 5

Échelle HOR.: 1:1000
VERT.: 1:200

wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX SECTEUR GOODWOOD

NOTES :

À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :

CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING). WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02

DATE : 2018-04-05

ÉCHELLE ORIGINALE : Indiquée

CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.
David Collins-Fekete, ing. M.Sc.

DESSINÉ PAR : Étienne Bilodeau, dessinateur

VÉRIFIÉ PAR : François Groux, ing. Master génie de l'eau

SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.

25mm

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

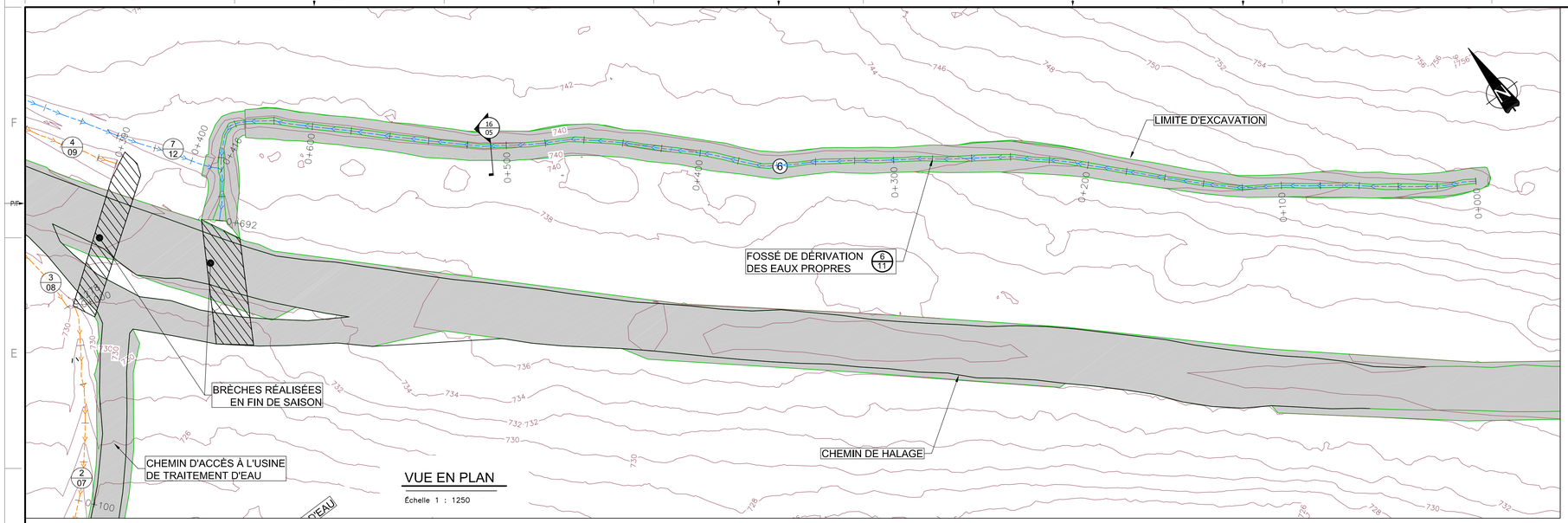
PLAN DE GESTION DES EAUX DE L'AN 1
FOSSÉ 5
PLAN ET PROFIL

NUMÉRO DU FEUILLET : **131-21244-02_F10**

FEUILLET # : **09** DE **15**

ÉMISSION : **PLANS FINAUX** EN DATE DU : **2018-04-26**

RV. : **0**



PROFIL DU FOSSÉ DE DÉRIVATION DES EAUX PROPRES 6

Échelle HOR.: 1:1000
VERT.: 1:200

wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :
À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :
CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING). WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

EM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02
DATE : 2018-04-05
ÉCHELLE ORIGINALE : Indiquée
CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.
David Collins-Fekete, ing. M.Sc.
DESSINÉ PAR : Étienne Bilodeau, dessinateur
VÉRIFIÉ PAR : François Groux, ing. Master génie de l'eau

SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.
25mm

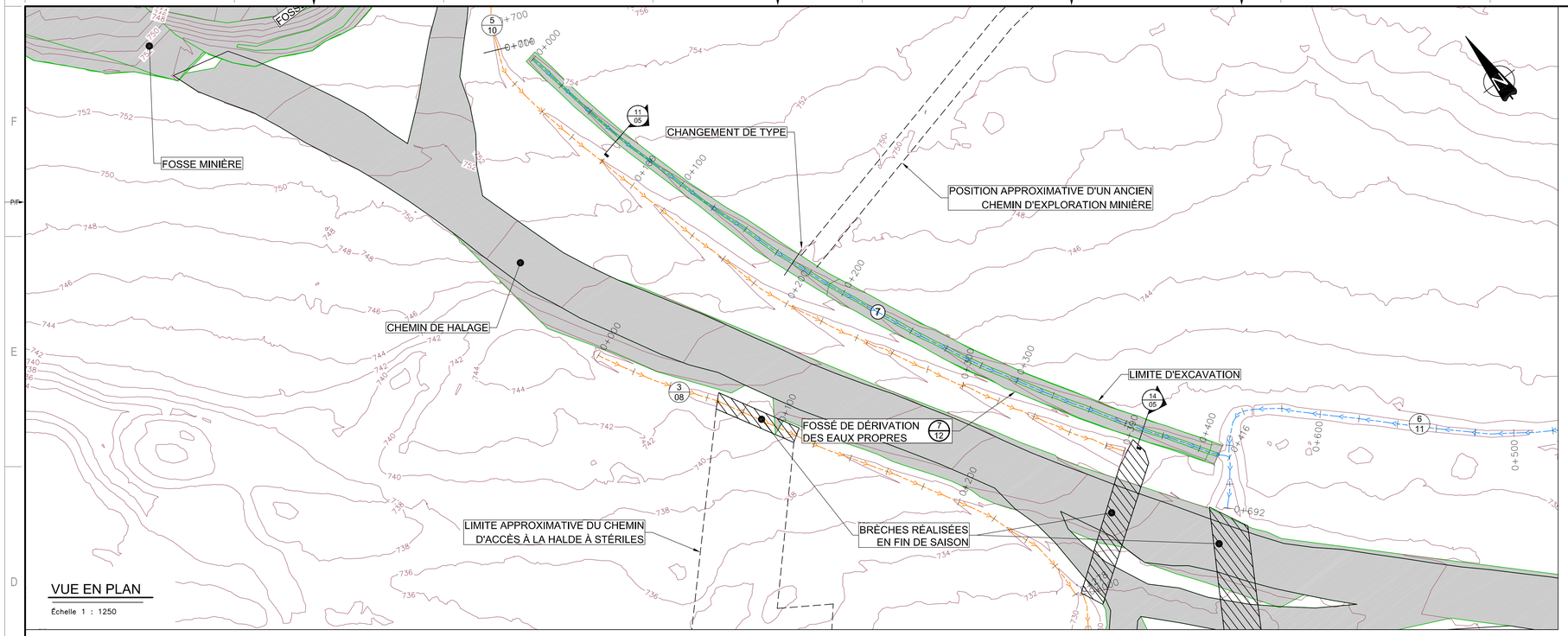
DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX DE L'AN 1
FOSSÉ 6
PLAN ET PROFIL

NUMÉRO DU FEUILLET :
131-21244-02_F11
FEUILLET # : 11 DE 15

ÉMISSION : **PLANS FINAUX**
EN DATE DU : **2018-04-26**
RV. **0**

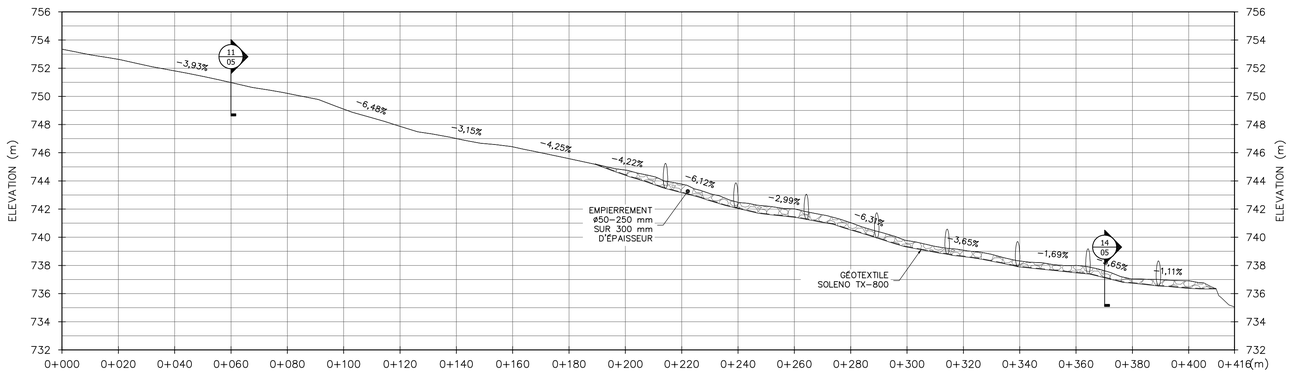


VUE EN PLAN

Échelle 1 : 1250

LÉGENDE

- INFRASTRUCTURES RELEVÉS
- INFRASTRUCTURES NON RELEVÉS (LIMITES APPROXIMATIVES)
- COURBE TOPOGRAPHIQUE AU 2 m
- FOSSÉ DE DÉRIVATION DES EAUX PROPRES
- FOSSÉ DES EAUX USÉES MINIÈRES
- X, NO. DE DÉTAIL YY, NO. DE FEUILLET



PROFIL DU FOSSÉ DE DÉRIVATION DES EAUX PROPRES 7

Échelle HOR.: 1:1000
VERT.: 1:200

wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :

À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :

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L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02
DATE : 2018-04-05
ÉCHELLE ORIGINALE : Indiquée
CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.
David Collins-Fekete, ing. M.Sc.
DESSINÉ PAR : Étienne Bilodeau, dessinateur
VÉRIFIÉ PAR : François Groux, ing. Master génie de l'eau

SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.
25mm

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

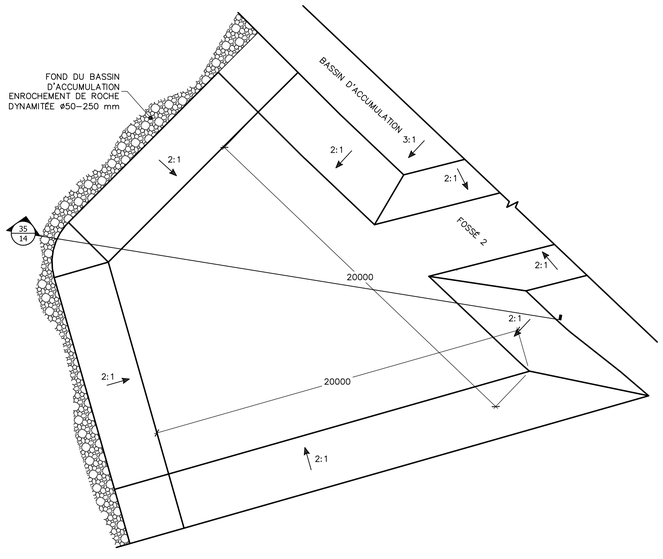
PLAN DE GESTION DES EAUX DE L'AN 1
FOSSÉ 7
PLAN ET PROFIL

NUMÉRO DU FEUILLET : **131-21244-02_F12**

FEUILLET # : 12 DE 15

ÉMISSION : **PLANS FINAUX** EN DATE DU : 2018-04-26

RV. : 0

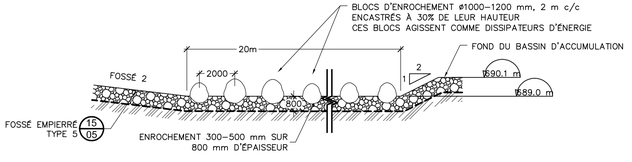


148_015

VUE EN PLAN 34

BASSIN DE DISSIPATION D'ÉNERGIE DES FOSSÉS 1A ET 2

Échelle: Aucune



148_015

COUPE TYPIQUE 35

BASSIN DE DISSIPATION D'ÉNERGIE DES FOSSÉS 1A ET 2

Échelle: Aucune

wsp

1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :

À MOINS D'INDICATIONS CONTRAIRES LES UNITÉS DE MESURES SONT EN MILLIMÈTRES.

NOTE:

POUR FINS DE REPRÉSENTATION CLAIRES DES DIFFÉRENTES COUCHES DES GÉOSYNTHÉTIQUES, LA PROPORTION VERTICALE DE CERTAINS DÉTAILS A FORTEMENT ÉTÉ EXAGÉRÉE.

AVERTISSEMENT : DROIT D'AUTEUR :

CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING), WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

ÉMISSION - RÉVISION :

EM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02

DATE : 2018-04-05

ÉCHELLE ORIGINALE : Indiquée

SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.

25mm

CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.
David Collins-Fekete, ing, M.Sc.

DESSINÉ PAR : Étienne Bilodeau, dessinateur

VÉRIFIÉ PAR : Charles Veilleux, ing.
François Groux, ing. Master génie de l'eau

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX DE L'AN 1
BASSIN DE DIFFUSION DU FOSSÉ 1
BASSIN DE DISSIPATION D'ÉNERGIE DES FOSSÉS 1A ET 2
DÉTAILS TYPIQUES

NUMÉRO DU FEUILLET : **131-21244-02_F13**

FEUILLET # : **14** DE **15**

ÉMISSION : **PLANS FINAUX** EN DATE DU : **2018-04-26**

RV. : **0**

LISTE DE POINTS

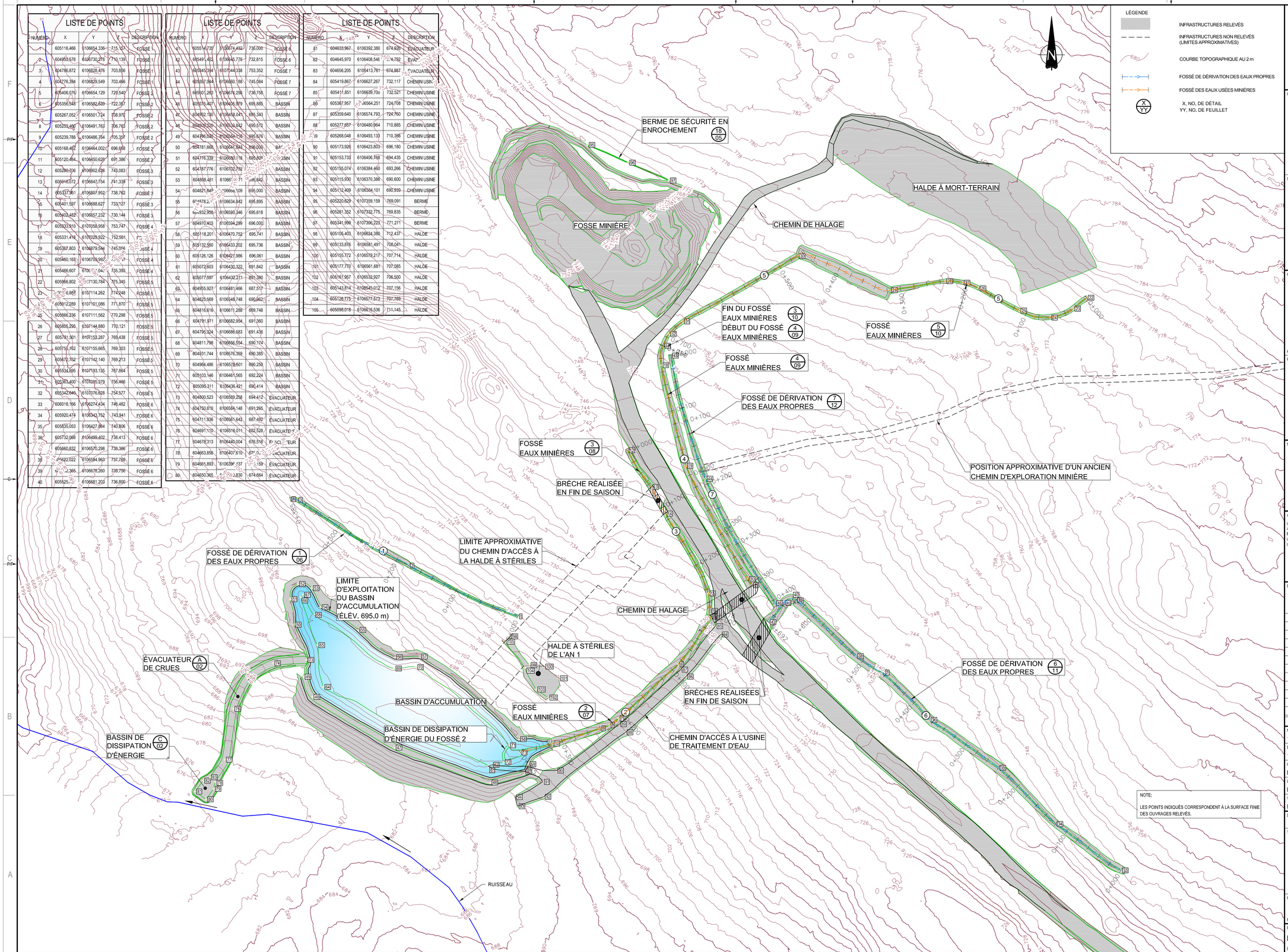
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3	604786.872	6106828.476	703.856	FOSSE 1
4	604776.394	6106829.549	703.466	FOSSE 1
5	605406.076	6106654.129	729.540	FOSSE 2
6	605356.548	6106592.639	722.357	FOSSE 2
7	605267.052	6106501.724	708.970	FOSSE 2
8	605293.493	6106491.763	706.763	FOSSE 2
9	605239.788	6106486.764	705.357	FOSSE 2
10	605168.462	6106464.002	696.668	FOSSE 2
11	605120.494	6106450.629	691.386	FOSSE 2
12	605280.036	6106902.628	743.083	FOSSE 3
13	605048.072	6106847.754	741.339	FOSSE 3
14	605137.951	6106807.952	738.762	FOSSE 3
15	605401.597	6106688.627	733.127	FOSSE 3
16	605402.482	6106657.232	730.144	FOSSE 3
17	605933.910	6107058.958	753.747	FOSSE 4
18	605331.418	6107029.922	752.561	FOSSE 4
19	605367.803	6106879.544	745.056	FOSSE 4
20	605460.163	6106709.997	[illegible]	FOSSE 4
21	605466.607	6106[illegible].043	735.393	FOSSE 4
22	605966.802	[illegible]7130.784	775.345	FOSSE 5
23	[illegible].6.807	6107114.262	774.248	FOSSE 5
24	605912.289	6107101.086	771.870	FOSSE 5
25	605866.236	6107111.562	770.298	FOSSE 5
26	605806.295	6107144.880	770.121	FOSSE 5
27	605781.501	6107153.287	769.438	FOSSE 5
28	605755.162	6107155.665	769.303	FOSSE 5
29	605672.752	6107142.140	769.213	FOSSE 5
30	605534.895	6107193.135	767.864	FOSSE 5
31	605363.400	6107095.879	756.466	FOSSE 5
32	605342.846	6107076.828	754.577	FOSSE 5
33	606018.166	6106274.434	748.482	FOSSE 6
34	605920.474	6106343.752	743.941	FOSSE 6
35	605835.053	6106427.864	740.806	FOSSE 6
36	605732.068	6106499.402	738.413	FOSSE 6
37	605660.832	6106570.298	738.386	FOSSE 6
38	605622.022	6106594.963	737.788	FOSSE 6
39	6[illegible]2.365	6106678.260	738.756	FOSSE 6
40	605525.[illegible]	6106681.203	736.800	FOSSE 6

LISTE DE POINTS

NUMERO	X	Y	Z	DESCRIPTION
41	605514.735	6106674.482	736.000	FOSSE 6
42	605491.422	6106645.776	732.815	FOSSE 6
43	605345.394	6107044.338	753.352	FOSSE 7
44	605337.044	6106800.188	745.684	FOSSE 7
45	605501.283	6106674.238	736.758	FOSSE 7
46	605076.407	6106406.979	695.885	BASSIN
47	604962.180	6106458.041	695.343	BASSIN
48	604905.226	6106534.642	695.572	BASSIN
49	604796.032	6106569.116	695.876	BASSIN
50	604781.668	6106641.842	696.000	BA[illegible]
51	604776.339	6106800.118	695.809	BASSIN
52	604787.776	6106702.752	[illegible]	BASSIN
53	604808.481	6106[illegible].71	[illegible].642	BASSIN
54	604821.849	[illegible]6.109	695.000	BASSIN
55	604878.2[illegible]	6106634.942	695.895	BASSIN
56	[illegible]932.958	6106593.946	695.618	BASSIN
57	604970.403	6106594.299	696.000	BASSIN
58	605118.201	6106470.752	695.741	BASSIN
59	605132.560	6106433.202	695.736	BASSIN
60	605126.126	6106421.986	696.061	BASSIN
61	605072.603	6106430.322	691.842	BASSIN
62	605077.597	6106432.271	691.380	BASSIN
63	604955.927	6106481.466	687.517	BASSIN
64	604825.569	6106548.748	690.662	BASSIN
65	604816.616	6106611.288	689.748	BASSIN
66	604791.971	6106682.954	691.360	BASSIN
67	604790.324	6106686.583	691.436	BASSIN
68	604811.798	6106666.554	690.174	BASSIN
69	604931.744	6106576.358	690.385	BASSIN
70	604964.486	6106578.501	690.250	BASSIN
71	605103.146	6106461.565	692.224	BASSIN
72	605095.311	6106436.421	690.414	BASSIN
73	604800.523	6106569.258	694.412	EVACUATEUR
74	604750.810	6106584.148	691.265	EVACUATEUR
75	604711.936	6106561.642	687.492	EVACUATEUR
76	604691.110	6106516.011	682.528	EVACUATEUR
77	604678.313	6106440.004	676.516	EVACUATEUR
78	604663.858	6106407.610	671.0[illegible]	EVACUATEUR
79	604661.893	6106394.137	[illegible].159	EVACUATEUR
80	604650.365	[illegible]6.830	674.664	EVACUATEUR

LISTE DE POINTS

NUMERO	X	Y	Z	DESCRIPTION
81	604633.967	6106392.380	674.926	EVACUATEUR
82	604645.970	6106408.546	[illegible].792	EVAC[illegible]
83	604656.205	6106413.761	674.987	EVACUATEUR
84	605419.867	6106627.267	732.117	CHEMIN USIN[illegible]
85	605411.851	6106635.70[illegible]	732.521	CHEMIN USINE
86	605367.957	J6564.251	724.708	CHEMIN USINE
87	605359.640	6106574.793	724.760	CHEMIN USINE
88	605277.857	6106480.964	710.885	CHEMIN USINE
89	605268.048	6106493.133	710.766	CHEMIN USINE
90	605173.926	6106423.803	696.180	CHEMIN USINE
91	605153.733	6106406.768	694.435	CHEMIN USINE
92	605155.074	6106384.460	693.266	CHEMIN USINE
93	605115.930	6106370.386	690.600	CHEMIN USINE
94	605112.409	6106384.101	690.939	CHEMIN USINE
95	605220.829	6107359.159	769.091	BERME
96	605261.352	6107332.775	769.835	BERME
97	605341.999	6107306.223	771.271	BERME
98	605106.403	6106624.380	712.437	HALDE
99	605133.876	6106581.491	708.041	HALDE
100	605155.772	6106579.217	707.714	HALDE
101	605177.770	6106561.681	707.085	HALDE
102	605161.957	6106532.927	706.500	HALDE
103	605143.814	6106545.012	707.156	HALDE
104	605126.775	6106577.573	707.769	HALDE
105	605098.018	6106616.536	731.145	HALDE



NOTE:

LES POINTS INDIQUÉS CORRESPONDENT À LA SURFACE FINIE DES OUVRAGES RELEVÉS.

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QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 418 623-2254 | TÉLÉC. : 418 624-1857 | WWW.WSPGROUP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX SECTEUR GOODWOOD

NOTES :

À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT :

DROIT D'AUTEUR :

CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. LES RELEVÉS D'ARPENTAGE ONT ÉTÉ RÉALISÉS PAR L'ENTREPRENEUR (GREY ROCK MINING). WSP NE PEUT GARANTIR LA VALIDITÉ OU LA PRÉCISION DES RELEVÉS.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE

EMISSION - RÉVISION :

EM.	RV.	DATE	DESCRIPTION
B		2018-04-26	PLANS FINAUX
A		2017-05-10	POUR CONSTRUCTION

NO PROJET : 131-21244-02	DATE : 2018-04-05
ÉCHELLE ORIGINALE : 1 : 2500	SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.
CONÇU PAR : Pierre-Olivier Maltais, ing, M. Sc.	
David Collins-Fekete, ing. M.Sc.	
DESSINÉ PAR : Étienne Bilodeau, dessinateur	
VÉRIFIÉ PAR : François Groux, ing. Master génie de l'eau	25mm

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX DE L'AN 1
VUE EN PLAN GÉNÉRALE
POINTS DE CONTRÔLE

NUMÉRO DU FEUILLET :

131-21244-02_F14

FEUILLET # : 07 DE 15

EMISSION : **PLANS FINAUX** EN DATE DU : 2018-04-26

RV. : **0**

APPENDIX B

GOODWOOD WATER MANAGEMENT – END OF EXPLOITATION

Gestion des eaux
Secteur Goowood

Plan de gestion des eaux en fin de période d'exploitation
Pour construction

Date: 2018-07-11
131-21244-02

Préparé par:

1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 1-418-623-2254 | WWW.WSP.COM

LISTE DES PLANS

No. PLAN	TITRE
–	PAGE TITRE
F01/06	PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION VUE EN PLAN
F02/06	PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION DÉTAILS
F03/06	PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION FOSSÉ F1, PROFIL EN LONG ET SECTIONS TRANSVERSALES
F04/06	PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION FOSSÉ F2, PROFIL EN LONG ET SECTIONS TRANSVERSALES
F05/06	PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION FOSSÉ F3, PROFIL EN LONG ET SECTIONS TRANSVERSALES
F06/06	PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION NOTES

Gestion des eaux, Secteur Goowood, Pour construction, Dossier : 131-21244-02

FOSSE MINIÈRE EN FIN DE PÉRIODE D'EXPLOITATION (PAR D'AUTRES)

HALDE À MORT TERRAIN EN FIN DE PÉRIODE D'EXPLOITATION (PAR D'AUTRES)

HALDE À STÉRILES EN FIN DE PÉRIODE D'EXPLOITATION (PAR D'AUTRES)

FOSSÉ EAUX MINIÈRES F3 05

FOSSÉ EAUX MINIÈRES F1 03

DÉTAILS À VENIR
NE PAS UTILISER À DES FINS DE CONSTRUCTION

LIMITE D'EXPLOITATION DU BASSIN D'ACCUMULATION ÉL.: 695.0m

ÉVACUATEUR DE CRUES (CONSTRUIT À L'AN 1)

BASSIN D'ACCUMULATION D'EAUX MINIÈRES (CONSTRUIT À L'AN 1)

CRÊTE DE LA DIGUE ÉL.: 696.0m

BASSIN DE DISSIPATION (CONSTRUIT À L'AN 1)

DIGUE DU BASSIN D'ACCUMULATION (CONSTRUITE À L'AN 1) (2017)

EFFLUENT FINAL (LOCALISATION APPROXIMATIVE)

USINE DE TRAITEMENT DES EAUX (EN CONCEPTION PAR D'AUTRES)

RUISSEAU

ANCIEN FOSSÉ DE DÉRIVATION DES EAUX PROPRES (CONSTRUIT À L'AN 1) (2017)

FOSSÉ EXISTANT D'EAU USÉES MINIÈRES (CONSTRUIT À L'AN 1)

FOSSÉ EAUX USÉES MINIÈRES F2 04

PONCEAUX EXISTANTS

FOSSÉ DE DÉRIVATION DES EAUX PROPRES (CONSTRUIT À L'AN 1)

CHEMIN D'ACCÈS À L'USINE DE TRAITEMENT D'EAU (CONSTRUIT À L'AN 1)

FOSSÉ D'EAU MINIÈRES (CONSTRUIT À L'AN 1)

CHEMIN DE CONTOURNEMENT TEMPORAIRE (2017)

CHEMIN DE HALAGE (CONSTRUIT À L'AN 1)

RÉFÉRENCE:
LES COURBES DE NIVEAUX REPRÉSENTÉES SONT COMPOSÉES DE DONNÉES LIDAR 2013 ET DE RELEVÉS EFFECTUÉS PAR GREY ROCK MINING EN DÉCEMBRE 2017.

LÉGENDE

- COURBE TOPOGRAPHIQUE AU 2m
- FOSSÉ DE DÉRIVATION DES EAUX PROPRES
- FOSSÉ DES EAUX USÉES MINIÈRES
- FOSSÉ DES EAUX USÉES MINIÈRES EN FIN DE PÉRIODE D'EXPLOITATION
- PONCEAU
- CHEMIN DE HALAGE ET CHEMIN D'ACCÈS
- EMPREINTE DES INFRASTRUCTURES MINIÈRES EN FIN DE PÉRIODE D'EXPLOITATION
- X, NO. DE DÉTAIL
  YY, NO. DE FEUILLET
- EMPREINTE DES INFRASTRUCTURES MINIÈRES DE L'AN 1

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1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 1-418-623-2254 | WWW.WSP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

David Collins Fekete, 2018-07-12

François Groux, 2018-07-12

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX SECTEUR GOODWOOD

NOTES :
À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

L'ORDRE DES PLANS N'EST PAS LIÉ À LA SÉQUENCE DE CONSTRUCTION

AVERTISSEMENT : DROIT D'AUTEUR :
CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. L'ENTREPRENEUR DEVRA VÉRIFIER TOUTES LES DIMENSIONS AUX PLANS ET FAIRE LOCALISER TOUS LES SERVICES D'UTILITÉS PUBLIQUES ET RAPPORTER TOUTES ERREURS OU OMISSIONS AVANT DE COMMENCER LES TRAVAUX.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE.

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
2	1	2018-07-11	POUR CONSTRUCTION
1		2017-06-02	POUR CONSTRUCTION

NO PROJET : 131-21244-00
DATE : 2018-04-16
ÉCHELLE ORIGINALE : 1 : 2500
SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE. 25mm
CONÇU PAR : David Collins-Fekete, ing, M.sc
DESSINÉ PAR : Étienne Bilodeau, dessinateur
Gail Godmaire, tech / Anne Voyer, tech
VÉRIFIÉ PAR : François Groux, ing Master génie de l'eau

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION VUE EN PLAN GÉNÉRALE

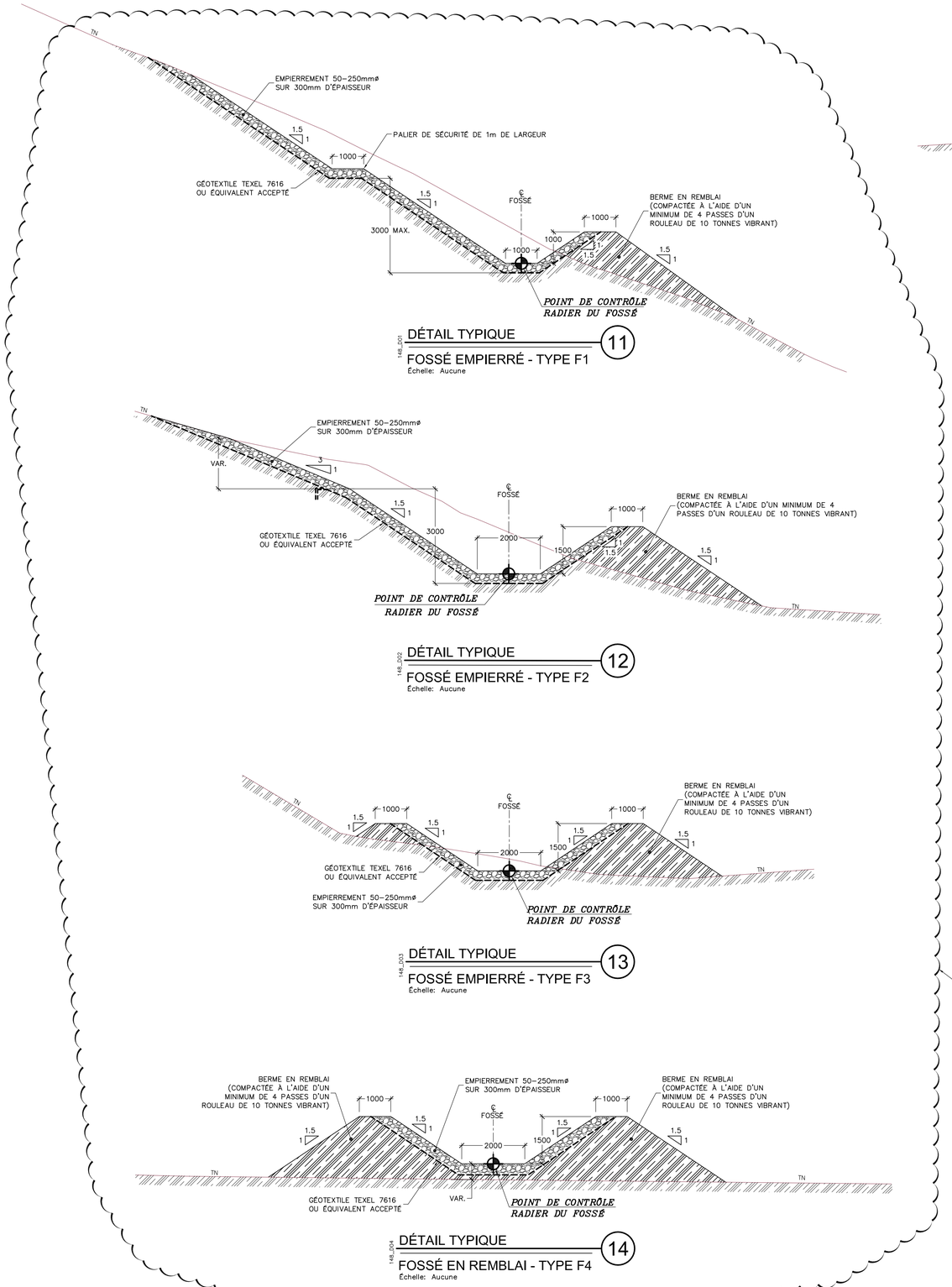
NUMÉRO DU FEUILLET : **131-21244-00_F01**

FEUILLET # : 01 DE 06

ÉMISSION : **POUR CONSTRUCTION** EN DATE DU : 2018-07-11

RV. : 2

Arch D-BLG, V:\2013\131-21244-00_Tata-Steel_Gestion-eau_Projet-2A\Projet-2017\F_Gestion-des-eaux_Situation-finale\Master\131-21244-00_F01.dwg, 2018-07-12 09:42:16



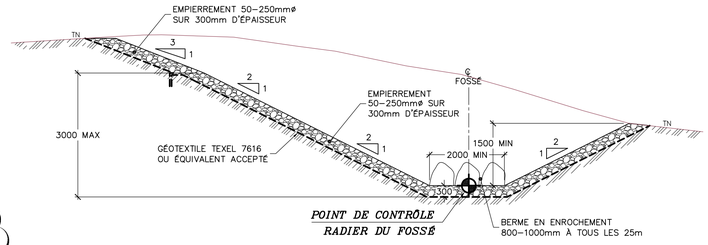
148_001 DÉTAIL TYPIQUE 11
FOSSÉ EMPIERRÉ - TYPE F1
Échelle: Aucune

148_002 DÉTAIL TYPIQUE 12
FOSSÉ EMPIERRÉ - TYPE F2
Échelle: Aucune

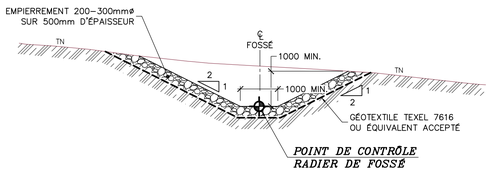
148_003 DÉTAIL TYPIQUE 13
FOSSÉ EMPIERRÉ - TYPE F3
Échelle: Aucune

148_004 DÉTAIL TYPIQUE 14
FOSSÉ EN REMBLAI - TYPE F4
Échelle: Aucune

DÉTAILS À VENIR
NE PAS UTILISER À DES
FINS DE CONSTRUCTION



148_005 DÉTAIL TYPIQUE 15
FOSSÉ EMPIERRÉ - TYPE F5
Échelle: Aucune



148_006 DÉTAIL TYPIQUE 16
FOSSÉ EMPIERRÉ - TYPE F6
Échelle: Aucune

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QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 1-418-623-2254 | WWW.WSP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

2018-07-12

2018-07-12

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :
À MOINS D'INDICATIONS CONTRAIRES LES UNITÉS DE MESURES SONT EN MILLIMÈTRES.

NOTE:
POUR FINS DE REPRÉSENTATION CLAIRES DES DIFFÉRENTES COUCHES DES GÉOSYNTHÉTIQUES, LA PROPORTION VERTICALE DE CERTAINS DÉTAILS A FORTEMENT ÉTÉ EXAGÉRÉE.

AVERTISSEMENT : DROIT D'AUTEUR :

CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. L'ENTREPRENEUR DEVRA VÉRIFIER TOUTES LES DIMENSIONS AUX PLANS ET FAIRE LOCALISER TOUS LES SERVICES D'UTILITÉS PUBLIQUES ET RAPPORTER TOUTES ERREURS OU OMISSIONS AVANT DE COMMENCER LES TRAVAUX.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE.

ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
2	1	2018-07-11	POUR CONSTRUCTION
1		2017-06-02	POUR CONSTRUCTION

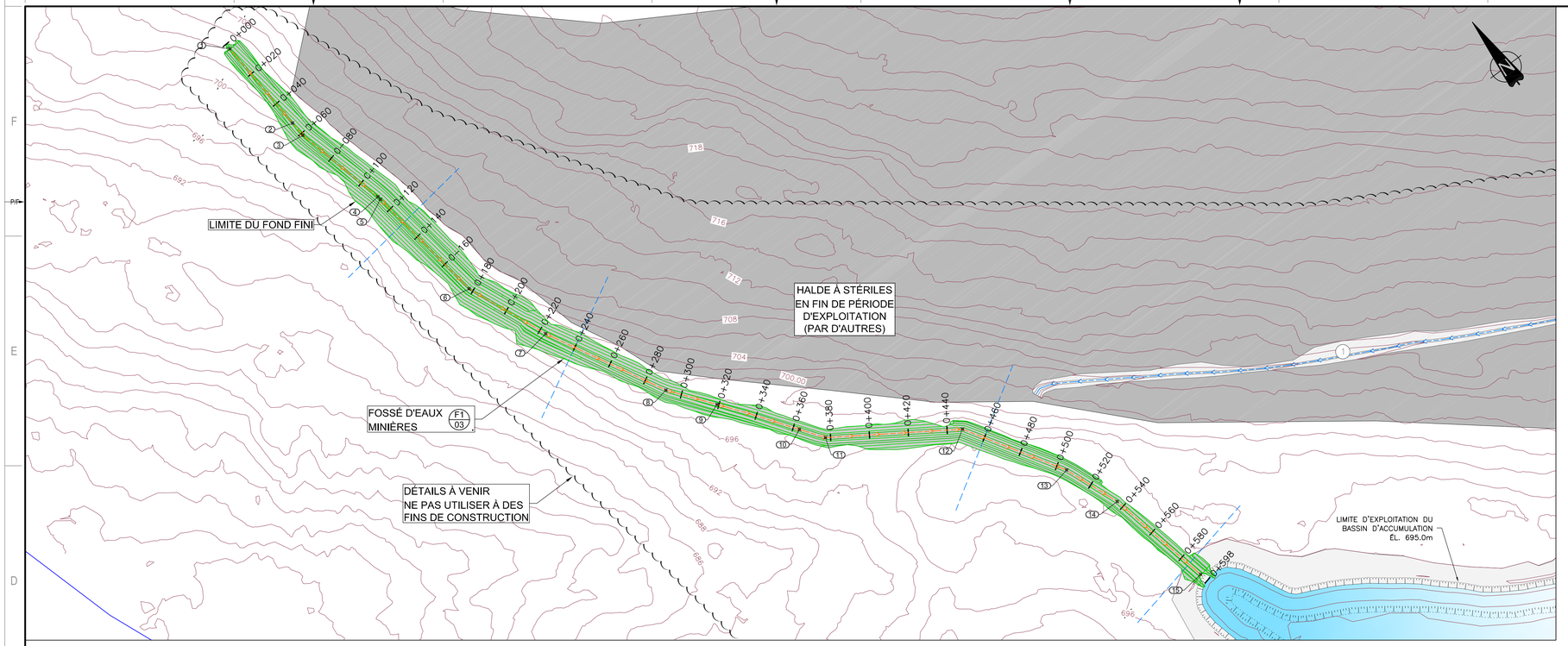
NO PROJET : 131-21244-00
DATE : 2018-04-16
ÉCHELLE ORIGINALE : Indiquée
SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE. 25mm
CONÇU PAR : David Collins-Fekete, ing, M.sc
DESSINÉ PAR : Étienne Bilodeau, dessinateur
Gail Godmaire, tech / Anne Voyer, tech
VÉRIFIÉ PAR : François Groux, ing Master génie de l'eau

DISCIPLINE : **ENVIRONNEMENT**

TITRE :
PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION
DÉTAILS

NUMÉRO DU FEUILLET : **131-21244-00_F02**
FEUILLET # : 02 DE 06

ÉMISSION : **POUR CONSTRUCTION**
EN DATE DU : 2018-07-11
RV. : 2



LÉGENDE

- COURBE TOPOGRAPHIQUE AU 2m
- FOSSÉ DE DÉRIVATION DES EAUX PROPRES
- FOSSÉ DES EAUX USÉES MINIÈRES
- FOSSÉ DES EAUX USÉES MINIÈRES EN FIN DE PÉRIODE D'EXPLOITATION
- PONCEAU
- CHEMIN DE HALAGE ET CHEMIN D'ACCÈS
- EMPREINTE DES INFRASTRUCTURES MINIÈRES EN FIN DE PÉRIODE D'EXPLOITATION
- X, NO. DE DÉTAIL YY, NO. DE FEUILLET
- 0+200 SECTIONS

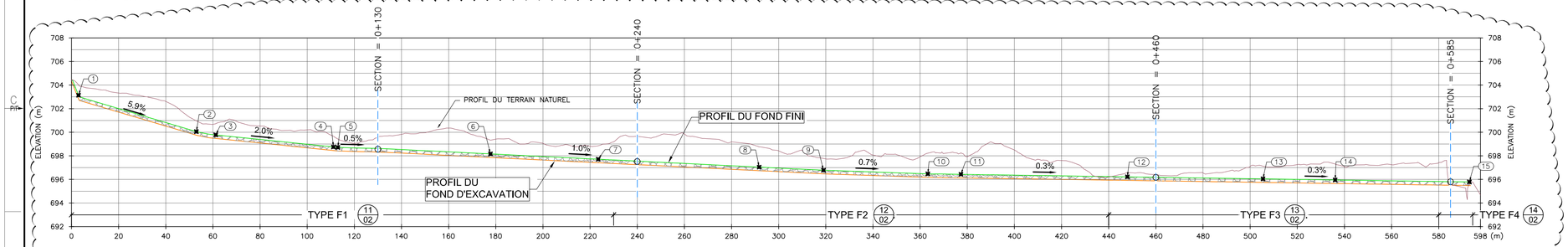
POINTS DE CONTRÔLE DESSUS D'EMPIERREMENT

POINT #	NORD (Y)	EST (X)	ÉLÉVATION (Z) REQUIS
1	6107220.826	604552.047	703.14
2	6107170.906	604554.866	700.05
3	6107162.709	604555.328	699.77
4	6107114.195	604567.108	698.75
5	6107112.337	604567.361	698.71
6	6107048.215	604576.111	698.16
7	6107005.998	604593.647	697.71
8	6106945.649	604625.596	697.04
9	6106923.958	604642.135	696.78
10	6106888.222	604668.258	696.47
11	6106876.787	604676.395	696.43
12	6106837.878	604735.308	696.22
13	6106788.883	604765.462	696.05
14	6106760.329	604776.503	695.95
15	6106704.592	604788.178	695.78

DÉTAILS À VENIR
NE PAS UTILISER À DES FINS DE CONSTRUCTION

VUE EN PLAN

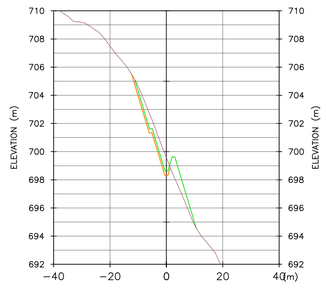
Échelle 1 : 1250



PROFIL DU FOSSÉ DES EAUX USÉES MINIÈRE F1

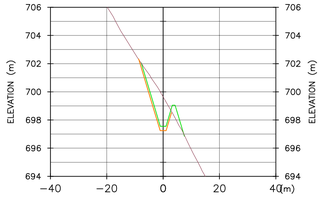
Échelle HOR.: 1:1000
VERT.: 1:200

0+130.00



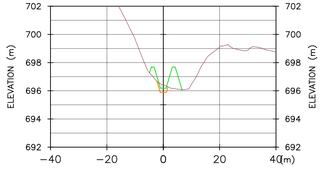
Échelle HOR.: 1:1000
VERT.: 1:200

0+240.00



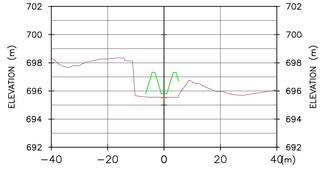
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Échelle HOR.: 1:1000
VERT.: 1:200

0+585.00



Échelle HOR.: 1:1000
VERT.: 1:200

DÉTAILS À VENIR
NE PAS UTILISER À DES FINS DE CONSTRUCTION

1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 1-418-623-2254 | WWW.WSP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

David Collins Fekete 096437 Québec Ordre des ingénieurs du Québec 2018-07-12

François Groux 037394 Québec Ordre des ingénieurs du Québec 2018-07-12

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX SECTEUR GOODWOOD

NOTES :

À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (SCoPQ), SYSTÈME DE RÉFÉRENCE GÉODÉSIQUE NAD 83, PROJECTION CARTOGRAPHIQUE MERCATOR TRANSVERSE UNIVERSEL (UTM) ZONE 19

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AVERTISSEMENT : DROIT D'AUTEUR :

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ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
2	1	2018-07-11	POUR CONSTRUCTION
1		2017-06-02	POUR CONSTRUCTION

NO PROJET : 131-21244-00

DATE : 2018-04-16

ÉCHELLE ORIGINALE : Indiquée

SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.

25mm

CONÇU PAR : David Collins-Fekete, ing. M.sc

DESSINÉ PAR : Étienne Bilodeau, dessinateur
Gail Godmaire, tech / Anne Voyer, tech

VÉRIFIÉ PAR : François Groux, ing Master génie de l'eau

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION
FOSSÉ F1
PROFIL EN LONG ET SECTIONS TRANSVERSALES

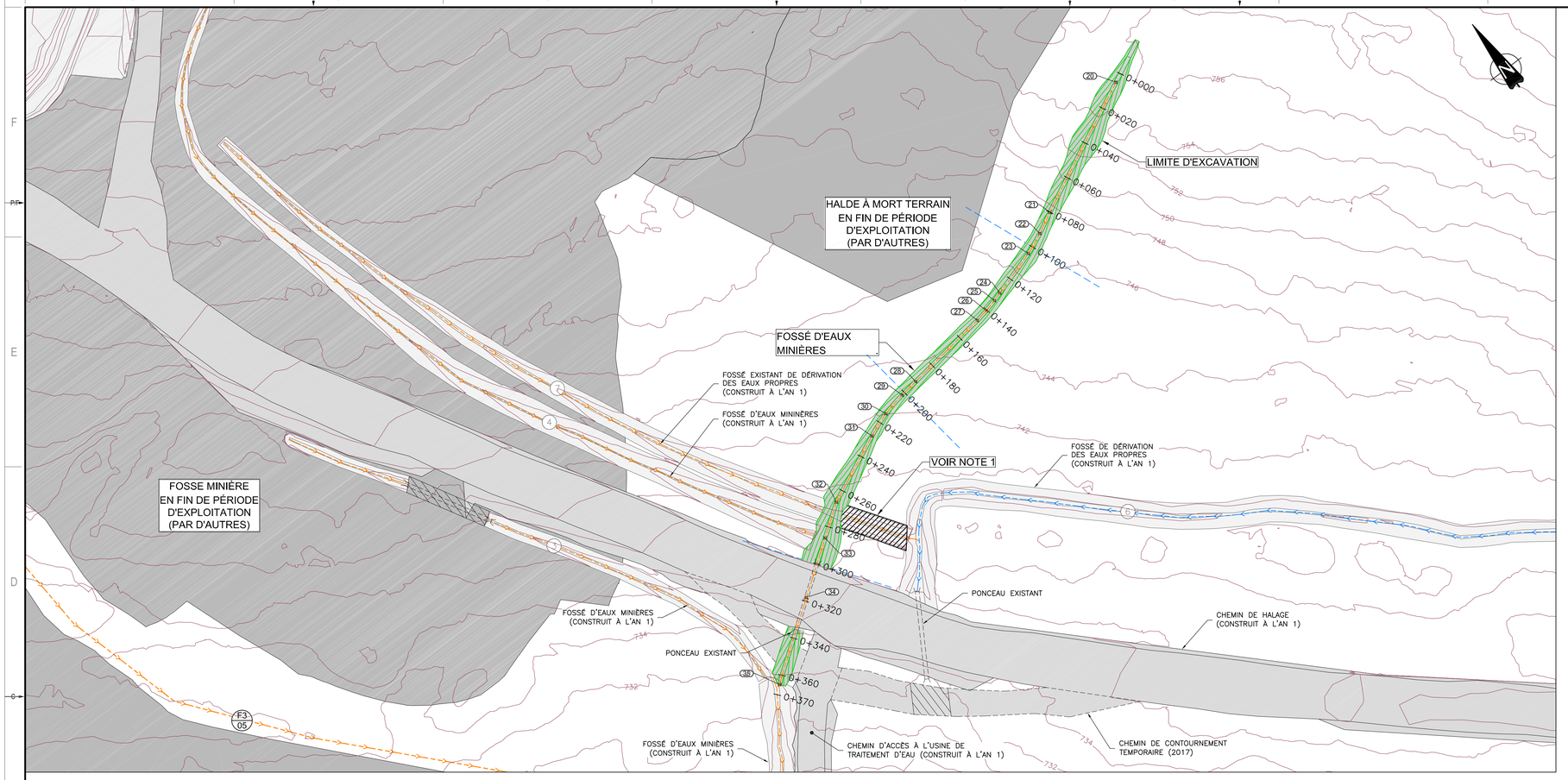
NUMÉRO DU FEUILLET : **131-21244-00_F03**

FEUILLET # : 03 DE 06

ÉMISSION : **POUR CONSTRUCTION** EN DATE DU : 2018-07-11

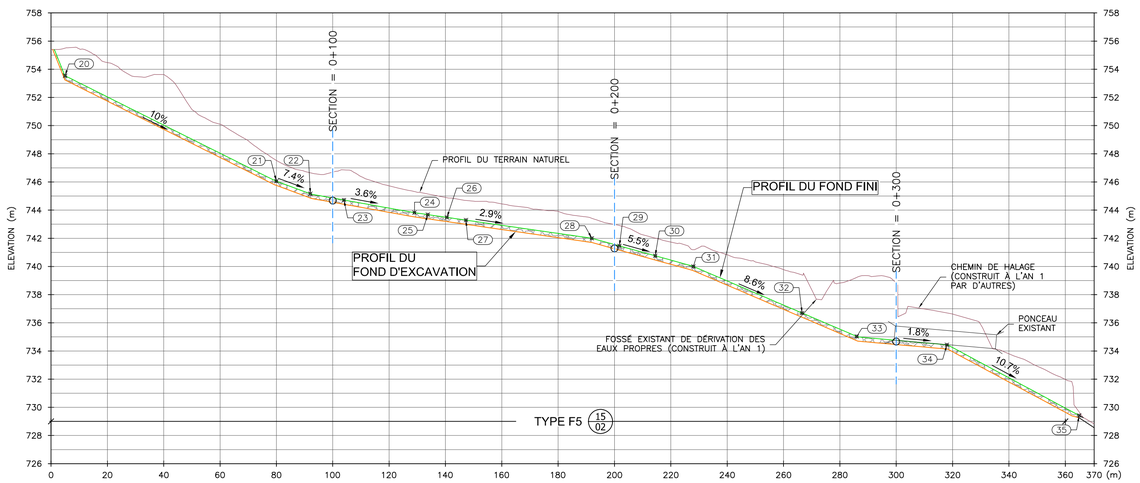
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VUE EN PLAN

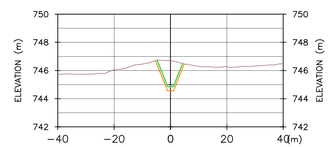
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PROFIL DU FOSSÉ D'EAUX USÉES MINIÈRE F2

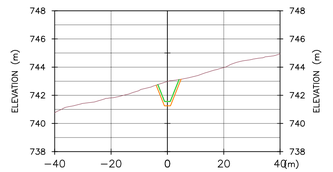
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VERT.: 1:200

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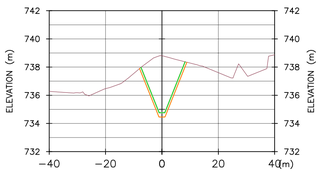
Échelle HOR.: 1:1000
VERT.: 1:200

0+200.00



Échelle HOR.: 1:1000
VERT.: 1:200

0+300.00



Échelle HOR.: 1:1000
VERT.: 1:200

LÉGENDE

- COURBE TOPOGRAPHIQUE AU 2m
- FOSSÉ DE DÉRIVATION DES EAUX PROPRES
- FOSSÉ DES EAUX USÉES MINIÈRES
- FOSSÉ DES EAUX USÉES MINIÈRES EN FIN DE PÉRIODE D'EXPLOITATION
- PONCEAU
- CHEMIN DE HALAGE ET CHEMIN D'ACCÈS
- EMPREINTE DES INFRASTRUCTURES MINIÈRES EN FIN DE PÉRIODE D'EXPLOITATION
- X, NO. DE DÉTAIL YY, NO. DE FEUILLET
- 0+200 SECTIONS

NOTE 1:
CETTE ZONE DOIT ÊTRE REMBLAYÉE ET COMPACTÉE À L'AIDE DE 4 PASSES D'UN ROULEAU VIBRANT DE 10 TONNES, AVEC MATÉRIAUX D'EXCAVATION DU FOSSÉ.

NOTE 2:
UNE BERME EN ENROULEMENT DOIT ÊTRE IMPLANTÉE À TOUS LES 25m. VOIR DÉTAIL TYPIQUE 15/02

POINTS DE CONTRÔLE DESSUS D'EMPIERREMENT

POINT #	NORD (Y)	EST (X)	ÉLÉVATION (Z) REQUIS
20	6106793.472	605730.566	753.54
21	6106760.496	605663.205	746.05
22	6106754.903	605652.556	745.16
23	6106750.231	605641.570	744.72
24	6106742.799	605617.686	743.82
25	6106741.418	605613.141	743.68
26	6106739.709	605606.593	743.49
27	6106738.520	605599.931	743.29
28	6106732.386	605555.696	742.00
29	6106731.071	605545.972	741.46
30	6106728.410	605533.559	740.76
31	6106723.600	605520.920	740.00
32	6106707.400	605485.886	736.69
33	6106696.110	605470.111	735.03
34	6106677.487	605444.088	734.44
35	6106649.930	605406.124	729.42

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CONSULTANT - SOUS-CONSULTANT :

SCEAU :

2018-07-12

2018-07-12

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX SECTEUR GOODWOOD

NOTES :

À MOINS D'INDICATIONS CONTRAIRES, LES UNITÉS DE MESURE SONT EN MÈTRES.

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AVERTISSEMENT :

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DROIT D'AUTEUR :

ÉMISSION - RÉVISION :

EM.	RV.	DATE	DESCRIPTION
2	1	2018-07-11	POUR CONSTRUCTION
1		2017-06-02	POUR CONSTRUCTION

NO PROJET : 131-21244-00

DATE : 2018-04-16

ÉCHELLE ORIGINALE : Indiquée

SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE.

25mm

CONÇU PAR : David Collins-Fekete, ing, M.sc

DESSINÉ PAR : Étienne Bilodeau, dessinateur
Gail Godmaire, tech / Anne Voyer, tech

VÉRIFIÉ PAR : François Groux, ing Master génie de l'eau

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION FOSSÉ F2 PROFIL EN LONG ET SECTIONS TRANSVERSALES

NUMÉRO DU FEUILLET : **131-21244-00_F04**

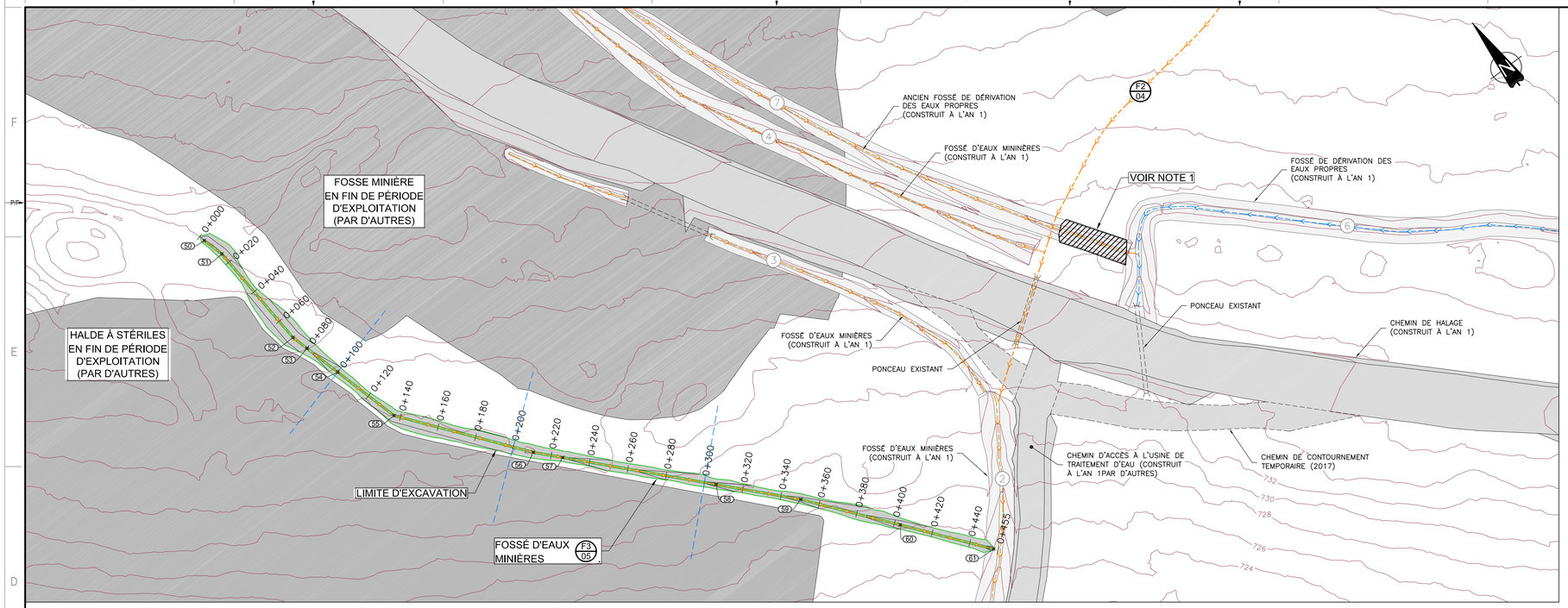
FEUILLET # : 04 DE 06

ÉMISSION : **POUR CONSTRUCTION**

EN DATE DU : 2018-07-11

RV. : 2

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LÉGENDE

- COURBE TOPOGRAPHIQUE AU 2m
- FOSSÉ DE DÉRIVATION DES EAUX PROPRES
- FOSSÉ DES EAUX USÉES MINIÈRES
- FOSSÉ DES EAUX USÉES MINIÈRES EN FIN DE PÉRIODE D'EXPLOITATION
- PONCEAU
- CHEMIN DE HALAGE ET CHEMIN D'ACCÈS
- EMPREINTE DES INFRASTRUCTURES MINIÈRES EN FIN DE PÉRIODE D'EXPLOITATION
- X, NO. DE DÉTAIL YY, NO. DE FEUILLET
- SECTIONS

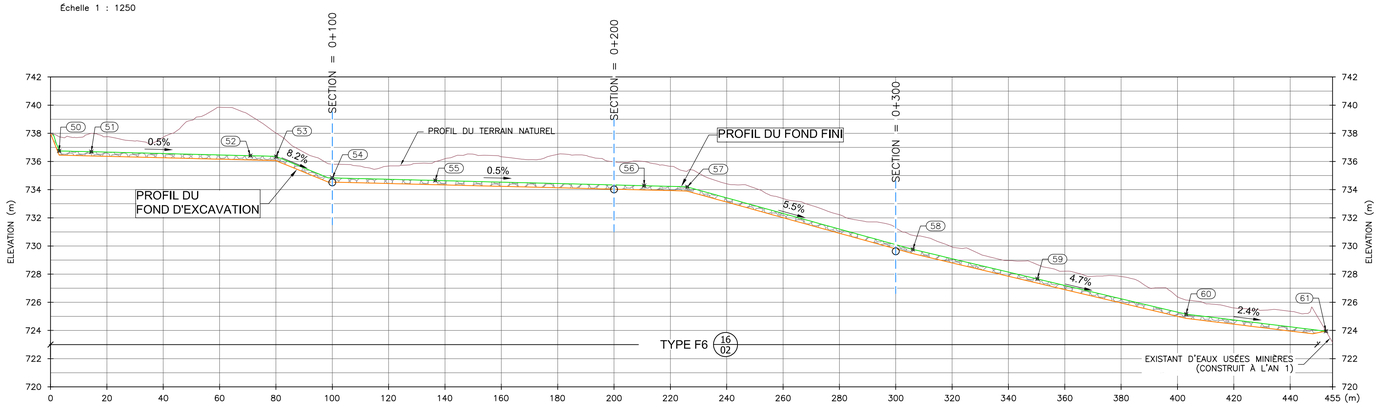
NOTE 1:
CETTE ZONE DOIT ÊTRE REMBLAYÉE ET COMPACTÉE À L'AIDE DE 4 PASSES D'UN ROULEAU VIBRANT DE 10 TONNES.

POINTS DE CONTRÔLE DESSUS D'EMPIERREMENT

POINT #	NORD (Y)	EST (X)	ÉLÉVATION (Z) REQUIS
50	6106960.918	605128.563	736.75
51	6106949.946	605131.656	736.69
52	6106893.593	605134.978	736.41
53	6106884.754	605137.394	736.35
54	6106865.547	605142.660	734.83
55	6106830.286	605152.317	734.65
56	6106772.060	605198.203	734.28
57	6106760.871	605208.648	734.19
58	6106702.339	605263.286	729.76
59	6106670.023	605293.451	727.66
60	6106628.769	605326.393	725.16
61	6106589.975	605357.370	723.95

VUE EN PLAN

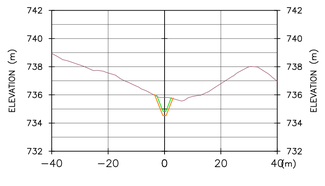
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PROFIL DU FOSSÉ DES EAUX USÉES MINIÈRE F3

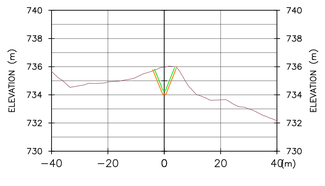
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VERT.: 1:200

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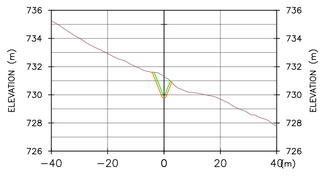
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VERT.: 1:200

0+200.00



Échelle HOR.: 1:1000
VERT.: 1:200

0+300.00



Échelle HOR.: 1:1000
VERT.: 1:200

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CONSULTANT - SOUS-CONSULTANT :

SCEAU :

2018-07-12

2018-07-12

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

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NOTES :
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ÉMISSION - RÉVISION :

ÉM.	RV.	DATE	DESCRIPTION
2	1	2018-07-11	POUR CONSTRUCTION
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NO PROJET : 131-21244-00
DATE : 2018-04-16
ÉCHELLE ORIGINALE : Indiquée
SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE. 25mm
CONÇU PAR : David Collins-Fekete, ing, M.sc
DESSINÉ PAR : Étienne Bilodeau, dessinateur
Gail Godmaire, tech / Anne Voyer, tech
VÉRIFIÉ PAR : François Groux, ing Master génie de l'eau

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX EN FIN DE PÉRIODE D'EXPLOITATION FOSSÉ F3 PROFIL EN LONG ET SECTIONS TRANSVERSALES

NUMÉRO DU FEUILLET : **131-21244-00_F05**

FEUILLET # : 05 DE 06

ÉMISSION : **POUR CONSTRUCTION** EN DATE DU : 2018-07-11

RV. : 2

1. NOTES GÉNÉRALES

1.1 LES COURBES TOPOGRAPHIQUES SONT BASÉES SUR LES DONNÉES LIDAR FOURNIES PAR TSMC.

1.2 LES COORDONNÉES SONT BASÉES SUR LE SYSTÈME NAD 83 UTM ZONE 19. LES ÉLÉVATIONS RÉFÈRENT AU MÊME SYSTÈME GÉODÉSIQUE.

1.3 LA TOLÉRANCE POUR LES COTES EST DE 0,1 m.

2. SYSTÈME DE DRAINAGE (FOSSÉS ET PONCEAUX)

2.1 LES PONCEAUX SONT CONÇUS POUR UNE CONTRAINTE IMPOSÉE PAR UN CAMION MINIER CAT 789D. ILS DOIVENT AVOIR UNE ÉPAISSEUR DE RECOUVREMENT MINIMALE DE 500 mm (OU PLUS, SELON LES RECOMMANDATIONS DU MANUFACTURIER) EN MATÉRIAU GRANULAIRE DE TYPE MG–20. TOUT CHANGEMENT À UN DE CES PARAMÈTRES ENTRAÎNE LA RÉVISION DE LA CONCEPTION DES PONCEAUX.

2.2 L'EMPLACEMENT ET L'ÉLÉVATION DES FOSSÉS ET DES PONCEAUX SONT BASÉS SUR LES DONNÉES TOPOGRAPHIQUES REÇUES DE TSMC AVEC UNE PRÉCISION DE ± 1 m. LA LOCALISATION ET L'ÉLÉVATION DOIVENT ÊTRE ADAPTÉES DURANT LA CONSTRUCTION POUR ASSURER UN RÉSEAU DE DRAINAGE OPTIMAL.

3. DÉBLAI–REMBLAI

4.1 LES MATÉRIAUX DE REMBLAI SERONT EXEMPTS DE MATIÈRES ORGANIQUES OU AUTRES MATÉRIAUX NUISIBLES, NON APPROUVÉS, INSTABLES OU INAPPROPRIÉS TEL QUE LA GLACE, LA NEIGE, LE TILL OU LA TOURBE.

4.2 LES MATÉRIAUX DE REMBLAI SONT DÉFINIS COMME ÉTANT « INSTABLES » OU « INAPPROPRIÉS » LORSQU'ILS SONT TROP HUMIDES, CONTIENNENT DES PARTICULES HORS DU FUSEAU GRANULOMÉTRIQUE SPÉCIFIÉ, DES MATIÈRES ORGANIQUES, DE LA GLACE OU DE LA NEIGE, OU LORSQU'ILS ONT DE MAUVAISES CARACTÉRISTIQUES POUVANT AVOIR COMME CONSÉQUENCE UN MOUVEMENT DU REMBLAI INDÉSIRABLE. CETTE DÉFINITION PERMET L'ASSÈCHEMENT, LA DÉSHYDRATION, L'HYDRATATION, LE TAMISAGE, LE RACLAGE ET TOUTE AUTRE ACTION DE TRAITEMENT NÉCESSAIRE POUR RENDRE LE MATÉRIEL STABLE ET APPROPRIÉ AVANT SON UTILISATION DANS LE REMBLAI.

4.3 IL FAUT DISPOSER DE TOUS MATÉRIAUX D'EXCAVATION GELÉS AINSI QUE DE LA NEIGE SELON LES DIRECTIVES DU PROPRIÉTAIRE OU DE SON REPRÉSENTANT.

4.4 L'ENTREPRENEUR DEVRA ENLEVER, GRATTER ET DÉCAPER LA NEIGE, LA GLACE ET LES BLOCS AVANT TOUS TRAVAUX D'EXCAVATION OU DE REMBLAI.

4.5 LE REPRÉSENTANT CONTRÔLE QUALITÉ/ASSURANCE QUALITÉ POURRAIT OCCASIONNELLEMENT DEMANDER QUE DES TRAVAUX DE DÉCAPAGE DE SOL ET D'ENLÈVEMENT DE LA NEIGE ET DE LA GLACE ADDITIONNELS SOIENT RÉALISÉS DANS DES ZONES À L'EXTÉRIEUR DE L'EMPREINTE DE LA DIGUE.

4.6 LES PRESCRIPTIONS DE TRAVAUX D'EXCAVATION DE LA CNESST DEVRONT ÊTRE RESPECTÉES EN TOUT TEMPS PAR L'ENTREPRENEUR.

4. MATÉRIAU GRANULAIRE ET ENROCHEMENT

5.1 LE MATÉRIAU GRANULAIRE DOIT ÊTRE DURABLE ET NE DOIT PAS (SAUF SI AUTREMENT SPÉCIFIÉ) CONTENIR DE PETITES PARTICULES DE FORME MINCE OU ALLONGÉE ET DOIT ÊTRE LIBRE DE TOUTE MATIÈRE ORGANIQUE ET AUTRES MATÉRIAUX QUI POURRAIENT NUIRE À SA STABILITÉ (NEIGE, GLACE, ETC.). LES PARTICULES DEVRAIENT ÊTRE DURES ET RÉSISTANTES AUX CHOCS SUBIS DURANT LA MANUTENTION.

5.2 LE MATÉRIAU GRANULAIRE DOIT AVOIR UNE GRANULOMÉTRIE ÉTALÉE DANS LES LIMITES DU CALIBRE SPÉCIFIÉ AUX PLANS. IL DOIT Y AVOIR UN MÉLANGE DE PARTICULES DES PLUS GROSSIÈRES AUX PLUS FINES. LES LIMITES SE MESURENT À LA MISE EN PLACE, AVANT COMPACTION.

5.3 LES MATÉRIAUX DOIVENT ÊTRE EXCAVÉS, TRANSPORTÉS, PLACÉS ET ÉPANDUS DE FAÇONS À LIMITER LA SÉGRÉGATION DES PARTICULES DANS CERTAINES ZONES.

5.4 LES MATÉRIAUX DÉPASSANT LES LIMITES DE CALIBRE SPÉCIFIÉES AUX PLANS DOIVENT ÊTRE SÉPARÉS ET REJETÉS AVANT LA MISE EN PLACE ET LA COMPACTION.

5.5 LES MATÉRIAUX GRANULAIRES UNE FOIS MIS EN PLACE DOIVENT ÊTRE EXEMPTS DE LENTILLES OU DE ZONES CARACTÉRISÉES PAR DES PARTICULES DE MÊME TAILLE.

5.6 LES MATÉRIAUX GRANULAIRES DOIVENT ÊTRE ÉPANDUS DE FAÇON À ÉLIMINER LES ESPACES LAISSÉS ENTRES LES PARTICULES ET DOIVENT ÊTRE NIVELÉS AVANT COMPACTION POUR OBTENIR UNE SURFACE LISSE EXEMPTE DE DÉPRESSIONS.

5.7 TOUTES LES ZONES OÙ IL EST PRÉVU DE METTRE EN PLACE DU MATÉRIEL GRANULAIRE DOIVENT ÊTRE RÉALISÉES EN LEVÉES SUCCESSIVES SUR LA LONGUEUR TOTALE DE L'OUVRAGE. UNE LEVÉE DOIT ÊTRE COMPLÈTEMENT TERMINÉE ET COMPACTÉE AVANT D'EN COMMENCER UNE DEUXIÈME.

5.8 UNE COMPACTION DIFFÉRENTIELLE POURRAIT AVOIR LIEU DURANT LES PREMIÈRES ANNÉES D'UTILISATION DE L'OUVRAGE ET UNE INSPECTION ANNUELLE DEVRA ÊTRE RÉALISÉE PAR UN INGÉNIEUR EN GÉOTECHNIQUE POUR ÉTABLIR LA GRAVITÉ DU DÉPLACEMENT. DES TRAVAUX SUPPLÉMENTAIRES POURRAIENT ÊTRE REQUIS POUR MAINTENIR LA REVANCHE REQUISE.

5.9 TOUS LES MATÉRIAUX GRANULAIRES ET L'ENROCHEMENT SERONT FABRIQUÉS AVEC DE LA ROCHE DE QUALITÉ SANS POTENTIEL DE GÉNÉRATION D'ACIDE (NPGA).

5.10 LES MATÉRIAUX GRANULAIRES COTÉS CG–14 ET MG–56 DOIVENT ÊTRE CONFORMES À LA PLUS RÉCENTE VERSION DE LA NORME BNQ 2560–114: TRAVAUX DE GÉNIE CIVIL – GRANULATS.

6. GÉOSYNTHÉTIQUES

6.1 FABRICATION

6.1.1 LES MANUFACTURIERS DE GÉOSYNTHÉTIQUES DEVRONT FOURNIR AU MAÎTRE D'ŒUVRE LES DOCUMENTS SUIVANTS :

6.1.1.1 UN TABLEAU DES PROPRIÉTÉS DES GÉOSYNTHÉTIQUES INCLUANT, AU MINIMUM, LES RÉSULTATS POUR LES PROPRIÉTÉS SPÉCIFIÉES ET LES PROCÉDURES POUR LES DIFFÉRENTS TESTS;

6.1.1.2 UNE LISTE DES DIFFÉRENTS POLYMÈRES ENTRANT DANS LA FABRICATION DES GÉOSYNTHÉTIQUES;

6.1.1.3 LES PROCÉDURES D'ÉCHANTILLONNAGE ET LA FRÉQUENCE;

6.1.1.4 UN CERTIFICAT GARANTISSANT QUE LES GÉOSYNTHÉTIQUES RENCONTRENT LES PROPRIÉTÉS EXIGÉES.

6.1.2 LE MAÎTRE D'ŒUVRE DOIT S'ASSURER :

6.1.2.1 QUE TOUS LES GÉOSYNTHÉTIQUES RENCONTRENT LES SPÉCIFICATIONS;

6.1.2.2 QUE LES MÉTHODES POUR METTRE À L'ESSAI LES GÉOSYNTHÉTIQUES EN USINE SONT BEL ET BIEN CONFORMES.

6.2 ENTREPOSAGE

6.2.1 L'ENTREPRENEUR GÉNÉRAL DEVRA PRÉVOIR AVEC LE MAÎTRE D'ŒUVRE, SUR LE CHANTIER, UN ENDROIT ADÉQUAT POUR ENTREPOSER LES GÉOSYNTHÉTIQUES. CET ENDROIT DOIT ÊTRE CHOISI DE MANIÈRE À MINIMISER LE TRANSPORT ET LES MANIPULATIONS SUR LE CHANTIER. L'ESPACE D'ENTREPOSAGE DOIT ÊTRE PROTÉGÉ DU VANDALISME, DU PASSAGE DES VÉHICULES, ÊTRE SEC ET PROTÉGER DES ACCUMULATIONS D'EAU CAUSÉES PAR LE RUISSELLEMENT; DE PLUS, IL DEVRA ÊTRE SITUÉ À PROXIMITÉ DE LA SURFACE DE TRAVAIL.

6.2.2 LIMITER LA HAUTEUR D'EMPILEMENT À DEUX ROULEAUX POUR TOUS LES GÉOSYNTHÉTIQUES, SAUF POUR LE GÉOTEXTILE QUI PEUT ÊTRE EMPILÉ À TROIS ROULEAUX DE HAUTEUR. RESPECTER TOUTEFOIS LES RECOMMANDATIONS DES MANUFACTURIERS SI ELLES SONT PLUS SÉVÈRES, CES HAUTEURS D'EMPILEMENT PERMETTENT D'ASSURER UNE ACCESSIBILITÉ SÉCURITAIRE DES ROULEAUX À LA MACHINERIE ET AUX TRAVAILLEURS, DE PRÉSERVER LES PROPRIÉTÉS DES GÉOSYNTHÉTIQUES, D'EMPÊCHER L'ÉCRASEMENT OU LA DÉFORMATION DES ROULEAUX À LA BASE DE L'EMPILEMENT QUI COMPLIQUERAIT ENSUITE L'INSTALLATION DU PRODUIT ET DES GÉOSYNTHÉTIQUES SOUS–JACENTS, ETC.

6.2.3 LES ROULEAUX DE GÉOSYNTHÉTIQUES DOIVENT DEMEURER ENROULÉS DANS LEUR EMBALLAGE DE LIVRAISON JUSQU'À LEUR INSTALLATION AFIN DE LES PROTÉGER CONTRE LE RAYONNEMENT SOLAIRE DIRECT, LES RAYONS ULTRAVIOLETS, LA CHALEUR EXCESSIVE, LES PRÉCIPITATIONS, LA BOUE, LA TERRE, LES POUSSIÈRES, LES DÉBRIS ET LES RONGEURS. SI L'EMBALLAGE D'UN ROULEAU EST ENDOMMAGÉ ET QUE LE GÉOSYNTHÉTIQUE SEMBLE ALTÉRÉ, LE MAÎTRE D'ŒUVRE POURRA FAIRE ENLEVER LA PORTION DE GÉOSYNTHÉTIQUES ENDOMMAGÉS ET/OU EXIGER DES ANALYSES DE CERTAINES PROPRIÉTÉS AUX FRAIS DE L'INSTALLATEUR POUR ACCEPTER LE ROULEAU CONCERNÉ.

6.3 AVANT DE PROCÉDER À L'INSTALLATION DES GÉOSYNTHÉTIQUES L'ENTREPRENEUR DOIT S'ASSURER QUE L'ÉTAT DES SURFACES/SUPPORTS PRÉALABLEMENT MIS EN ŒUVRE AUX TERMES D'AUTRES SECTIONS EST ACCEPTABLE ET PERMET DE RÉALISER LES TRAVAUX CONFORMEMENT AUX INSTRUCTIONS ÉCRITES DU FABRICANT

6.4 LES GÉOTEXTILES DOIVENT ÊTRE MANIPULÉS DE MANIÈRE À S'ASSURER QU'ILS NE SUBISSENT AUCUN DOMMAGE.

6.5 SUR DES SURFACES NIVELÉES, METTRE EN PLACE LES GÉOTEXTILES EN LES DÉROULANT DANS LE SENS, DE LA MANIÈRE ET À L'ENDROIT INDIQUÉ, NOTAMMENT NE PAS DÉPLOYER DE ROULEAU PERPENDICULAIREMENT AU SENS DES PENTES, MAIS BIEN PARALLÈLEMENT. NE PAS FAIRE DE JOINTS TRANSVERSAUX DANS LES PENTES; METTRE EN PLACE LES GÉOTEXTILES EN UNE BANDE CONTINUE DU PIED DE LA PENTE JUSQU'À LA LIMITE SUPÉRIEURE PRÉVUE. METTRE EN PLACE LES GÉOTEXTILES DE FAÇON À OBTENIR UNE SURFACE UNIE ET EXEMPTE D'AIRES TENDUES, DE PLISSEMENT ET DE GONDOLEMENTS.

6.6 LES JOINTS DE DEUX LAIZES DE GÉOSYNTHÉTIQUES DOIVENT SE RECOUVRIR SUR UN MINIMUM DE 500 mm OU TEL QUE SPÉCIFIÉ DANS LES RECOMMANDATIONS DU MANUFACTURIER.

6.7 PRÉVENIR LE DÉPLACEMENT DES GÉOSYNTHÉTIQUES ET LES PROTÉGER CONTRE TOUT DOMMAGE OU TOUTE DÉTÉRIORATION AVANT, PENDANT ET APRÈS LA MISE EN PLACE DES COUCHES DE PROTECTION.

6.8 LA LONGUEUR DES LAIZES DE GÉOTEXTILE DOIT ÊTRE SUFFISANTE POUR COUVRIR COMPLÈTEMENT LE MATÉRIAU SOUS–JACENT À PROTÉGER ET, SI REQUIS, LES AIRES DE CHAMPS DE BLOCS PRÉSENTS DANS L'EMPRISE DES DIGUES, LE TOUT SANS TENSION, EFFORT OU PLI.

6.9 À LA SUITE DE LEUR MISE EN PLACE, L'ENTREPRENEUR DOIT VÉRIFIER VISUELLEMENT CHAQUE ROULEAU AFIN D'IDENTIFIER TOUTE SURFACE ENDOMMAGÉE OU D'APPARENCE ANORMALE. TOUTE DÉFECTUOSITÉ DOIT ÊTRE RECOUVERTE PAR UNE AUTRE PIÈCE DE GÉOSYNTHÉTIQUE EXCÉDANT LA PARTIE EN QUESTION D'AU MOINS 500 mm DANS TOUTES LES DIRECTIONS.

6.10 LE DÉVERSEMENT DE MATÉRIAUX DE REMBLAI SUR TOUTE PORTION DE GÉOSYNTHÉTIQUE RECOUVRANT UNE SURFACE INCLINÉE EST INTERDIT. L'ENTREPRENEUR DOIT S'ASSURER QUE LE GÉOTEXTILE EST RETENU TEMPORAIREMENT LE LONG DU PAREMENT DES BERGES OU DE TOUTE PENTE LORS DE LA MISE EN PLACE DES MATÉRIAUX LE RECOUVRANT. LES MATÉRIAUX DOIVENT ÊTRE POUSSÉS DE BAS EN HAUT.

6.11 MISE EN PLACE DES GÉOTEXTILES

6.11.1 L'ASSISE DES GÉOTEXTILES DOIT AVOIR REÇU L'APPROBATION D'UN TECHNICIEN CERTIFIÉ AVANT D'ÊTRE PLACÉ AUX ENDROITS PRÉVUS AUX PLANS.

6.11.2 L'ENTREPRENEUR DOIT S'OCCUPER DE L'ENTREPOSAGE, DE LA MANUTENTION, DE LA MISE EN PLACE DES GÉOTEXTILES SELON LES SPÉCIFICATIONS DU FABRICANT.

6.11.3 AUCUN MATÉRIEL DE REMBLAI SERA PLACÉ SUR LE GÉOTEXTILE AVANT AVOIR OBTENU L'APPROBATION DU PERSONNEL CONTRÔLE QUALITÉ/ASSURANCE QUALITÉ;

6.11.4 LES GÉOTEXTILES DOIVENT ÊTRE PLACÉS DIRECTEMENT SUR LA SOUS–COUCHE PRÉPARÉE SELON LES RECOMMANDATIONS DU MANUFACTURIER. METTRE EN PLACE LES GÉOTEXTILES DE FAÇON À OBTENIR UNE SURFACE UNIE ET EXEMPTE DE PLISSEMENTS, DE GONDOLEMENTS ET DE ZONES SOUS TENSION.

7. PROTECTION DE L'ENVIRONNEMENT

7.1 PROPRETÉ DU CHANTIER

7.1.1 LE CHANTIER DOIT ÊTRE LIBRE EN TOUT TEMPS DE DÉCHETS QU'IL S'AGISSE DE CONTENANTS VIDES DE TOUTES SORTES OU AUTRES À MOINS QU'ILS NE SOIENT PLACÉS DANS UN RÉCIPIENT ÉTANCHE DESTINÉ À CETTE FIN.

7.1.2 SI L'ENTREPRENEUR LAISSE DU MATÉRIEL SUR LE TERRAIN APRÈS LES HEURES DE TRAVAIL, IL DOIT INSTALLER LES PROTECTIONS REQUISES POUR S'ASSURER QUE LE SITE SOIT SÉCURITAIRE.

7.1.3 DE PLUS, CONFORMÉMENT À L'ARTICLE 20 DE LA LOI SUR LA QUALITÉ DE L'ENVIRONNEMENT (LQE), IL EST INTERDIT DE JETER DES DÉBRIS DE TOUTES SORTES DANS UN COURS D'EAU, DANS UN LAC ET DANS L'ENVIRONNEMENT Y COMPRIS TOUS LES ARBRES OU PARTIES D'ARBRES QUI TOMBENT DANS UN COURS D'EAU OU DANS UN LAC.

7.2 ENTRETIEN DE LA MACHINERIE

7.2.1 L'ENTREPRENEUR DOIT MAINTENIR SES ÉQUIPEMENTS EN PARFAIT ÉTAT DE FONCTIONNEMENT. CETTE CLAUSE S'APPLIQUE ÉGALEMENT À TOUS LES SOUS–TRAITANTS. TOUS LES JOURS, IL EST TENU DE VÉRIFIER LA PRÉSENCE DE FUITE DE CONTAMINANTS SUR SES ÉQUIPEMENTS, QU'IL DOIT RÉPARER IMMÉDIATEMENT, LE CAS ÉCHÉANT. L'ENTRETIEN ET LE NETTOYAGE DE LA MACHINERIE AINSI QUE SON RAVITAILLEMENT EN CARBURANT ET EN LUBRIFIANT DOIVENT ÊTRE EFFECTUÉS À UNE DISTANCE D'AU MOINS 30 M D'UN COURS D'EAU, D'UN LAC OU DE TOUTE AUTRE ÉTENDUE D'EAU.

7.2.2 S'IL EST PHYSIQUEMENT IMPOSSIBLE DE RESPECTER CETTE DISTANCE, L'ENTREPRENEUR DOIT EFFECTUER TOUS LES TRAVAUX DE MAINTENANCE ET DE RAVITAILLEMENT EN CARBURANT DE SES ENGINS SUR UN SITE OÙ LES CONTAMINANTS SERONT CONFINÉS EN CAS DE DÉVERSEMENT, TOUT EN AYANT SUR PLACE DU MATÉRIEL D'INTERVENTION EN CAS DE DÉVERSEMENT ACCIDENTEL DE CONTAMINANTS. L'ENTREPRENEUR DOIT MUNIR CHAQUE ENGIN DE CHANTIER D'UNE QUANTITÉ SUFFISANTE D'ABSORBANTS AFIN D'INTERVENIR EFFICACEMENT EN CAS DE DÉVERSEMENT ACCIDENTEL DE CONTAMINANTS. AUCUN RÉSERVOIR OU CONTENANT D'ESSENCE OU D'HUILE NE DOIT ÊTRE LAISSÉ SANS SURVEILLANCE À MOINS DE 60 M D'UN COURS D'EAU OU D'UN LAC.

7.2.3 DE PLUS, AUCUNE MACHINERIE OU ÉQUIPEMENT À ESSENCE NE DOIT DEMEURER SUR UN BATARDEAU, UNE JETÉE OU SUR LA BANDE RIVERAINE D'UN COURS D'EAU OU D'UN LAC PENDANT LES HEURES DE FERMETURE DU CHANTIER, DANS L'IMPOSSIBILITÉ DE RESPECTER CETTE PRESCRIPTION, DES MESURES DE PROTECTION DE L'ENVIRONNEMENT DOIVENT ÊTRE APPLIQUÉES (SURVEILLANCE OU AUTRE).

7.2.4 L'ENTREPRENEUR DOIT PRÉVOIR SUR PLACE UNE PROVISION DE MATIÈRES ABSORBANTES AINSI QUE DES RÉCIPIENTS ÉTANCHES BIEN IDENTIFIÉS, DESTINÉS À RECEVOIR LES RÉSIDUS PÉTROLIERS ET LES DÉCHETS.

7.3 DÉVERSEMENT ACCIDENTEL DE PRODUITS PÉTROLIERS

7.3.1 L'ENTREPRENEUR DOIT INFORMER SANS DÉLAI URGENCE ENVIRONNEMENT LORS DE DÉVERSEMENT OU ACCIDENT POUVANT PERTURBER L'ENVIRONNEMENT. LE NUMÉRO DE TÉLÉPHONE DOIT ÊTRE AFFICHÉ DANS LE BUREAU DE CHANTIER.

URGENCE ENVIRONNEMENT
TÉLÉPHONE : 1–866–694–5454
24 HEURES SUR 24

7.3.2 AU DÉBUT DES TRAVAUX, L'ENTREPRENEUR DOIT PRÉSENTER UN PLAN D'INTERVENTION EN CAS DE DÉVERSEMENT ACCIDENTEL DE CONTAMINANTS AU MOINS 15 JOURS AVANT LE DÉBUT DES TRAVAUX. L'ENTREPRENEUR DOIT PLACER SON PLAN D'URGENCE DANS UN ENDROIT À LA VUE DE TOUS LES EMPLOYÉS.

7.3.3 L'ENTREPRENEUR DOIT DISPOSER EN PERMANENCE SUR LE CHANTIER D'AU MOINS UNE TROUSSE D'URGENCE DE RÉCUPÉRATION DE PRODUITS PÉTROLIERS. LA TROUSSE DOIT COMPRENDRE SUFFISAMMENT DE ROULEAUX ABSORBANTS POUR PERMETTRE D'INTERVENIR SUR LA LARGEUR DU COURS D'EAU OU DE PERMETTRE DE CONFINER LES PRODUITS PÉTROLIERS À L'INTÉRIEUR DU PÉRIMÈTRE DE LA MACHINERIE EN CAUSE EN AMÉNAGEANT UNE ESTACADE FLOTTANTE.

7.3.4 TOUS LES OUVRIERS AFFECTÉS AU CHANTIER DEVRAIENT RECEVOIR UNE FORMATION ET UNE ATTESTATION QUI DÉMONTRE QU'ILS SAVENT COMMENT UTILISÉS DE FAÇON ADÉQUATE CHAQUE COMPOSANTE DE LA TROUSSE DE DÉVERSEMENT.

7.3.5 VOICI LE CONTENU MINIMAL D'UNE TROUSSE D'URGENCE EN CAS DE DÉVERSEMENT :

- 1 BARIL OU BOÎTE CONTENANT LE MATÉRIEL D'INTERVENTION EN CAS DE DÉVERSEMENT;
- 10 COUSSINS ABSORBANTS EN POLYPROPYLÈNE DE 430 cm³ DE DIMENSION;
- 200 FEUILLES ABSORBANTES EN POLYPROPYLÈNE;
- 10 BOUDINS ABSORBANTS EN POLYPROPYLÈNE;
- 5 SACS DE 10 LITRES DE FIBRE DE TOURBE TRAITÉE POUR ABSORBER LES HYDROCARBURES;
- 10 SACS EN POLYÉTHYLÈNE DE 6 mm D'ÉPAISSEUR ET DE 205 LITRES DE GRANDEUR POUR DÉPOSER LES ABSORBANTS CONTAMINÉS.

7.3.6 ELLE DOIT ÊTRE DISPONIBLE À PROXIMITÉ DU COURS D'EAU ET DE LA MACHINERIE ET FACILEMENT ACCESSIBLE EN TOUT TEMPS POUR UNE INTERVENTION RAPIDE.

7.3.7 TOUT DÉVERSEMENT SUR LE CHANTIER DOIT ÊTRE DÉCLARÉ. LE SOL CONTAMINÉ DOIT ÊTRE QUANTIFIÉ ET RÉCUPÉRÉ. LA PREUVE DE SON TRANSPORT DANS UN SITE AUTORISÉ, AUX FRAIS DE L'ENTREPRENEUR, DOIT ÊTRE REMISE À L'INGÉNIEUR.

7.4 DRAINAGE

7.4.1 EN COURS DE TRAVAUX, L'ENTREPRENEUR DOIT RESPECTER LE DRAINAGE NATUREL DU MILIEU ET PRENDRE TOUTES LES MESURES APPROPRIÉES POUR PERMETTRE L'ÉCOULEMENT NORMAL DES EAUX ET ÉVITER LA FORMATION D'ÉTANGS. LORS DE L'AMÉNAGEMENT DE FOSSÉS TEMPORAIRES, L'ENTREPRENEUR DOIT RÉDUIRE, AU BESOIN, LA PENTE DU FOSSÉ EN Y INSTALLANT, À INTERVALLES RÉGULIERS, DES OBSTACLES QUI PERMETTRONT D'ÉVITER L'ÉROSION (EX. : SACS DE SABLE, BALLOTS DE PAILLE, ETC.). LORSQUE LE DRAINAGE DE SURFACE RISQUE D'ENTRAÎNER DES SÉDIMENTS DANS DES COURS D'EAU, L'ENTREPRENEUR DOIT APPLIQUER DES MESURES POUR CONTENIR LES SÉDIMENTS OU LES DÉTOURNER AFIN QU'ILS N'ATTEIGNENT PAS LES COURS D'EAU.

7.5 RÉSERVOIRS ET PARC D'ENTREPOSAGE DE PRODUITS PÉTROLIERS

7.5.1 L'ENTREPRENEUR DOIT SUIVRE LES DISPOSITIONS DU RÈGLEMENT SUR LES PRODUITS PÉTROLIERS POUR LA GESTION DE SES ÉQUIPEMENTS ET DE SES PRODUITS PÉTROLIERS DANS LE CADRE DU CONTRAT QUI LUI EST ALLOUÉ.

7.5.2 AUCUN RÉSERVOIR, NI PARC D'ENTREPOSAGE DE PRODUITS PÉTROLIERS NE SERA AUTORISÉ SUR LE SITE DES TRAVAUX.

7.5.3 L'ENTREPRENEUR DOIT MANIPULER LES PRODUITS PÉTROLIERS DE FAÇON À PRÉVENIR ET À MAÎTRISER LES FUITES ET LES DÉVERSEMENTS. AINSI, IL DOIT GARDER EN TOUT TEMPS DES SUBSTANCES ABSORBANT LES HYDROCARBURES SUR LES LIEUX OU D'UTILISATION DE PRODUITS PÉTROLIERS. LORS D'UN DÉVERSEMENT DE CONTAMINANTS, L'ENTREPRENEUR DOIT IMMÉDIATEMENT APPLIQUER SON PLAN D'URGENCE.

7.5.4 L'ENTREPRENEUR DOIT MUNIR CHAQUE CAMION–CITERNE UTILISÉ POUR LE TRANSPORT DE PRODUITS PÉTROLIERS D'AU MOINS UN EXTINCTEUR À POUDRE CHIMIQUE DONT LE POUVOIR D'EXTINCTION TOTALE EST D'AU MOINS 20 bc. DE PLUS, UN EXTINCTEUR D'AU MOINS 5 bc DOIT ÊTRE INSTALLÉ DANS SON SUPPORT ET BIEN VISIBLE DANS LA CABINE DU CAMION OU ATTACHÉ À L'EXTÉRIEUR DE CELLE–CI.

wsp
1135, BOULEVARD LEBOURGNEUF
QUÉBEC (QUÉBEC) CANADA G2K 0M5
TÉL. : 1-418-623-2254 | WWW.WSP.COM

CONSULTANT - SOUS-CONSULTANT :

SCEAU :

2018-07-12

CLIENT :

TATA STEEL

RÉF. CLIENT :

PROJET :

GESTION DES EAUX
SECTEUR GOODWOOD

NOTES :

AVERTISSEMENT : DROIT D'AUTEUR :

CE DESSIN EST LA PROPRIÉTÉ INTELLECTUELLE DE WSP. AUCUNE RÉVISION, REPRODUCTION OU TOUT AUTRE USAGE N'EST PERMIS SANS L'AUTORISATION ÉCRITE DE WSP. L'ENTREPRENEUR DEVRA VÉRIFIER TOUTES LES DIMENSIONS AUX PLANS ET FAIRE LOCALISER TOUS LES SERVICES D'UTILITÉS PUBLIQUES ET RAPPORTER TOUTES ERREURS OU OMISSIONS AVANT DE COMMENCER LES TRAVAUX.
L'ÉCHELLE DE CE DESSIN NE DOIT PAS ÊTRE MODIFIÉE.

ÉMISSION - RÉVISION :

EM.	RV.	DATE	DESCRIPTION
2	1	2018-07-11	POUR CONSTRUCTION
1		2017-06-02	POUR CONSTRUCTION

NO PROJET : 131-21244-00
DATE : 2018-04-16
ÉCHELLE ORIGINALE : Aucune
SI CETTE BARRE NE MESURE PAS 25mm AJUSTER VOTRE ÉCHELLE DE TRAÇAGE. 25mm
CONÇU PAR : David Collins-Fekete, ing. M.sc
DESSINÉ PAR : Étienne Bilodeau, dessinateur
Gail Godmaire, tech / Anne Voyer, tech
VÉRIFIÉ PAR : François Groux, ing Master génie de l'eau

DISCIPLINE : **ENVIRONNEMENT**

TITRE :

PLAN DE GESTION DES EAUX
EN FIN DE PÉRIODE D'EXPLOITATION
NOTES

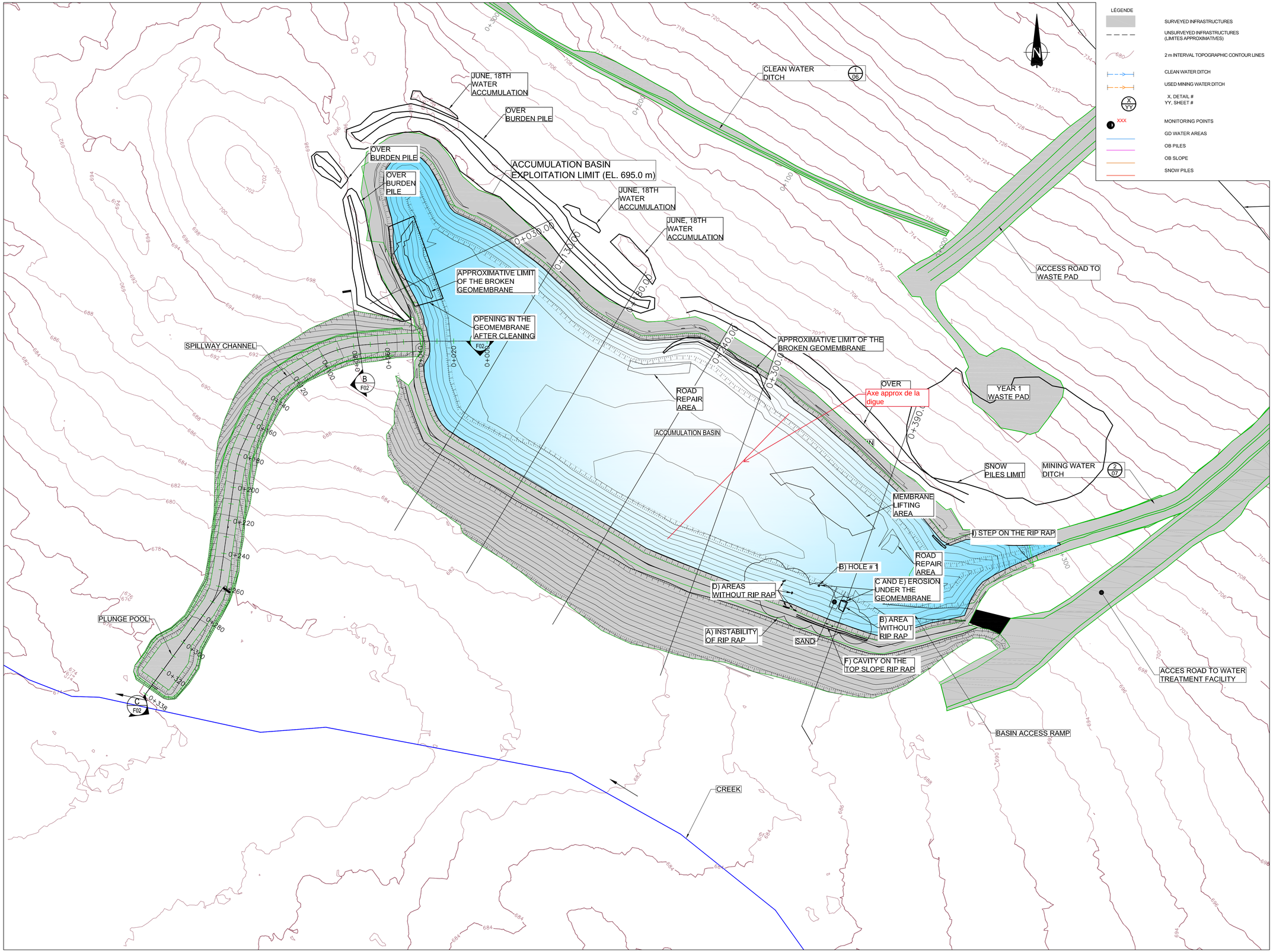
NUMÉRO DU FEUILLET : **131-21244-00_F06**

FEUILLET # : 06 DE 06

ÉMISSION : **POUR CONSTRUCTION**
EN DATE DU : 2018-07-11
RV. : 2

APPENDIX C

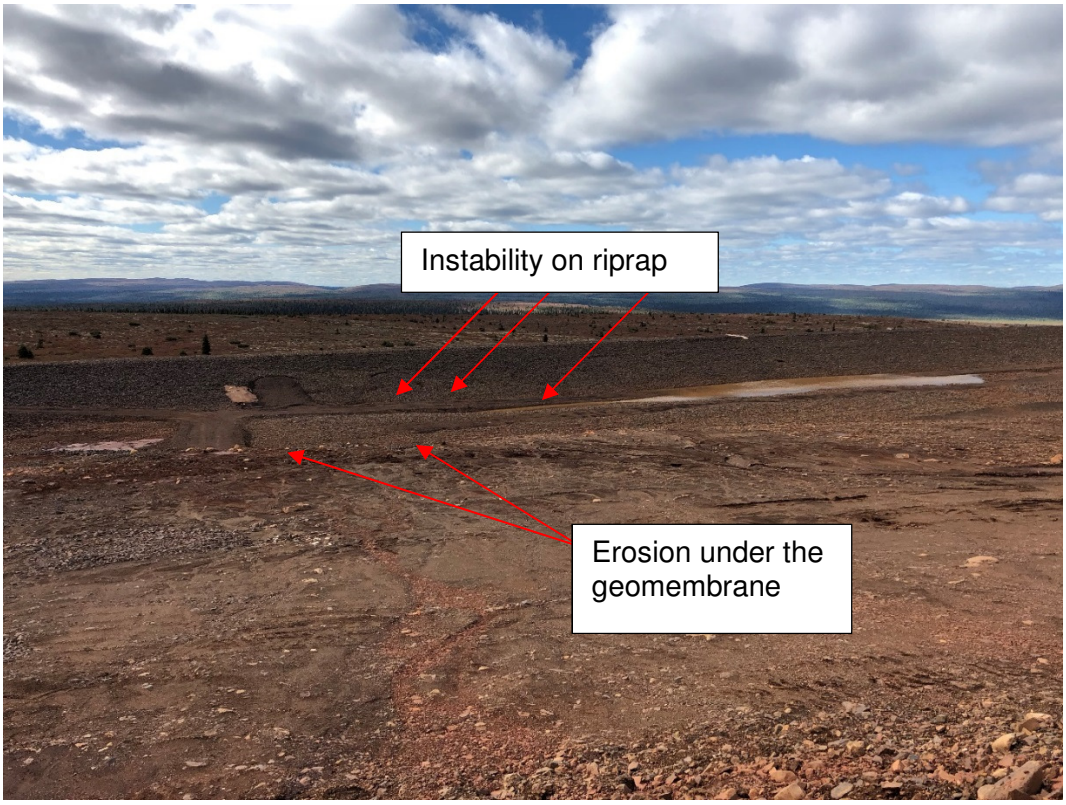
LOCATION OF DEFECTS IN THE POND AREA


LÉGENDE
SURVEYED INFRASTRUCTURES
UNSURVEYED INFRASTRUCTURES (LIMITES APPROXIMATIVES)
2 m INTERVAL TOPOGRAPHIC CONTOUR LINES
CLEAN WATER DITCH
USED MINING WATER DITCH
X, DETAIL # YY, SHEET #
XXX
MONITORING POINTS
GD WATER AREAS
OB PILES
OB SLOPE
SNOW PILES
N
JUNE, 18TH WATER ACCUMULATION
OVER BURDEN PILE
OVER BURDEN PILE
OVER BURDEN PILE
ACCUMULATION BASIN EXPLOITATION LIMIT (EL. 695.0 m)
JUNE, 18TH WATER ACCUMULATION
JUNE, 18TH WATER ACCUMULATION
CLEAN WATER DITCH
1 06
APPROXIMATIVE LIMIT OF THE BROKEN GEOMEMBRANE
OPENING IN THE GEOMEMBRANE AFTER CLEANING
SPILLWAY CHANNEL
ACCESS ROAD TO WASTE PAD
APPROXIMATIVE LIMIT OF THE BROKEN GEOMEMBRANE
OVER
Axe approx de la digue
YEAR 1 WASTE PAD
ROAD REPAIR AREA
ACCUMULATION BASIN
SNOW PILES LIMIT
MINING WATER DITCH
2 07
MEMBRANE LIFTING AREA
I) STEP ON THE RIP RAP
ROAD REPAIR AREA
B) HOLE # 1
C AND E) EROSION UNDER THE GEOMEMBRANE
D) AREAS WITHOUT RIP RAP
B) AREA WITHOUT RIP RAP
A) INSTABILITY OF RIP RAP
SAND
F) CAVITY ON THE TOP SLOPE RIP RAP
PLUNGE POOL
ACCES ROAD TO WATER TREATMENT FACILITY
BASIN ACCESS RAMP
CREEK
B F02
C F02
0+000
0+020
0+040
0+060
0+080
0+100
0+120
0+140
0+160
0+180
0+200
0+220
0+240
0+260
0+280
0+300
0+320
0+335
0+340
0+360
0+380
0+390
0+400
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0+440
0+460
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0+500
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1+100
1+120
1+140
1+160
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1+260
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1+300
1+320
1+340
1+360
1+380
1+400
1+420
1+440
1+460
1+480
1+500
1+520
1+540
1+560
1+580
1+600
1+620
1+640
1+660
1+680
1+700
1+720
1+740
1+760
1+780

APPENDIX D

EXPERTISE REPORT AND PHOTOGRAPHIC DOCUMENT – DAYS 1 AND 2

a) South dike : zone where the rip rap has moved (some areas without rip rap are apparent). Some seem to have been caused by erosion under the geomembrane. Others seem to have been caused by erosion of fine particles in the riprap





b) HOLE # 1 : The geomembrane is folded into the dike, at the base of the hole. It's a puncture (movement from top to bottom), may be done by an equipment. The hole has created internal erosion of the dike (under the geomembrane).



c) Geomembrane without protection, erosion under the geomembrane, at the toe of the dike, sand in the slope, East of that area. The exposed geomembrane is not broken but in tension.



d) Rip rap missing on the slope, the geomembrane is exposed.



e) Erosion under the geomembrane, South dike. The geomembrane is not supported and is in tension (no hole was found)



f) Cavity on the top of dike (South), the rip rap has moved. A survey was done.



g) The toe of the South dike, interior side, must be monitored to observe if there is presence of movements (instability).



h) Low point on the top of the North-East dike of the pound. Runoff water goes in pond.



i) Step on the rip rap North-East dike of the pond (instability)



j) Default on the ditch at the entrance of the pond. To be repaired.



k) Crest of the slope (North). Was the anchor trench compacted properly, to limit the infiltration of runoff under the geomembrane?



l) A road cuts two ditches. The culvert has to be installed, North of the main road to the pond.



Test pits Report

Project : TSMC – GOODWOOD – WATER MANAGEMENT	**Date :** 2018-09-19	**Day :** Wednesday
By : Louise Chaput, ing. Christian Houle, ing.	**C :** (514) – 773 – 0188 (581) – 397 – 1263	**E :** louise.chaput@wsp.com christian.houle@wsp.com
Temp. AM: 1°C, Cloudy.	**Temp. PM:** 2°C Cloudy with sunny break.	

Contractor : (GRM) Greyrock/Dexter **(2 worker + excavator)**

- AM: 349 excavator: 2 test pits for the ground characterisation in the area of the future water treatment plan;
- PM: 323 excavator with a blade bucket: geomembrane cleaning to understand some defects on dyke north and south.

Owner representative

- Tara Oak and Pallav Sinha (environment department).
- Surveyor: Kristin Sheffer, location of defects and geomembrane exposed.
- Mine operation: Ben House, accompanist for WSP representative and work supervision.

Meeting with supervisors: Planning of the activities for the expertise of defects on the Goodwood pound.

Visit of the site: with Ben House, Kristin Sheffer and Pallav Sinha (environment department).

1. Discussion about the **location of the future water treatment plan**: no information is available concerning the ground characteristics. Louise Chaput proposed to use the 349 excavator to do tests pits. See the Test Pits reports.

2. Inspection of the pound

   a) HOLE # 1 : The geomembrane is folded into the dyke, at the base of the hole. It's a puncture (movement from top to bottom), maybe by an equipment. The hole has created internal erosion of the dyke (under the geomembrane).



b) Geomembrane without protection, erosion under the geomembrane, at the toe of the dyke, sand in the slope, East of that area. The exposed geomembrane is not broken but in tension!.



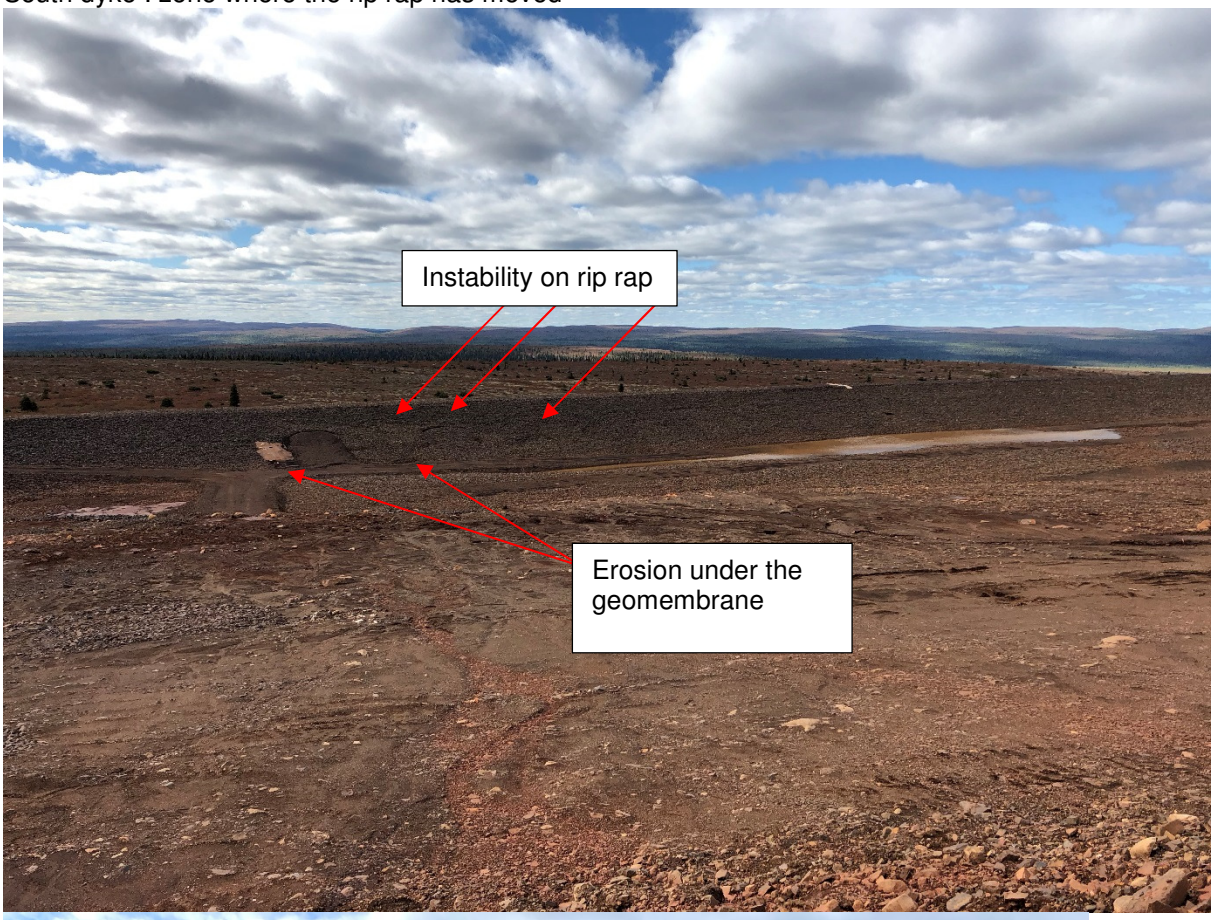
c) Cavity on the top of dyke, the rip rap has moved. Surveying was done



d) Rip rap missing on the slope, the geomembrane is exposed.



e) South dyke : zone where the rip rap has moved





f) Default on the ditch, at the entrance of the pond. To be repaired.



g) Crest of the slope (North). Was the anchor trench compacted properly to limit the infiltration of runoff under the geomembrane?



Expertise Daily Report

Project : TSMC – GOODWOOD – WATER MANAGEMENT	**Date :** 2018-09-20	**Day :** Thursday
By : Louise Chaput, ing. Christian Houle, ing. (morning)	**C :** (514) – 773 – 0188 (581) – 397 – 1263	**E :** louise.chaput@wsp.com christian.houle@wsp.com
Temp. AM: 2°C, Cloudy.	**Temp. PM:** 7°C Light rain	

Contractor : (GRM) Greyrock/Dexter **(3 workers + 6" pump)**

- AM: pumping of water inside the pond, to observe the toe of the South dyke.

Owner representative

- Tara Oak and Pallav Sinha (environment department).
- Surveyor: Kristin Sheffer, location of defects and geomembrane exposed.
- Mine operation: Ben House, accompanist for WSP representative and work supervision.

Visit of the site: with Ben House and Kristin Sheffer in the morning and a second in afternoon with Ben House.

a) Pumping of the water in the middle of the pond, to observe the toe of the South dyke



b) Low point on the top of the North-East dyke of the pound. Runoff water goes in pond.



c) Step on the rip rap North-East dyke of the pond



d) Erosion under the geomembrane, South dyke. The geomembrane is not supported and is in tension



e) A road cut two ditches. The culvert should be install, North of the principal road to the pond.

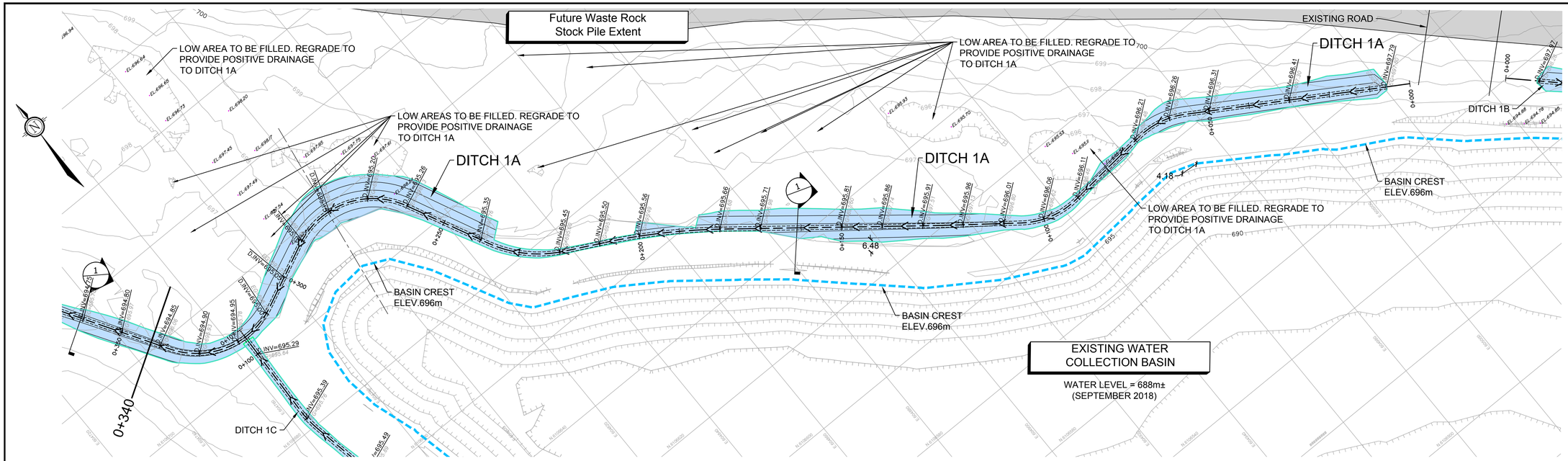


f) The toe of the South dyke, interior side, must be monitored to observe if movements appears!

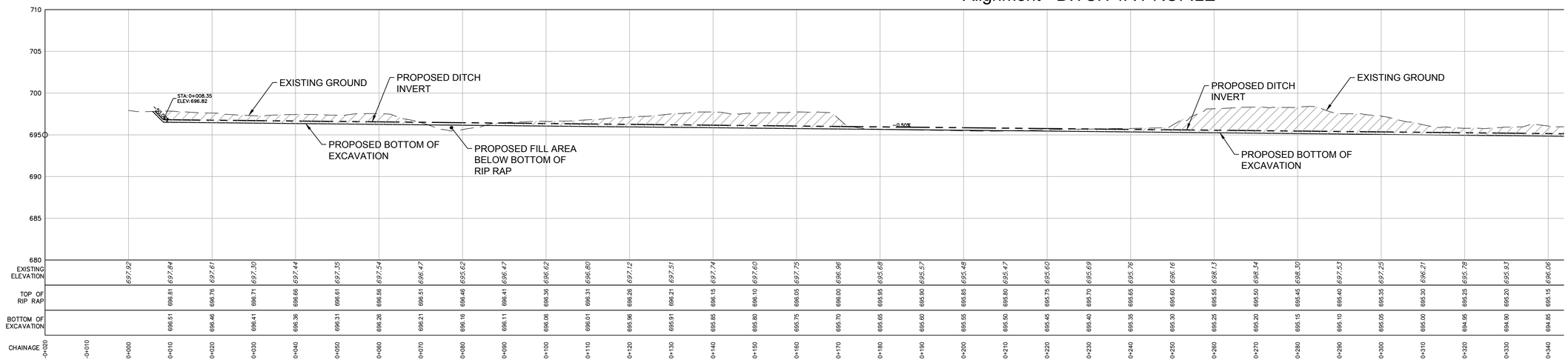


APPENDIX E

WINTERIZATION PLAN – DESIGNS PROPOSED BY WSP



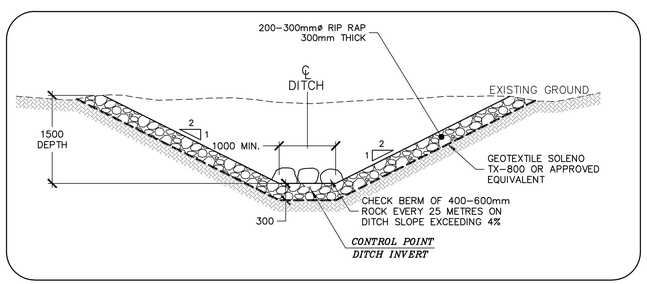
Alignment - DITCH 1A PROFILE



CHAINAGE	EXISTING ELEVATION	TOP OF RIP RAP	BOTTOM OF EXCAVATION
-0+020	697.92		
-0+010			
0+000	697.84	696.81	696.51
0+010	697.61	696.76	696.46
0+020	697.30	696.71	696.41
0+030	697.44	696.66	696.36
0+040	697.35	696.61	696.31
0+050	697.54	696.56	696.26
0+060	696.47	696.51	696.21
0+070	695.62	696.46	696.16
0+080	696.47	696.41	696.11
0+090	696.62	696.36	696.06
0+100	696.80	696.31	696.01
0+110	697.12	696.26	695.96
0+120	697.51	696.21	695.91
0+130	697.74	696.15	695.85
0+140	697.60	696.10	695.80
0+150	697.75	696.05	695.75
0+160	696.96	696.00	695.70
0+170	695.68	695.95	695.65
0+180	695.57	695.90	695.60
0+190	695.48	695.85	695.55
0+200	695.47	695.80	695.50
0+210	695.60	695.75	695.45
0+220	695.69	695.70	695.40
0+230	695.76	695.65	695.35
0+240	696.16	695.60	695.30
0+250	698.13	695.55	695.25
0+260	698.14	695.50	695.20
0+270	698.10	695.45	695.15
0+280	697.53	695.40	695.10
0+290	697.25	695.35	695.05
0+300	696.21	695.30	695.00
0+310	695.78	695.25	694.95
0+320	695.93	695.20	694.90
0+330	696.06	695.15	694.85
0+340			

NOT FOR CONSTRUCTION

PRELIMINARY
FOR DISCUSSION PURPOSES



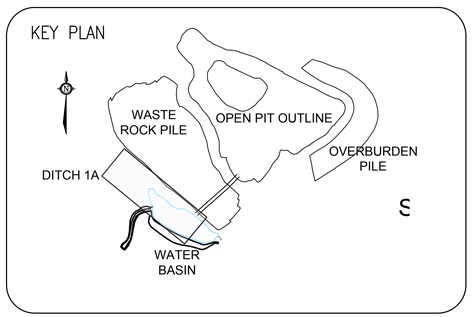
DETAIL 1 - DITCH CROSS SECTION

LEGEND

- PROPOSED DITCH
- PROPOSED DITCH EXTENT
- D.INV=693.85 — PROPOSED DITCH INVERT ELEVATION
- E=697.61 — *EXISTING GROUND ELEVATION*

NOTES:
1. NO CIRCULATION OF MACHINERY IS PERMITTED OUTSIDE DITCH EXTENTS. ALL CONSTRUCTION WORK SHALL BE UNDERTAKEN FROM THE FOOTPRINT OF THE DITCH.
2. ALL DIMENSIONS ARE TO BE OUTLINED IN THE FIELD AND APPROVED BY THE WSP REPRESENTATIVE ON SITE.
3. ALL EXCAVATED MATERIAL SHALL BE HAULED FROM THE DITCHING SITE TO THE OVERBURDEN DUMP.

KEY PLAN



CLIENT: TATA STEEL

CLIENT REF. #:

PROJECT:
GOODWOOD PIT
WATER MANAGEMENT

CONSULTANT:
wsp
4502 HANNA DRIVE,
BROCKVILLE (ONTARIO)
CANADA K6T 1A9
TEL.: 613 342-8300 | FAX: 613 342-9400
wsp.com

SEAL:

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THIS DRAWING IS NOT TO BE SCALED.

ISSUED FOR – REVISION:

IS	RE.	DATE (M/D/Y)	DESCRIPTION
C		10/31/18	ADJUSTED DITCH LOCATION
B		10/30/18	ADJUSTED DITCH LOCATION
A		10/29/18	PRELIMINARY FOR DISCUSSION

PROJECT NO: 181-04033-03
ORIGINAL SCALE: 1:500 (ARCH D SHEET)
DESIGNED BY: G.HOOGWERF
DRAWN BY: G.HOOGWERF
CHECKED BY: DAVID COLLINS-FEKETE
APPROVED BY: CHRISTIAN HOULE

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm

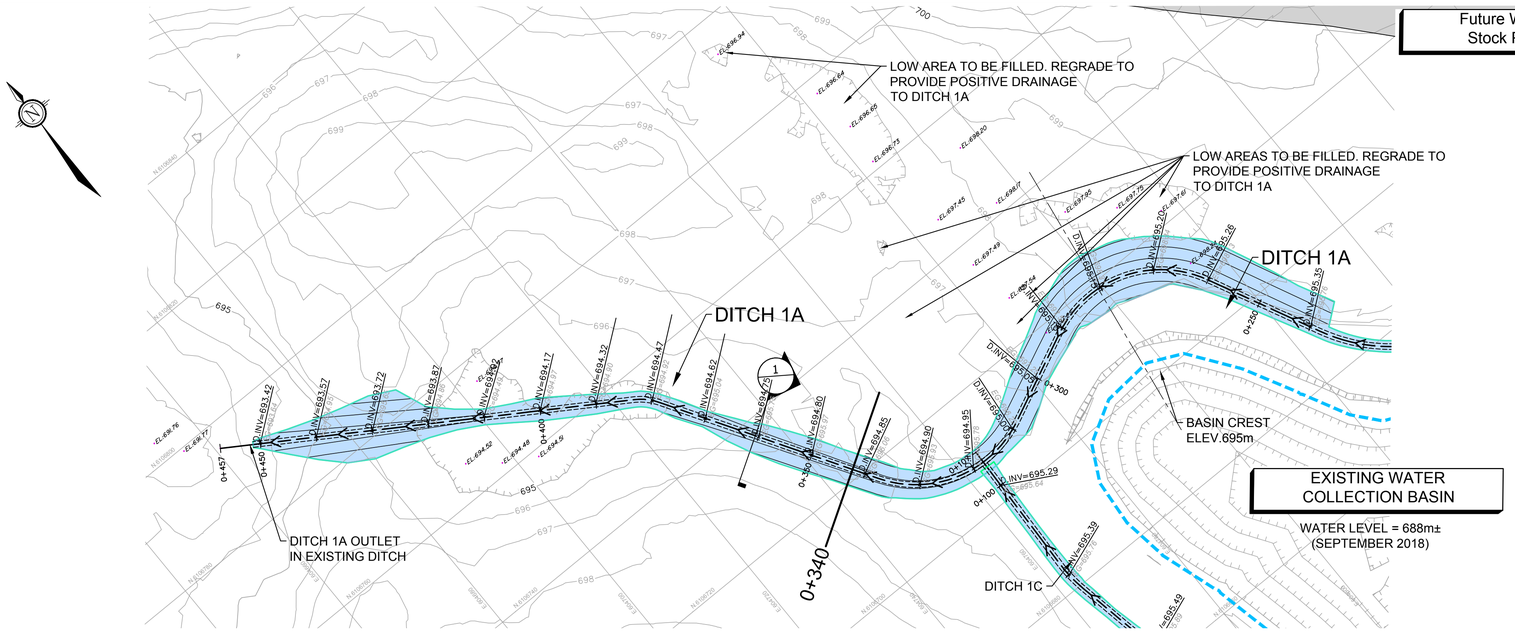
DISCIPLINE: MINING

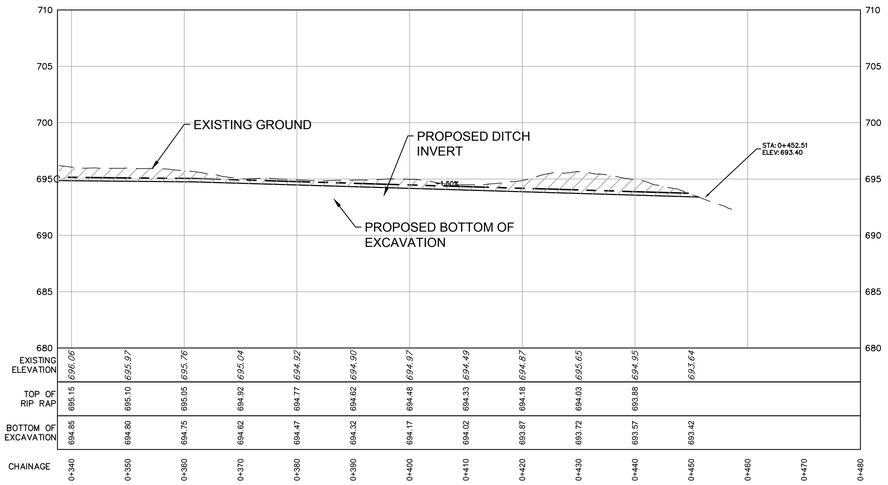
TITLE:
SITE PLAN
GOODWOOD PIT
PROPOSED DRAINAGE DITCH

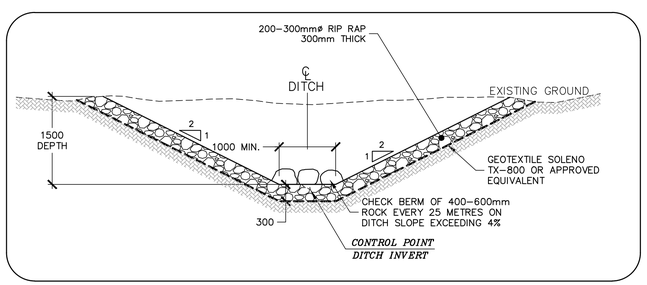
DOCUMENT NUMBER: 181-04033-DC1a
SHEET #: 1 OF ?
ISSUE: ADJUSTED DITCH LOCATION
DATE OF: OCTOBER 31, 2018
REV #: C

L:\2018\JOB-#4033-03 TSMC GOODWOOD\DC\CAD\DITCH CONSTRUCTION\BOOTS-DITCH 1A-BLICK01.DWG By: GARRET.HOOGWERF

LAST EDITED: 10/31/2018 1:32 PM







DETAIL 1 - DITCH CROSS SECTION

LEGEND

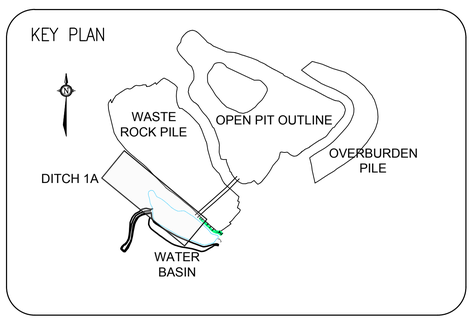
- PROPOSED DITCH
- PROPOSED DITCH EXTENT
- D.INV=693.85 — PROPOSED DITCH INVERT ELEVATION
- EG=697.61 — *EXISTING GROUND ELEVATION*

NOTES:
1. NO CIRCULATION OF MACHINERY IS PERMITTED OUTSIDE DITCH EXTENTS. ALL CONSTRUCTION WORK SHALL BE UNDERTAKEN FROM THE FOOTPRINT OF THE DITCH.
2. ALL DIMENSIONS ARE TO BE OUTLINED IN THE FIELD AND APPROVED BY THE WSP REPRESENTATIVE ON SITE.
3. ALL EXCAVATED MATERIAL SHALL BE HAULED FROM THE DITCHING SITE TO THE OVERBURDEN DUMP.

NOT FOR CONSTRUCTION

PRELIMINARY
FOR DISCUSSION PURPOSES

KEY PLAN



CLIENT: TATA STEEL

CLIENT REF. #:

PROJECT:
GOODWOOD PIT
WATER MANAGEMENT

CONSULTANT:
wsp
4502 HANNA DRIVE,
BROCKVILLE (ONTARIO)
CANADA K6T 1A9
TEL.: 613 342-8300 | FAX: 613 342-9400
wsp.com

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ISSUED FOR – REVISION:

IS	RE	DATE (M/D/Y)	DESCRIPTION
C		10/31/18	ADJUSTED DITCH LOCATION
B		10/30/18	ADJUSTED DITCH LOCATION
A		10/29/18	PRELIMINARY FOR DISCUSSION

PROJECT NO: 181-04033-03
ORIGINAL SCALE: 1:500 (ARCH D SHEET)
DESIGNED BY: G.HOOGWERF
DRAWN BY: G.HOOGWERF
CHECKED BY: DAVID COLLINS-FEKETE
APPROVED BY: CHRISTIAN HOULE

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm

DISCIPLINE: MINING

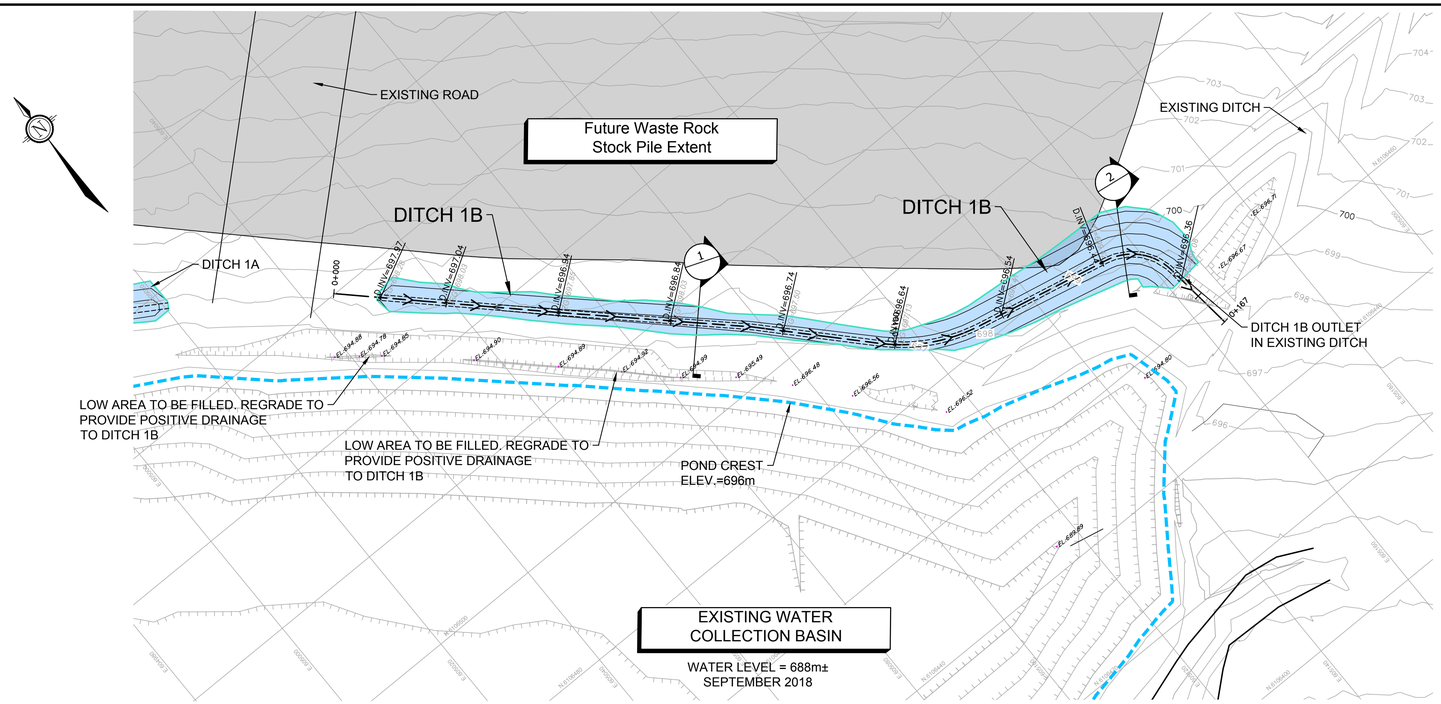
TITLE:
SITE PLAN
GOODWOOD PIT
PROPOSED DRAINAGE DITCH

DOCUMENT NUMBER: 181-04033-DC1b
SHEET #: 1 OF ?

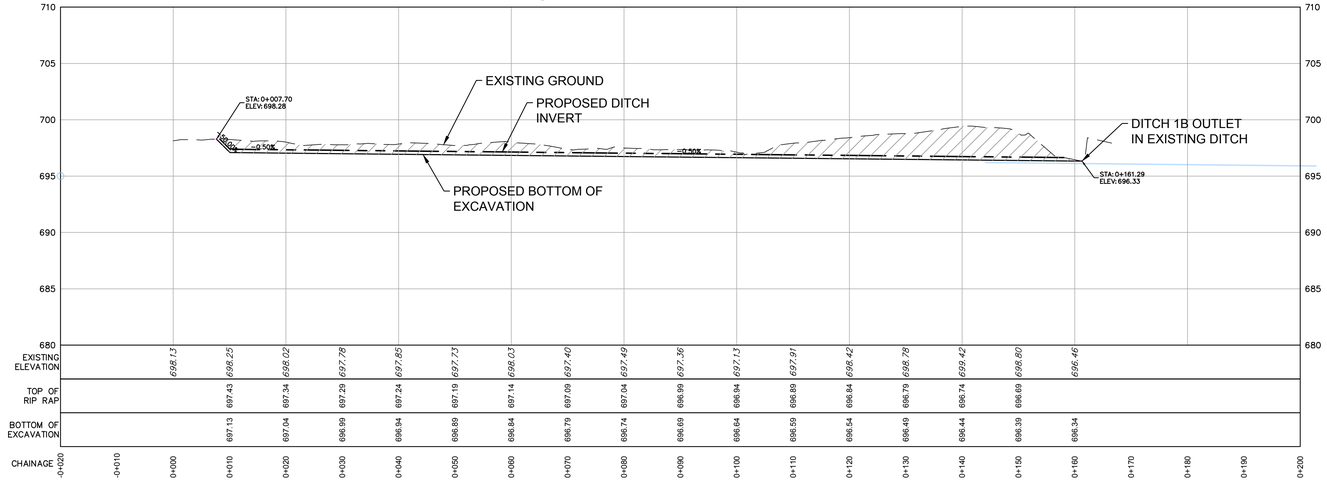
ISSUE: ADJUSTED DITCH LOCATION
DATE OF: OCTOBER 31, 2018
REV #: C

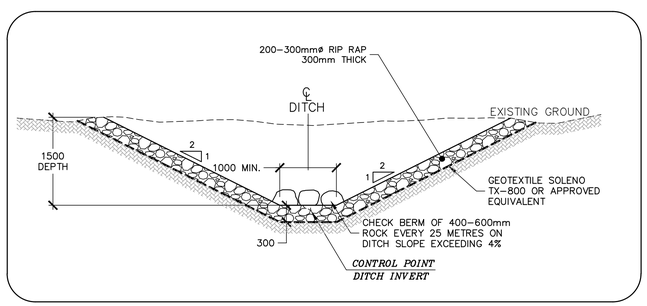
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LAST EDITED: 10/31/2018 1:32 PM

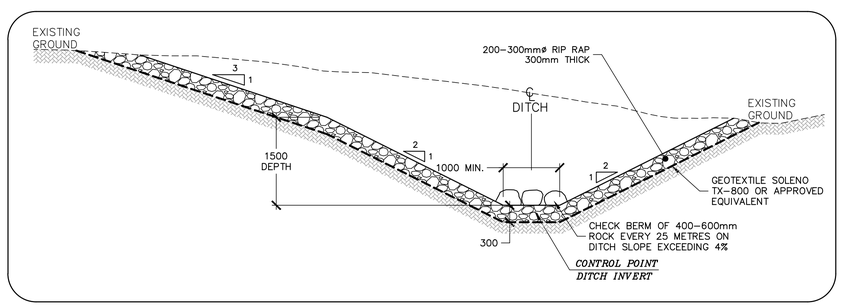


Alignment - DITCH 1B PROFILE





DETAIL 1 - DITCH CROSS SECTION



DETAIL 2 - DITCH CROSS SECTION

LEGEND

- PROPOSED DITCH
- PROPOSED DITCH EXTENT
- D.INV=693.85 PROPOSED DITCH INVERT ELEVATION
- EG=697.61 *EXISTING GROUND ELEVATION*

NOTES:

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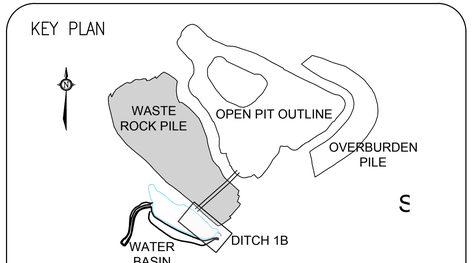
LIMITATION NOTES:

1. THE TEMPORARY WORK OUTLINED ON THESE PLANS ARE INTENDED TO MITIGATE THE RISK OF FURTHER DAMAGES TO THE ACCUMULATION BASIN FROM RUNOFF DURING THE 2019 SPRING THAW, PRIOR TO THE REPARATION WORK OF THE BASIN.
2. THE EFFICIENCY OF THE TEMPORARY WORK IS STRONGLY DEPENDENT ON MEASURES TAKEN BY TSMC AT THE SPRING THAW 2019 TO ENABLE THE DRAINAGE NETWORK, SUCH AS SNOW REMOVAL FROM THE DITCHES.
3. THE TEMPORARY MEASURES ARE INTENDED TO HAVE A 1-YEAR LIFE SPAN
4. THE DESIGN AND CONSTRUCTION OF A PERMANENT SOLUTION MIGHT REQUIRE TO MODIFY OR REMOVE PARTS OR ALL OF THE TEMPORARY MEASURES.
5. DESIGN WAS UNDERTAKEN USING LIMITED DATA AND THUS, WSP CANNOT GUARANTEE THE EFFICIENCY OF THE TEMPORARY MEASURES OUTLINED ON THE PLANS FOR THE PROTECTION OF THE ACCUMULATION BASIN.
6. WSP UNDERTOOK THE DESIGN BASED ON THE HYPOTHESIS THAT TSMC HAS THE REQUIRED AUTHORIZATIONS FROM THE ENVIRONMENTAL AUTHORITIES.

PRELIMINARY
FOR DISCUSSION PURPOSES

NOT FOR CONSTRUCTION

KEY PLAN



CLIENT: TATA STEEL

CLIENT REF. #:

PROJECT:
GOODWOOD PIT
WATER MANAGEMENT

CONSULTANT:
wsp
4502 HANNA DRIVE,
BROCKVILLE (ONTARIO)
CANADA K6T 1A9
TEL.: 613 342-8300 | FAX: 613 342-9400
wsp.com

SEAL:

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ISSUED FOR – REVISION:

IS	RE	DATE (M/D/Y)	DESCRIPTION
C		10/31/18	ADJUSTED DITCH LOCATION
B		10/30/18	ADJUSTED DITCH LOCATION
A		10/29/18	PRELIMINARY FOR DISCUSSION

PROJECT NO: 181-04033-03
ORIGINAL SCALE: 1:500 (ARCH D SHEET)
DESIGNED BY: G.HOOGWERF
DRAWN BY: G.HOOGWERF
CHECKED BY: DAVID COLLINS-FEKETE
APPROVED BY: CHRISTIAN HOULE

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25mm

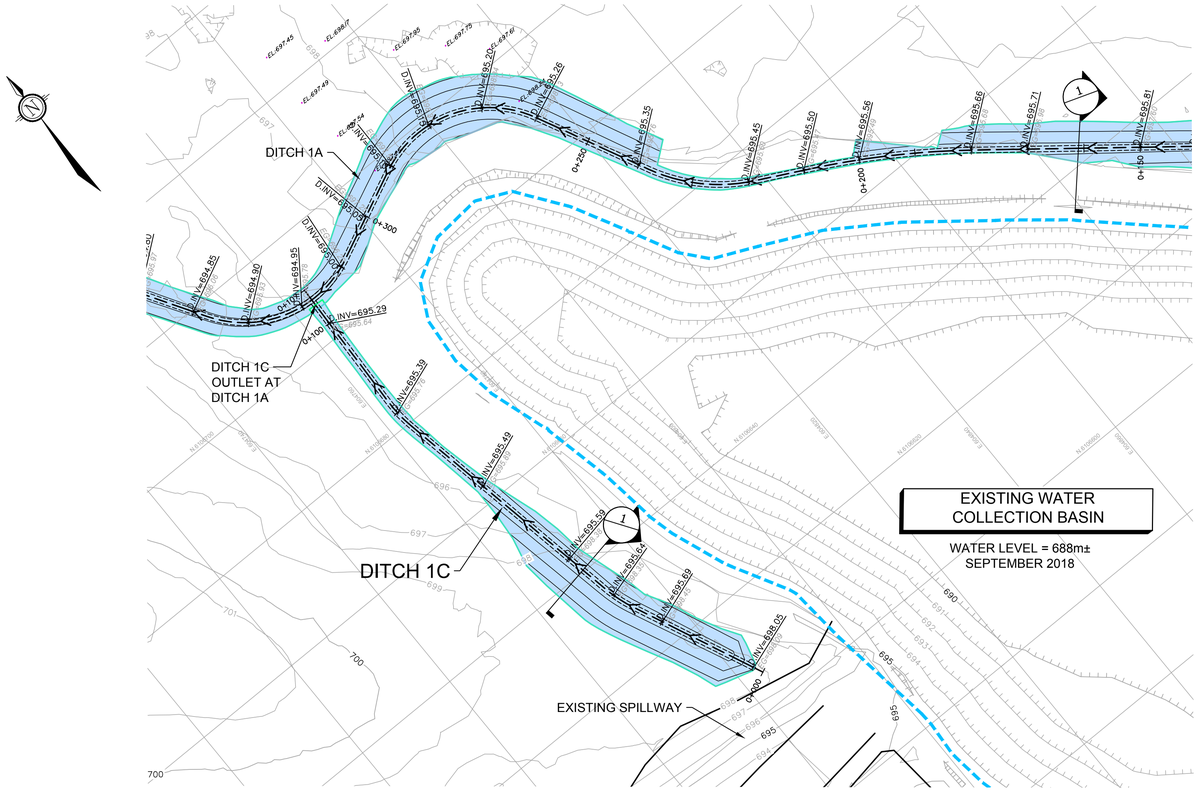
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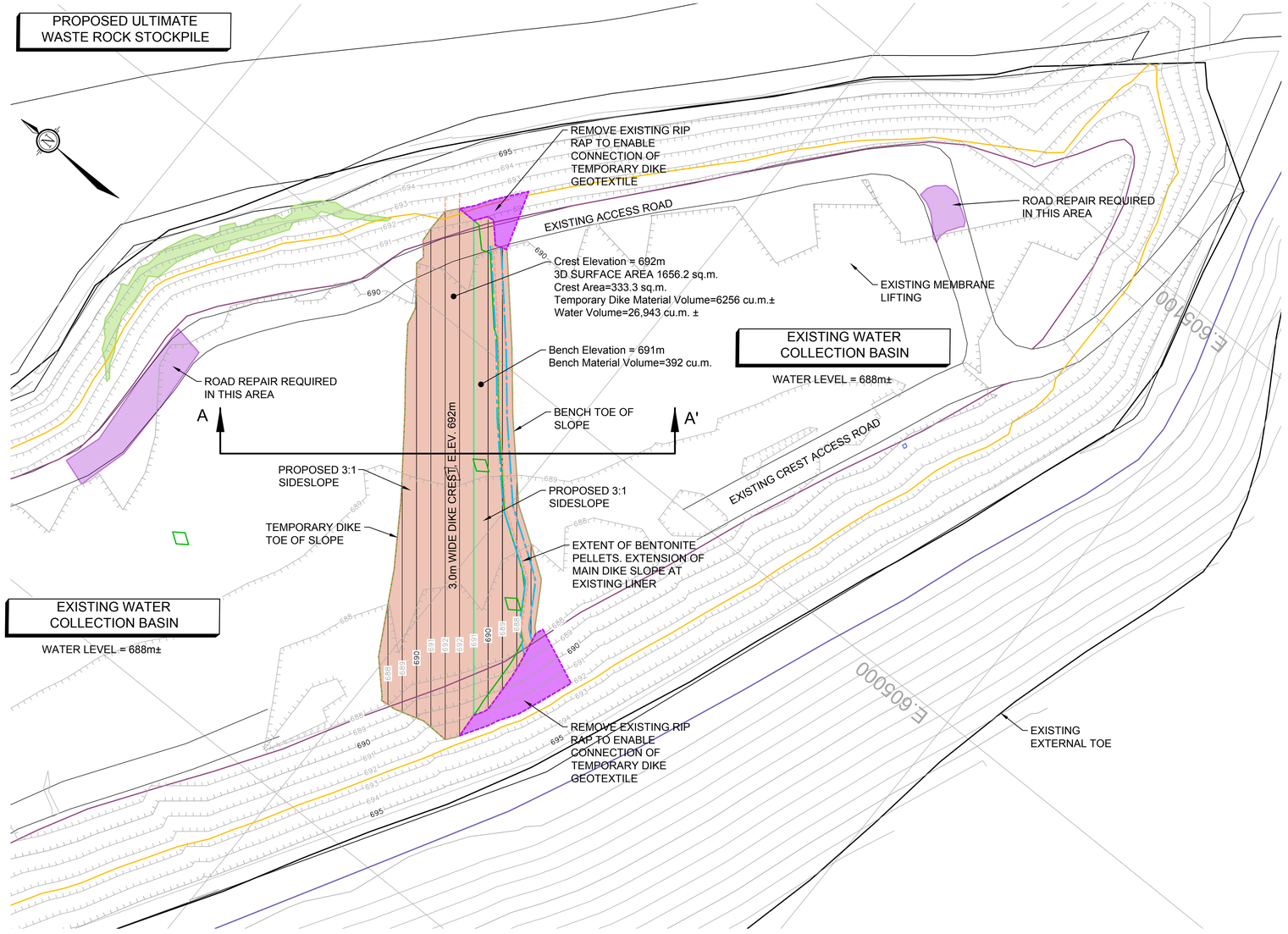
TITLE:
SITE PLAN
GOODWOOD PIT
PROPOSED DRAINAGE DITCH 1B

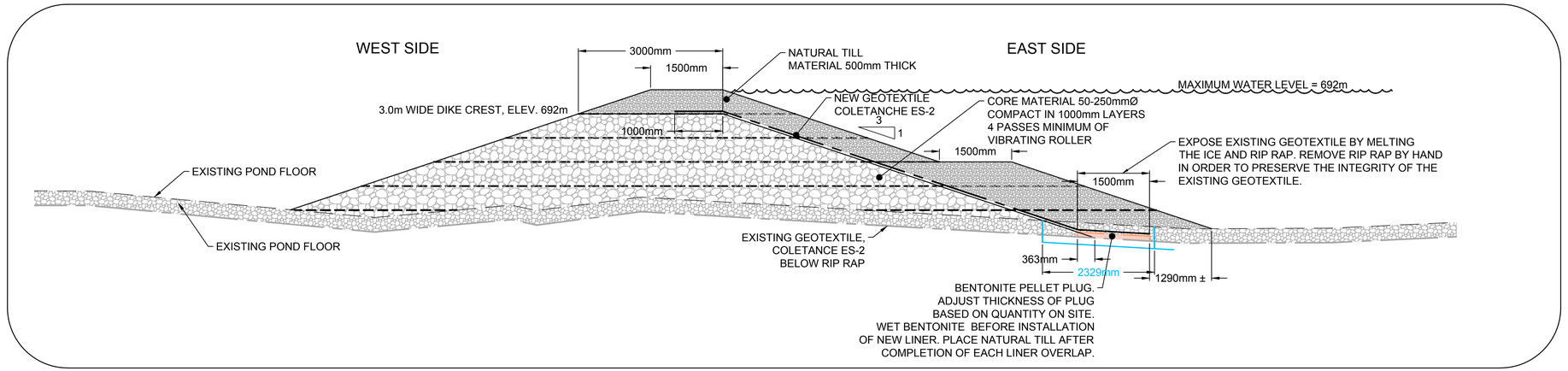
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SHEET #: 3 OF ?
ISSUE: ADJUSTED DITCH LOCATION
DATE OF: OCTOBER 31, 2018
REV #: C

L:\2018\4B-04033-03 TSMC-GOODWOOD\05-CAD\PTH CONSTRUCTION-INSTS-DITCH 1A-4B-C.DWG BY: GARNET.HOOGWERF

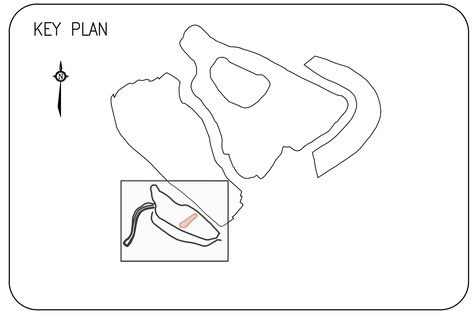
LAST EDITED: 10/31/2018 1:32 PM


DITCH 1A
DITCH 1C
OUTLET AT
DITCH 1A
DITCH 1C
EXISTING SPILLWAY
EXISTING WATER
COLLECTION BASIN
WATER LEVEL = 688m±
SEPTEMBER 2018
0+300
0+100
0+250
0+200
0+150
0+000
INV=694.85
INV=694.90
INV=694.95
INV=695.29
INV=695.39
INV=695.49
INV=695.59
INV=695.69
INV=695.79
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EL=699.34
EL=699.38
EL=699.42
EL=699.46
EL=699.50
EL=699.54
EL=699.58
EL=699.62
EL=699.66





SECTION A-A' SCALE 1:250



NOT FOR CONSTRUCTION

PRELIMINARY

FOR DISCUSSION PURPOSES

NOTES:

1. THERE SHALL BE NO CIRCULATION OF CONSTRUCTION EQUIPMENT, MACHINERY OR TRUCKS PERMITTED ON DIKE/POND MATERIAL 1 METRE THICK OR LESS.
2. FIRST LIFT OF 50-250mm MATERIAL PLACED WILL BE 1000mm THICK. SUBSEQUENT LIFTS PLACED WILL BE 500mm THICK. MATERIAL PLACED SHALL BE COMPACTED WITH 6 PASSES OF A 10 TON STATIC ROLLER. NO VIBRATING ROLLER IS PERMITTED.
3. THE PORTION OF THE EXISTING POND WHERE THE BENTONITE PELLETS ARE PLACED NEEDS TO BE CLEARED OF SNOW, ICE, WATER AND RIP RAP TO EXPOSE THE EXISTING POND COLTANCHE ES-2 LINER. AS LINER IS EXPOSED, COVER WITH INSULATED TARPS UNTIL NEW DIKE LINER IS CONNECTED.
4. ALL OTHER AREAS OF THE NEW DIKE FOOTPRINT, SNOW SHOULD BE REMOVED PRIOR TO PLACEMENT OF NATURAL TILL MATERIAL. NO EQUIPMENT IS ALLOWED ON THE POND FLOOR UNTIL THERE IS 1.0 METRE OF COMPACTED NATURAL TILL MATERIAL.
5. GEOTEXTILE CLAY LINER OVERLAPS WILL BE DETERMINED FOLLOWING THE INSPECTION OF THE FIRST LAYERS OF THE ROLLS. MINIMUM OVERLAP SHALL BE 600mm.
6. ICE SHOULD BE EXPECTED IN THE ZONE OF BENTONITE PELLETS. THAWING SHOULD COMMENCE AS SOON AS POSSIBLE USING DIESEL OR PROPANE HEATERS AND AN ENCLOSURE OF INSULATED TARPS.

CLIENT: TATA STEEL

CLIENT REF. #:

PROJECT:

GOODWOOD PIT
WATER MANAGEMENT

CONSULTANT:

wsp
4502 HANNA DRIVE,
BROCKVILLE (ONTARIO)
CANADA K6T 1A9
TEL.: 613 342-8300 | FAX: 613 342-9400
wsp.com

SEAL:

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THIS DRAWING IS NOT TO BE SCALED.

ISSUED FOR – REVISION:

IS	RE	DATE (M/D/Y)	DESCRIPTION
A		11/2/18	PRELIMINARY FOR DISCUSSION

PROJECT NO: 181-04033-03

ORIGINAL SCALE: 1:500 (ARCH D SHEET)

DESIGNED BY: G.HOOGWERF

DRAWN BY: G.HOOGWERF

CHECKED BY: DAVID COLLINS-FEKETE

APPROVED BY: CHRISTIAN HOULE

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

DISCIPLINE: MINING

TITLE:

SITE PLAN
GOODWOOD PIT
PROPOSED BASIN DIKE

DOCUMENT NUMBER: 181-04033-BD1

SHEET #: 1 OF ?

ISSUE: PRELIMINARY FOR DISCUSSION

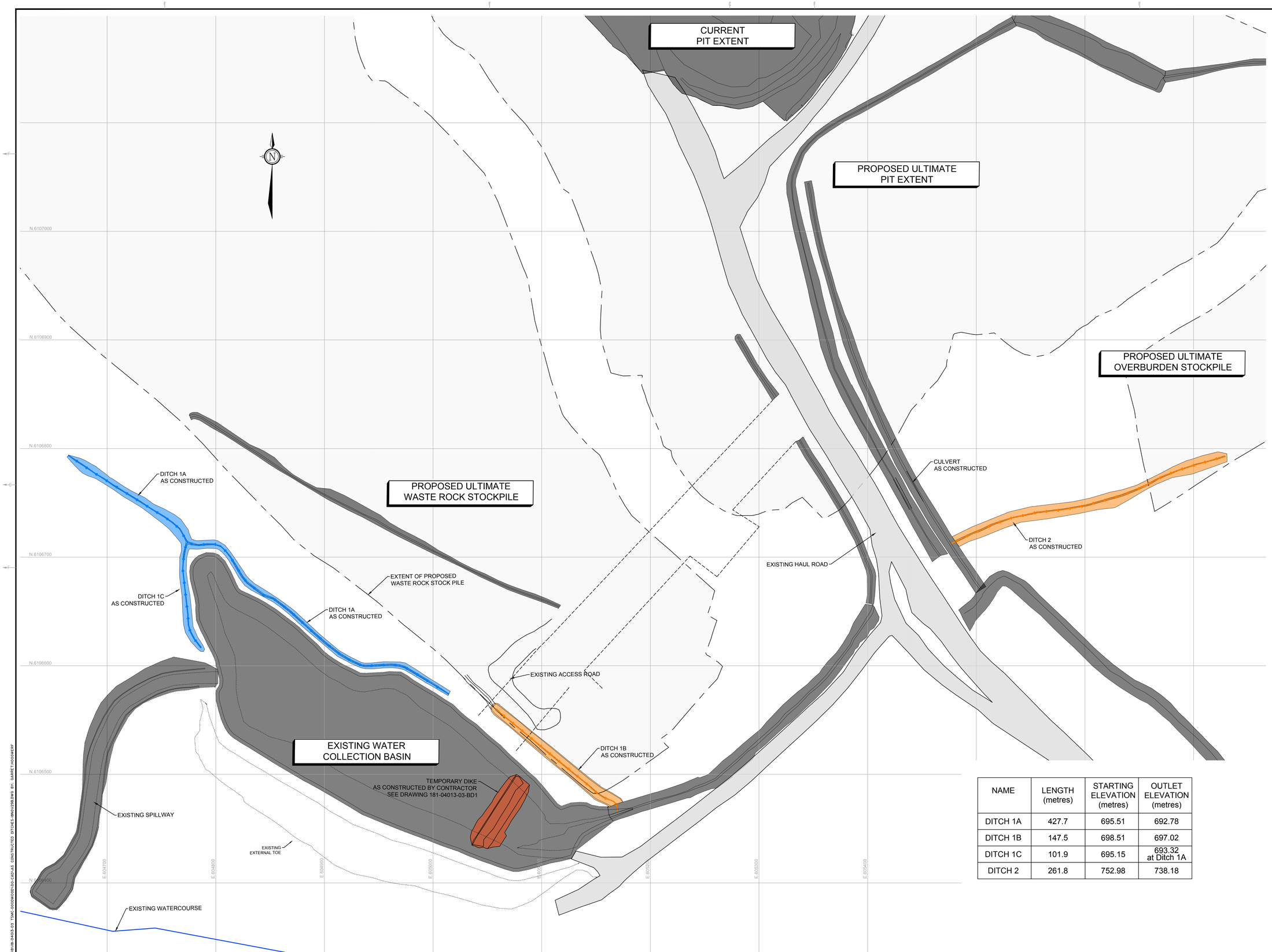
DATE OF: NOVEMBER 2, 2018

REV # A

C:\JOBS\WSP\181-04033-03 TSMC-GOODWOOD\05-CAD\181SPA DWG AT FROM ALL 3-1 SLOPE WAS BUILT SURFACE (BNV2).DWG BY: GARRETHOOGWERF
LAST EDITED: 11/2/2018 11:41 AM

APPENDIX F

WINTERIZATION PLAN – AS BUILT



NAME	LENGTH (metres)	STARTING ELEVATION (metres)	OUTLET ELEVATION (metres)
DITCH 1A	427.7	695.51	692.78
DITCH 1B	147.5	698.51	697.02
DITCH 1C	101.9	695.15	693.32 at Ditch 1A
DITCH 2	261.8	752.98	738.18

CLIENT:

TATA STEEL

CLIENT REF. #:

PROJECT:

GOODWOOD PIT
WATER MANAGEMENT

CONSULTANT:

wsp
1175, boul. LEBOURNEUF,
bureau 300
QUEBEC (QUEBEC)
CANADA G2K 0B4
TEL.: 418 780-0878 | FAX: 418 780-4182
wsp.com

SEAL:

GENERAL NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE.
2. INFORMATION PRESENTED IS PRELIMINARY ONLY AND NOT INTENDED FOR CONSTRUCTION.
3. COORDINATES AND THE GRID SHOWN REFER TO NORTH AMERICAN DATUM 1983, NAD83 UTM ZONE 19 (CSRS.UTM-19N)
4. ELEVATIONS SHOWN USES CANADIAN GEODETIC VERTICAL DATUM CGVD1928 **OR** CGVD2013
5. THE PLOT SIZE THAT WILL PROVIDE TRUE SCALE AND OPTIMUM READABILITY FOR THIS PLAN IS AN ARCH D (24x36) SHEET.
6. A PDF DOCUMENT OF THIS PLAN WILL BE AN APPROXIMATE SCALE.

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ISSUED FOR – REVISION:

IS	RE	DATE (M/D/Y)	DESCRIPTION
A		11/29/18	AS CONSTRUCTED BY CONTRACTOR

PROJECT NO: 181-04013-03
ORIGINAL SCALE: 1:1500 (ARCH D SHEET)
DESIGNED BY: .
DRAWN BY: G.HOOGWERF
CHECKED BY: DAVID COLLINS-FEKETE
APPROVED BY: CHRISTIAN HOULE

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm

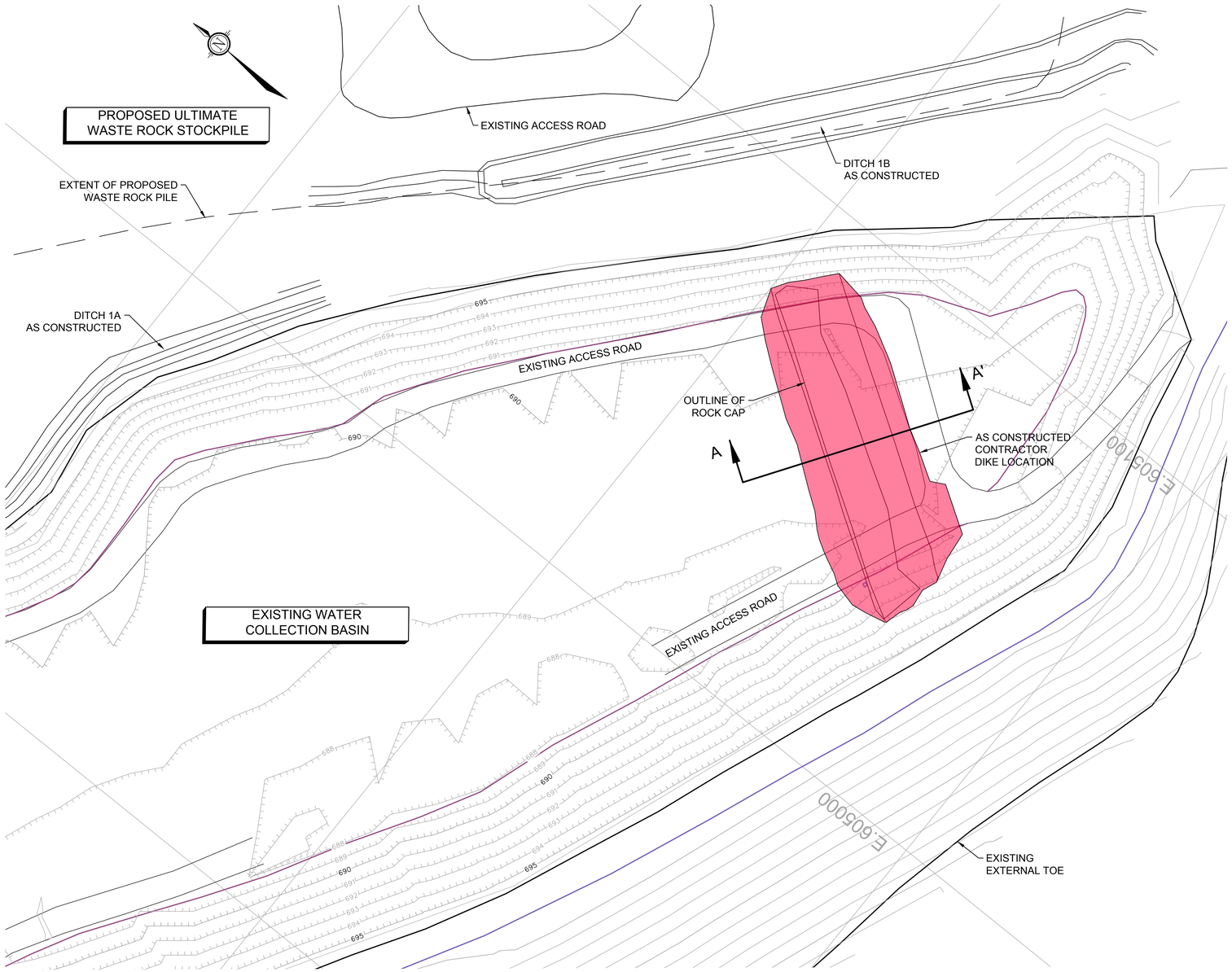
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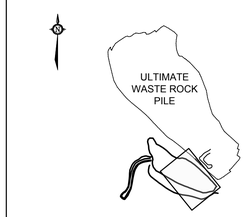
GOODWOOD SITE
DITCHES
AS CONSTRUCTED

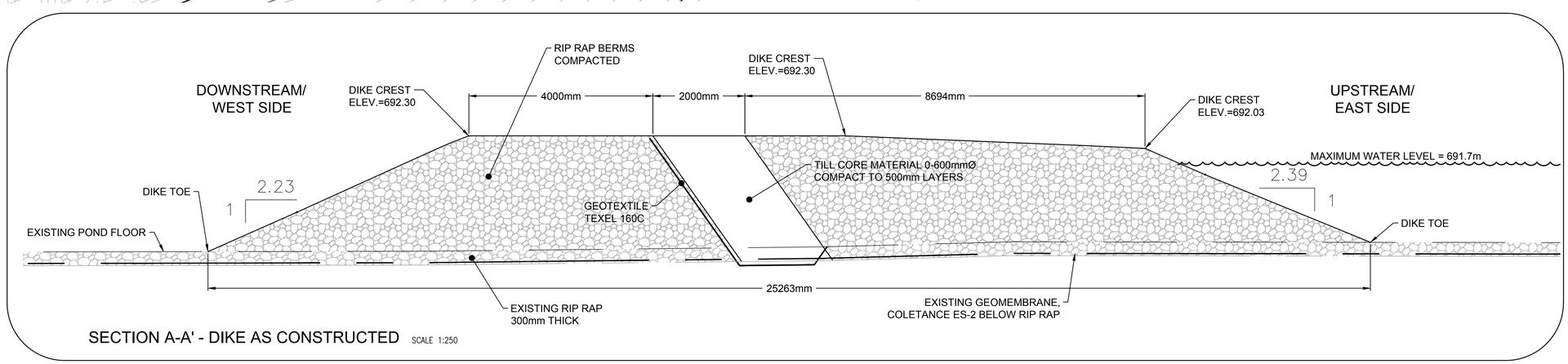
DOCUMENT NUMBER: 181-04013--03-BD2
SHEET #: 2 OF 2
ISSUE: AS CONSTRUCTED BY CONTRACTOR
REV #: A
DATE OF: NOVEMBER 29, 2018

C:\2018\18-04013-03 TSMC-GOODWOOD\VOL-CAD\AS CONSTRUCTED DITCHES-IN\GV2018.DWG BY: GARNET.HOOGWERF
LAST EDITED: 11/29/2018 3:56 PM



KEY PLAN





SECTION A-A' - DIKE AS CONSTRUCTED SCALE 1:250

CLIENT:

TATA STEEL

CLIENT REF. #:

PROJECT:

GOODWOOD PIT
WATER MANAGEMENT

CONSULTANT:

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1175, boul. LEBOURNEUF,
bureau 300
QUEBEC (QUEBEC)
CANADA G2K 0B4
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SEAL:

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ISSUED FOR – REVISION:

IS	RE	DATE (M/D/Y)	DESCRIPTION
D		11/29/18	DIKE LOCATION AS CONSTRUCTED
C		11/9/18	ADDED CONTRACTOR DIKE LOCATION
B		11/6/18	ISSUED FOR CONSTRUCTION
A		11/2/18	PRELIMINARY FOR DISCUSSION

PROJECT NO:	181-04033-03
ORIGINAL SCALE:	1:500 (ARCH D SHEET)
DESIGNED BY:	G.HOOGWERF
DRAWN BY:	G.HOOGWERF
CHECKED BY:	DAVID COLLINS-FEKETE
APPROVED BY:	CHRISTIAN HOULE

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DISCIPLINE: MINING

TITLE:

GOODWOOD SITE
TEMPORARY DIKE IN THE
ACCUMULATION BASIN
AS CONSTRUCTED

DOCUMENT NUMBER:

181-04013-03-BD1

SHEET #: 1 OF 2

ISSUE: AS CONSTRUCTED BY CONTRACTOR

DATE OF: NOVEMBER 28, 2018

REV # D

L:\2018\18-04033-03 TSMC-GOODWOOD\00-CAD\BASE DWG AS CONSTRUCTED 691M-MSV29.DWG By: dubret.HOOGWERF

LAST EDITED: 11/29/2018 10:50 AM

APPENDIX G

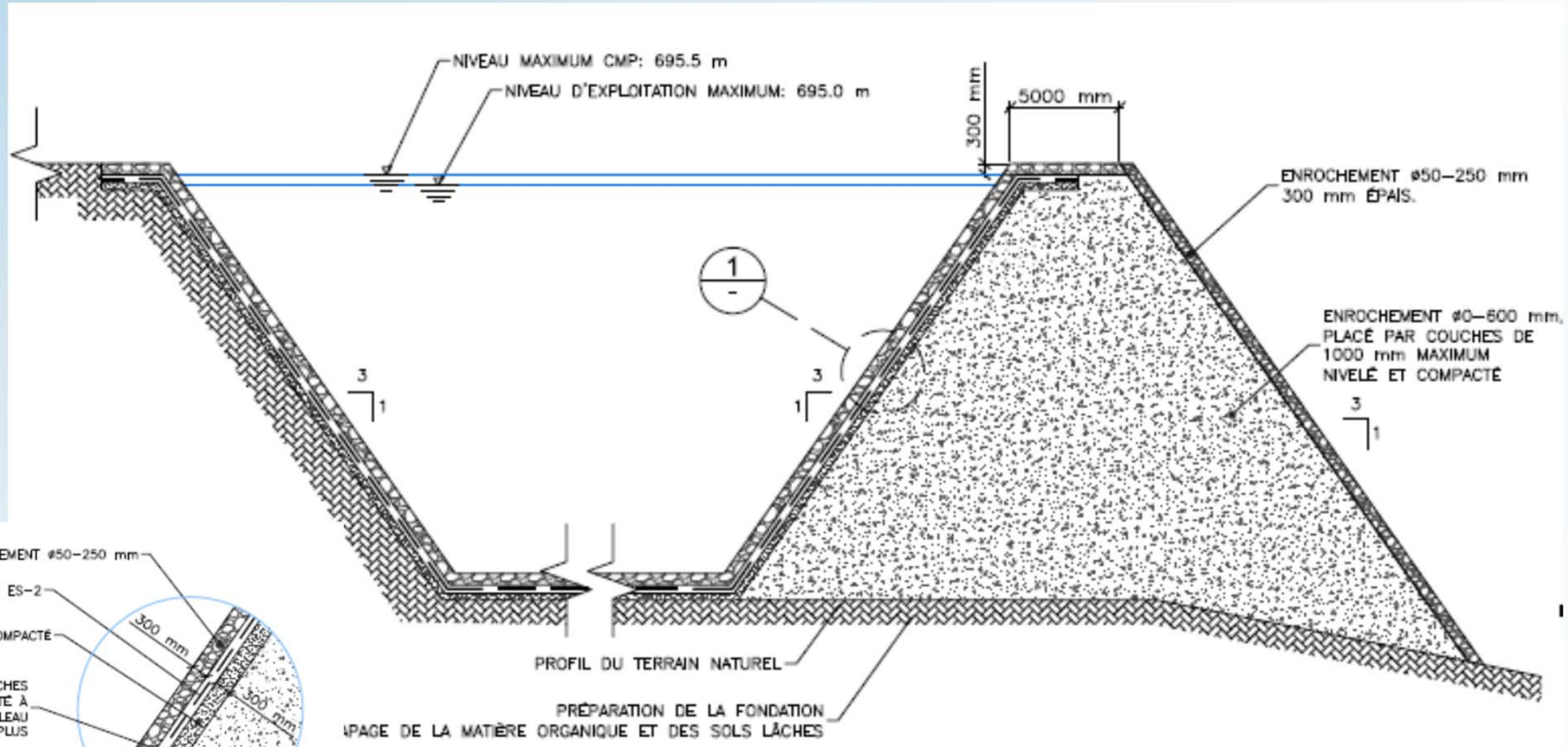
RISK MANAGEMENT PRESENTATION

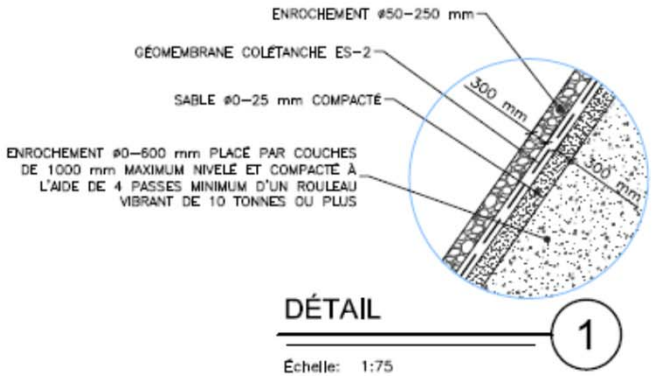
TSMC Brief 6th of November 2018

List of subjects

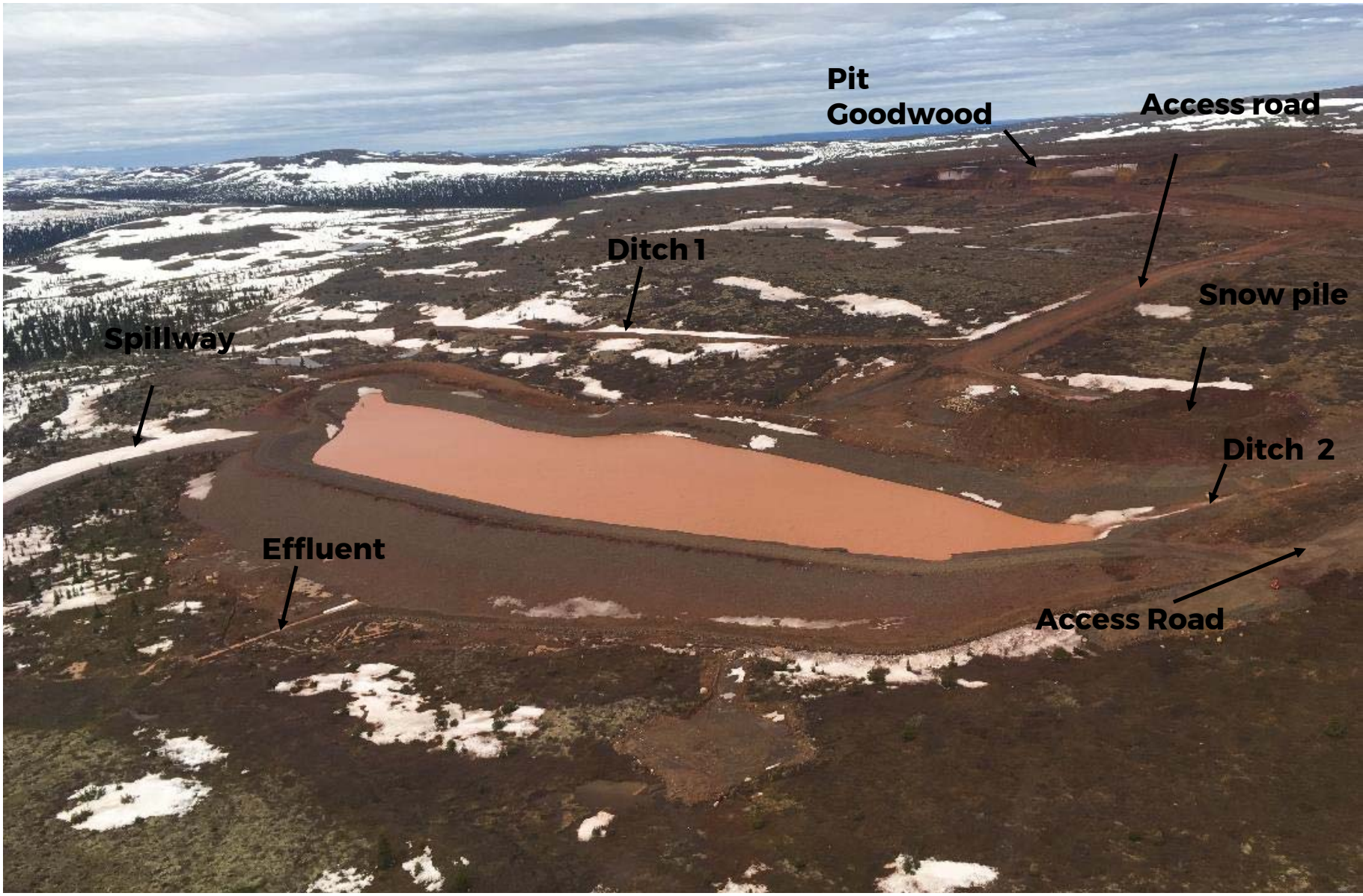
- Context
- Spring 2018 problematics
- Proposed wintering plan
  - *Drainage ditches*
  - *Temporary dike for buffer volume*
  - *Water management procedure for spring 2019*
- Risks of the wintering plan
  - *Overtopping the temporary dike*
  - *Further breaking of the geomembrane*
  - *Waterproofness of the temporary bassin*
- Questions and comments

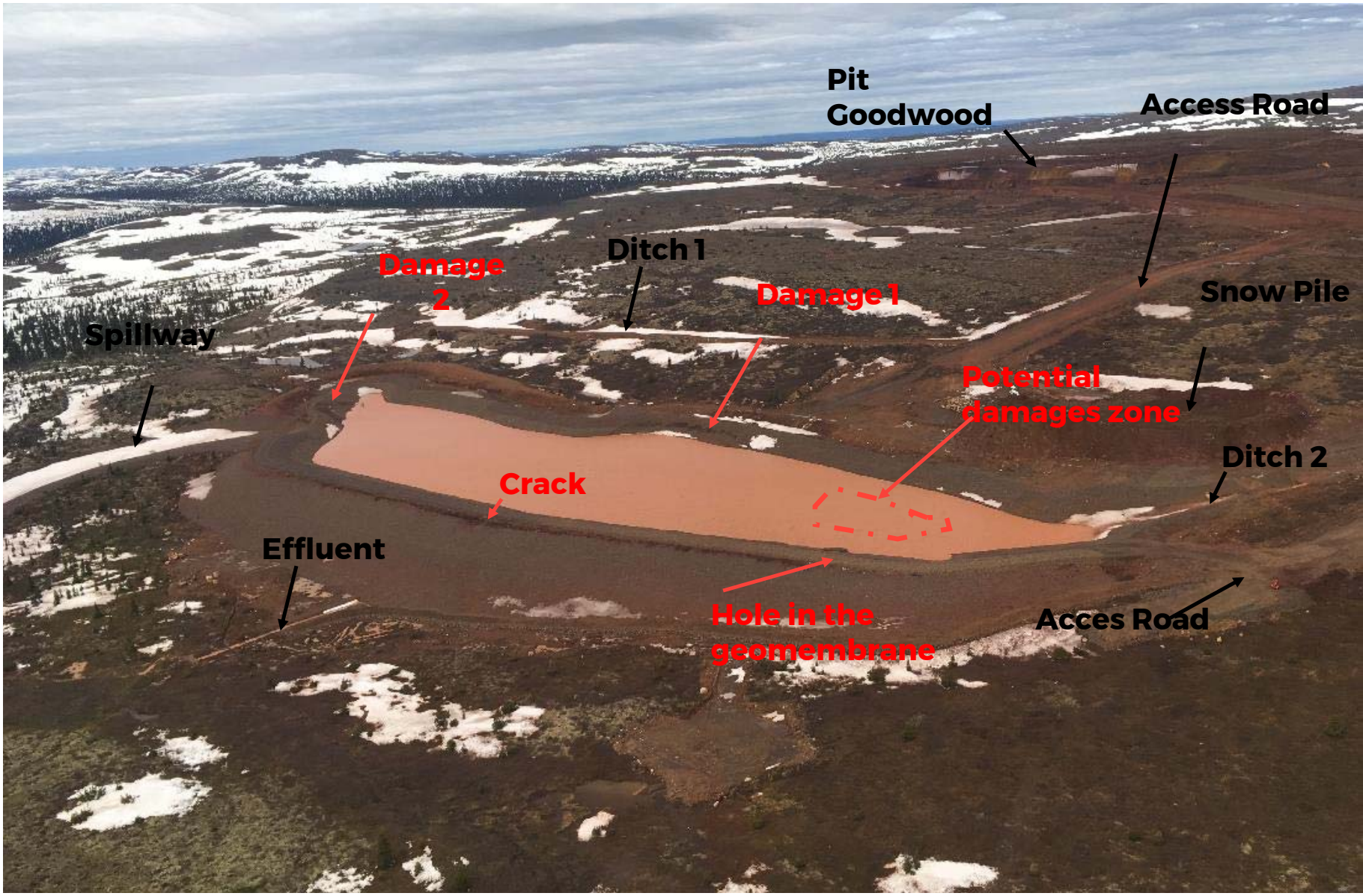
Accumulation basin – As-built detail





Problematics

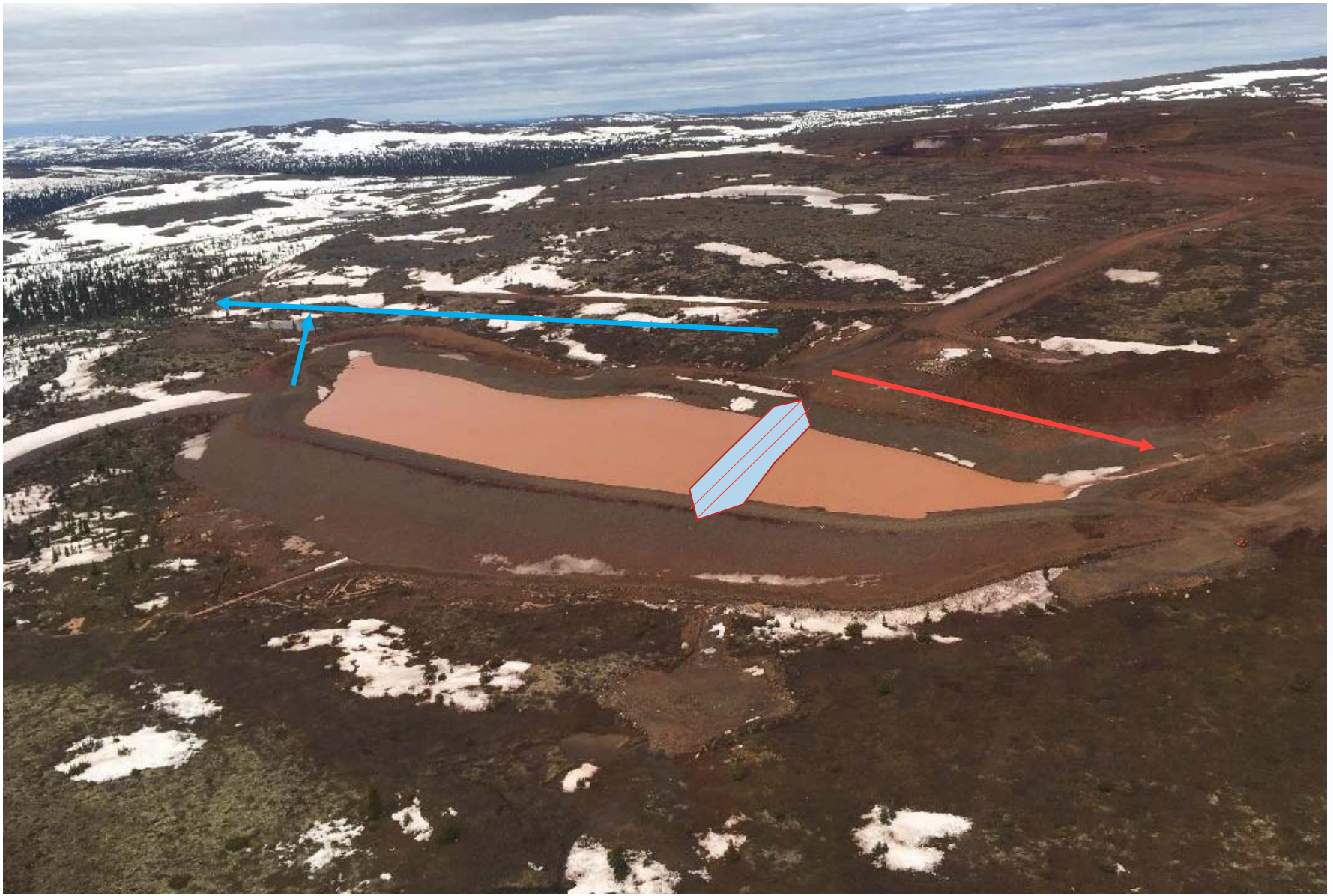

Pit
Goodwood
Access road
Ditch 1
Snow pile
Spillway
Ditch 2
Effluent
Access Road


Pit
Goodwood
Access Road
Ditch 1
Damage
2
Damage 1
Snow Pile
Spillway
Potential
damages zone
Ditch 2
Crack
Effluent
Hole in the
geomembrane
Acces Road

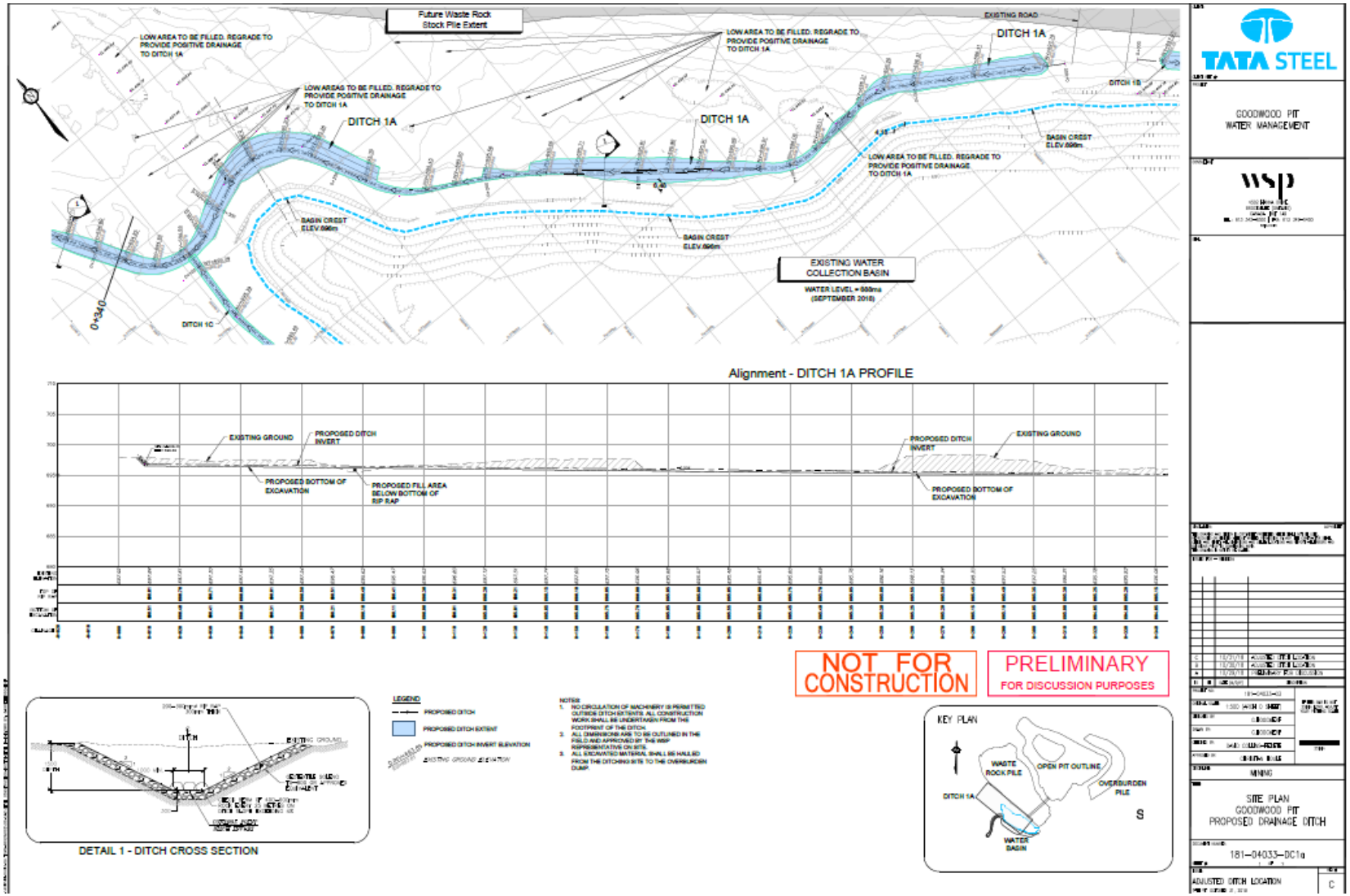
Wintering plan

General concept

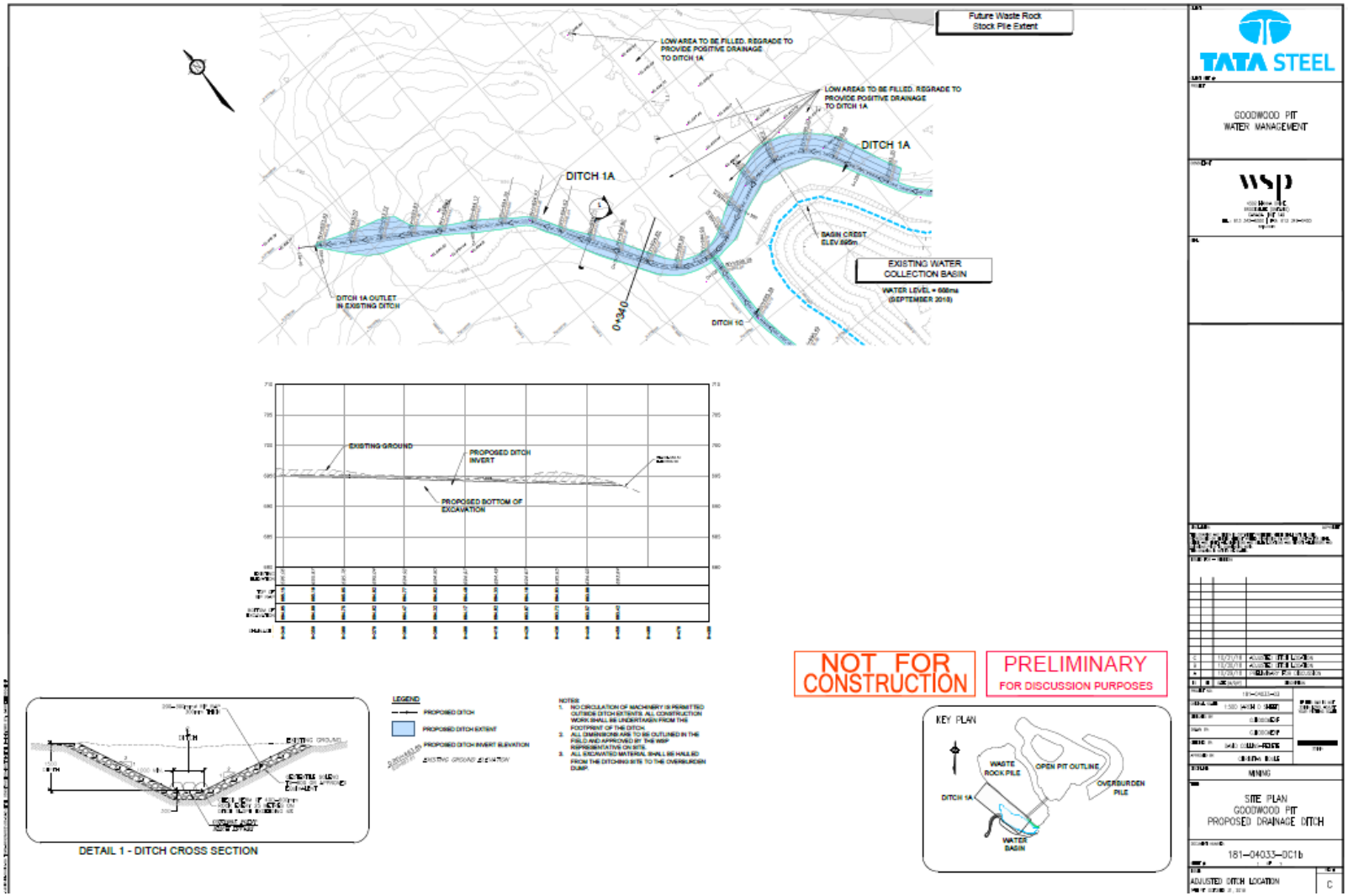
- Temporary dike
- Drainage ditches



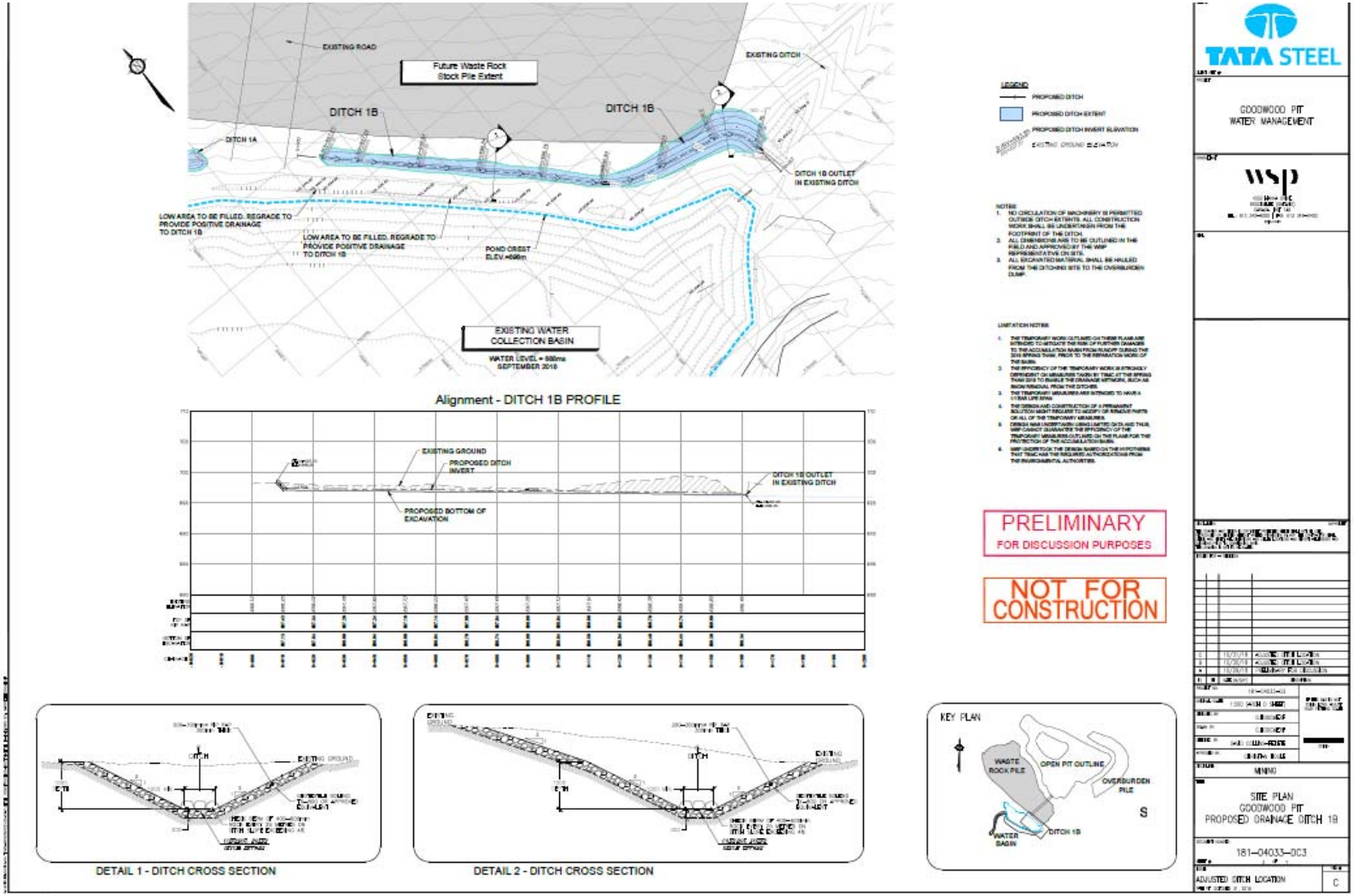
Ditch – 1A


Future Waste Rock Stock Pile Extent
EXISTING ROAD
DITCH 1A
DITCH 1B
DITCH 1C
LOW AREA TO BE FILLED. REGRADE TO PROVIDE POSITIVE DRAINAGE TO DITCH 1A
BASIN CREST ELEV.696m
EXISTING WATER COLLECTION BASIN
WATER LEVEL = 688ms (SEPTEMBER 2018)
0+340
Alignment - DITCH 1A PROFILE
EXISTING GROUND
PROPOSED DITCH INVERT
PROPOSED BOTTOM OF EXCAVATION
PROPOSED FILL AREA BELOW BOTTOM OF RIP RAP
NOT FOR CONSTRUCTION
PRELIMINARY
FOR DISCUSSION PURPOSES
DETAIL 1 - DITCH CROSS SECTION
LEGEND
PROPOSED DITCH
PROPOSED DITCH EXTENT
PROPOSED DITCH INVERT ELEVATION
EXISTING GROUND ELEVATION
KEY PLAN
WASTE ROCK PILE
OPEN PIT OUTLINE
OVERBURDEN PILE
WATER BASIN
TATA STEEL
GOODWOOD PIT
WATER MANAGEMENT
MINING
SITE PLAN
GOODWOOD PIT
PROPOSED DRAINAGE DITCH
181-04033-DC1a
ADJUSTED DITCH LOCATION
C

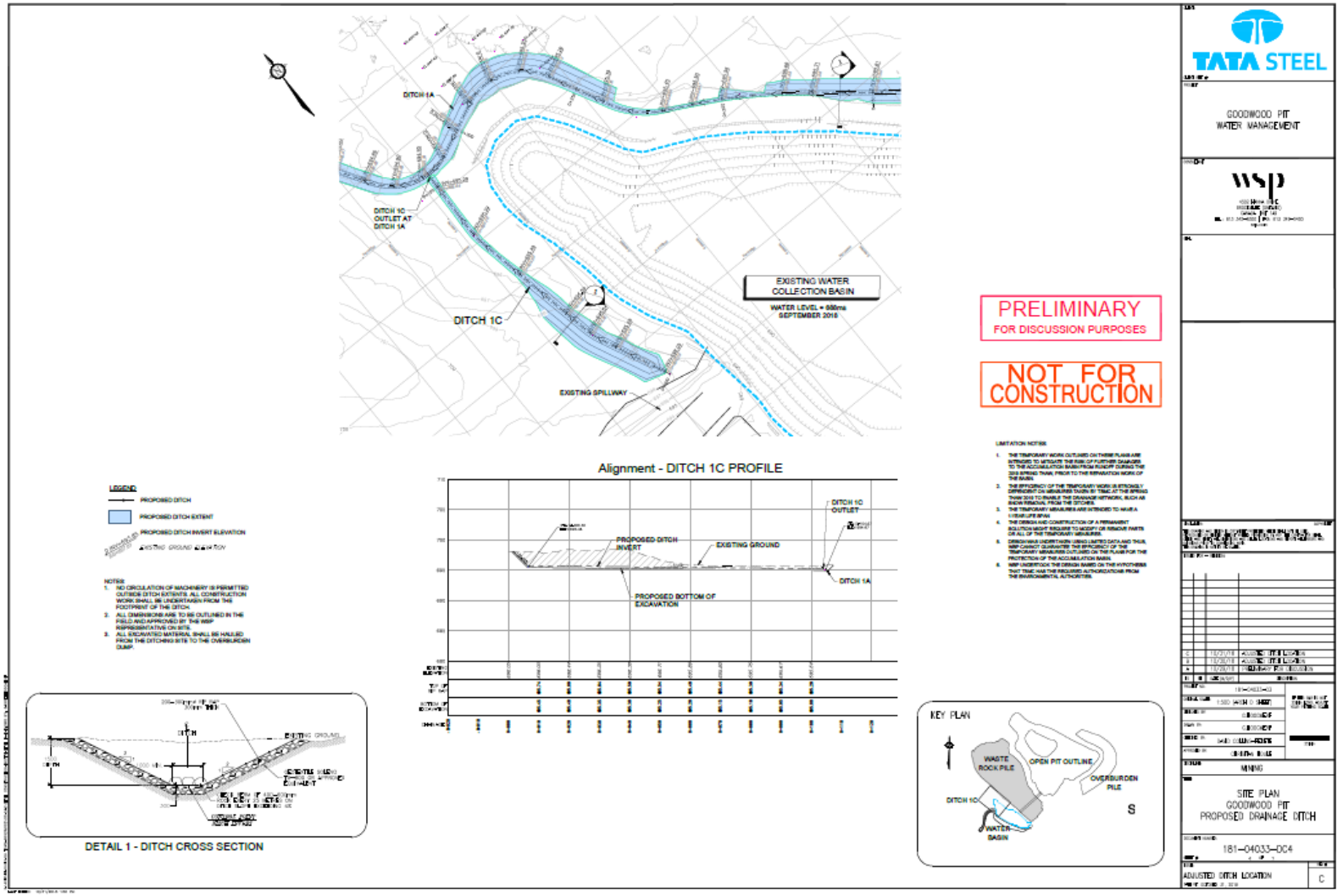
Ditch – 1A (part 2)



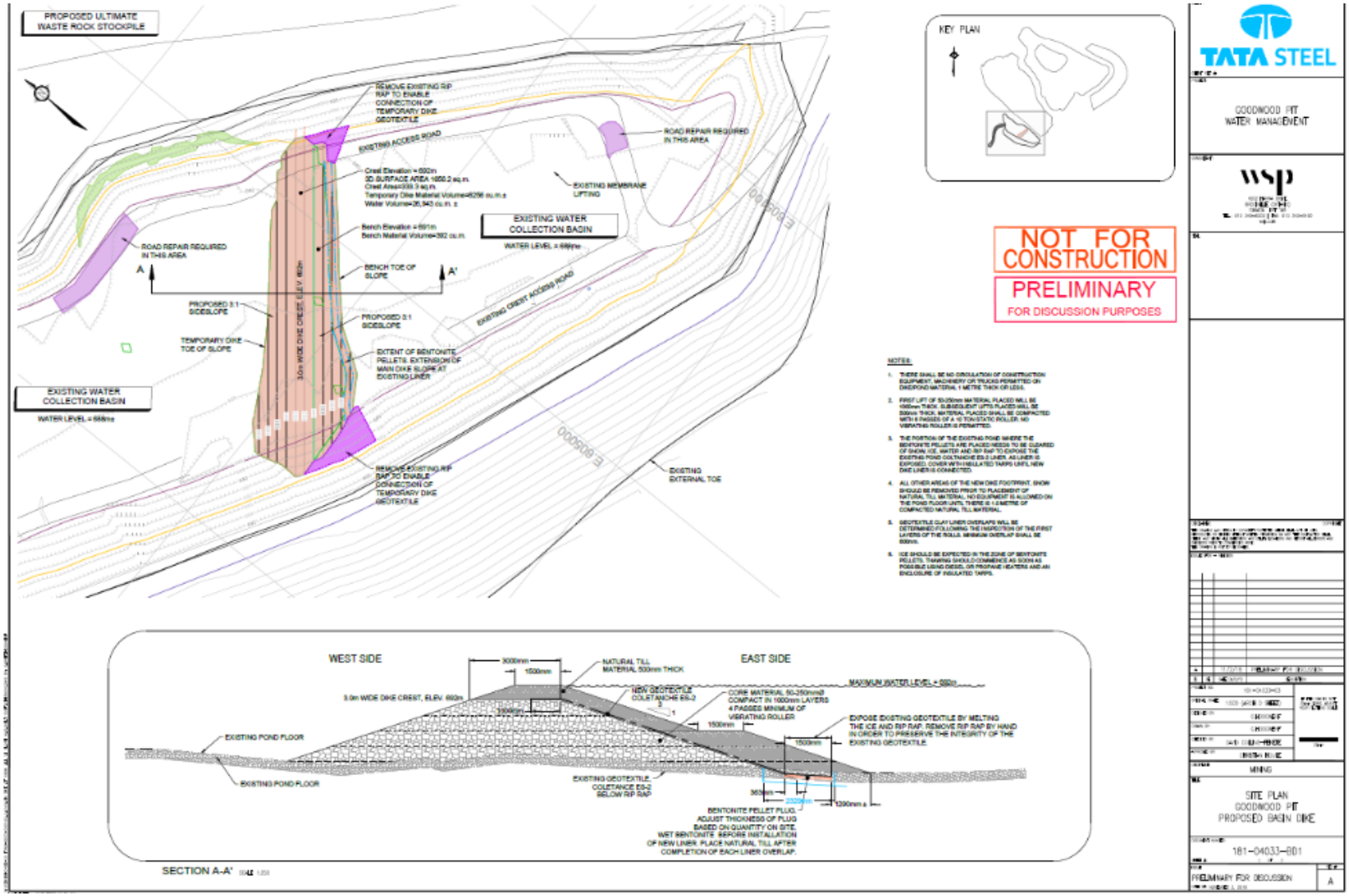
Ditch – 1B


EXISTING ROAD
Future Waste Rock Stock Pile Extent
EXISTING DITCH
DITCH 1B
DITCH 1B
DITCH 1A
DITCH 1B OUTLET IN EXISTING DITCH
LOW AREA TO BE FILLED. REGRADE TO PROVIDE POSITIVE DRAINAGE TO DITCH 1B
LOW AREA TO BE FILLED. REGRADE TO PROVIDE POSITIVE DRAINAGE TO DITCH 1B
POND CREST ELEV.=696m
EXISTING WATER COLLECTION BASIN
WATER LEVEL = 690m SEPTEMBER 2018
Alignment - DITCH 1B PROFILE
EXISTING GROUND
PROPOSED DITCH INVERT
PROPOSED BOTTOM OF EXCAVATION
DITCH 1B OUTLET IN EXISTING DITCH
DETAIL 1 - DITCH CROSS SECTION
DETAIL 2 - DITCH CROSS SECTION
KEY PLAN
WASTE ROCK PILE
OPEN PIT OUTLINE
OVERBURDEN PILE
WATER BASIN
DITCH 1B
LEGEND
PROPOSED DITCH
PROPOSED DITCH EXTENT
PROPOSED DITCH INVERT ELEVATION
EXISTING GROUND ELEVATION
NOTES
1. NO CIRCULATION OF MACHINERY IS PERMITTED OUTSIDE DITCH EXTENTS. ALL CONSTRUCTION WORK SHALL BE UNDERTAKEN FROM THE FOOTPRINT OF THE DITCH.
2. ALL DIMENSIONS ARE TO BE OUTLINED IN THE FIELD AND APPROVED BY THE WSP REPRESENTATIVE ON SITE.
3. ALL EXCAVATED MATERIAL SHALL BE HAULED FROM THE DITCHING SITE TO THE OVERBURDEN DUMP.
LIMITATION NOTES
1. THE TEMPORARY WORK OUTLINED ON THESE PLANS ARE INTENDED TO MITIGATE THE RISK OF FURTHER DAMAGES TO THE ACCUMULATION MARL FROM RUNOFF DURING THE 2018 SPRING THAW, PRIOR TO THE REPARATION WORKS OF THE MARL.
2. THE EFFICIENCY OF THE TEMPORARY WORK IS STRONGLY DEPENDENT ON MEASURES TAKEN BY TMAC AT THE SPRING THAW 2019 TO ENABLE THE DRAINAGE NETWORK, SUCH AS SNOW REMOVAL FROM THE DITCHES.
3. THE TEMPORARY MEASURES ARE INTENDED TO HAVE A LESS THAN LIFE SPAN.
4. THE DESIGN AND CONSTRUCTION OF A PERMANENT SOLUTION MIGHT REQUIRE TO MODIFY OF REMOVE PARTS OF ALL OF THE TEMPORARY MEASURES.
5. DESIGN WAS UNDERTAKEN USING LIMITED DATA AND THUS WSP CANNOT GUARANTEE THE EFFICIENCY OF THE TEMPORARY MEASURES OUTLINED ON THE PLANS FOR THE PROTECTION OF THE ACCUMULATION BASIN.
6. WSP UNDERTOOK THE DESIGN BASED ON THE HYPOTHESIS THAT TMAC HAS THE REQUIRED AUTHORIZATIONS FROM THE ENVIRONMENTAL AUTHORITIES.
PRELIMINARY
FOR DISCUSSION PURPOSES
NOT FOR CONSTRUCTION
TATA STEEL
GOODWOOD PIT
WATER MANAGEMENT
wsp
MMM
SITE PLAN
GOODWOOD PIT
PROPOSED DRAINAGE DITCH 1B
181-04033-003
ADJUSTED DITCH LOCATION
C

Ditch – 1C


TATA STEEL
GOODWOOD PIT
WATER MANAGEMENT
wsp
DITCH 1A
DITCH 1C OUTLET AT DITCH 1A
DITCH 1C
EXISTING WATER COLLECTION BASIN
WATER LEVEL = 000ms
SEPTEMBER 2018
EXISTING SPILLWAY
PRELIMINARY
FOR DISCUSSION PURPOSES
NOT FOR CONSTRUCTION
LEGEND
PROPOSED DITCH
PROPOSED DITCH EXTENT
PROPOSED DITCH INVERT ELEVATION
EXISTING GROUND ELEVATION
NOTES:
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3. ALL EXCAVATED MATERIAL SHALL BE HAULED FROM THE DITCHING SITE TO THE OVERBURDEN DUMP.
Alignment - DITCH 1C PROFILE
PROPOSED DITCH INVERT
EXISTING GROUND
PROPOSED BOTTOM OF EXCAVATION
DITCH 1C OUTLET
DITCH 1A
DETAIL 1 - DITCH CROSS SECTION
KEY PLAN
WASTE ROCK PILE
OPEN PIT OUTLINE
OVERBURDEN PILE
DITCH 1C
WATER BASIN
S
MINING
SITE PLAN
GOODWOOD PIT
PROPOSED DRAINAGE DITCH
181-04033-DC4
ADJUSTED DITCH LOCATION
C

Temporary dike



Technical brief for the procedure of spring 2019

- Snow management in the water management infrastructures before the spring thaw
- Pumping system between the Goodwood accumulation basin and K1C
- Water levels management in the temporary dike
- Dewatering of the Goodwood pit.
- Identification of a suitable location for snow piling

Management of risk

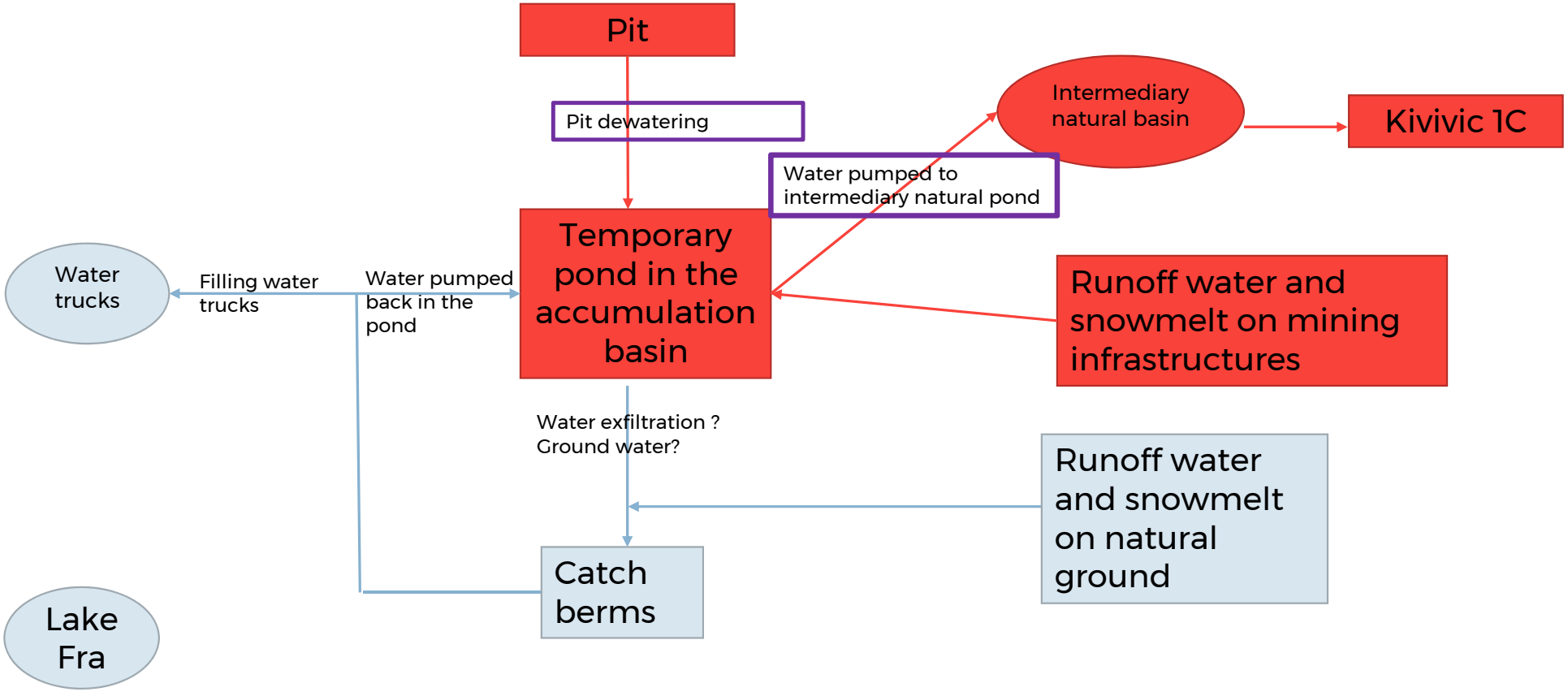
Hydrological balance summary

- Volume required before May 15th : 24 000 m^3
- Volume required before June 1st : 47 000 m^3
- Based on average meteorological conditions at Schefferville
- Does not consider Pit Dewatering
- Does not consider Water treatment or pumping out
- Numbers are conservative as there is no existing waste dump. Water is therefore conveyed to the environment for that section.

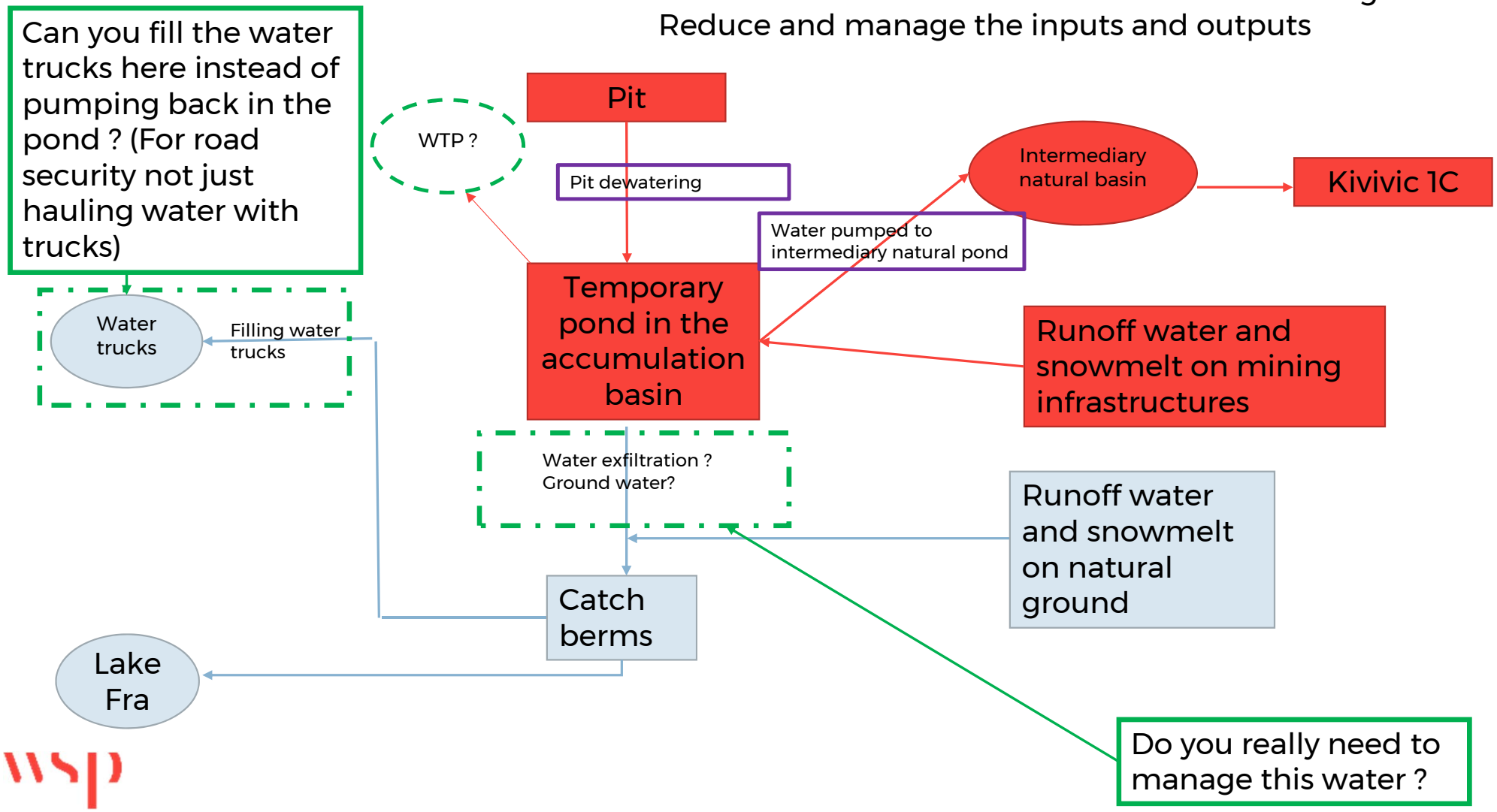
Key take away :

- Not the required capacity in the temporary pond for snowmelt and runoff - > Needs pumping
- Pumping installation need to be ready to work as soon as possible (As soon as the snow start melting)
- Volume required in temporary pond is function of pumping capacity and of pit dewatering management
- Objectives of the temporary dike :
  - Small retention capacity – Gives a buffer for the operators of the pump (balance)
  - Separation : Gives two different zones to repair in a dry environment
  - Increase the chance to retain and treat red water by reducing the footprint allowable for retention, thus, reducing potential water exfiltration
  - Give a buffer volume in case of pumps malfunctions

Schematic view of the existing drainage system



Areas to work on to reduce the volume to manage –
Reduce and manage the inputs and outputs



Water trucks impact on water management

- 50 m^3 per water truck
- A water truck takes approximately 30 minutes to fill
- 48 water trucks / day equates to 2400 m^3
- Dewatering last year at Goodwood pit = 480 m^3 / hr.

The water trucks definitely have an impact but a pump is better suited to manage water. If pumps are available, those should be preferred.

Option to reduce costs	Impact of option on operations	Requirements
Lower volume of temporary pond	Needs higher pumping capacity at the outlet of the temporary pond	Adapt the design from WSP (RFIs) Get in touch with the environmental authorities to have them approve the system
Use available till for the body of the dike	Saturated till might be unstable next year – Even with GCL – Saturated from the dry side	Compaction bench test on frozen till Compaction bench test on unfrozen till
Use materials available on site	No importation and handling required	Tests on the existing rolls of GCL Water test on bentonite pellets for inflation
Optimize pumping capacity between pit, temporary pond, exfiltration point, etc.	The pumping capacity must be higher at the outlet of the temporary pond	Have pumping system readily available at snow melt
Fill water trucks at the exfiltration	Reduces water trucks availability	Ask the government to empty water trucks on hauling road ?

Risks associated with the wintering plan

Risk	Mitigation measure
Overtopping of the temporary dyke could lead to its failure	Overtopping water will still be confined in the basin Pumping infrastructures available on site Needs surveillance
Damages to the geomembrane, even considering the drainage ditches	***Removing snow from the ditches 1, 1A, 1B, 1C in priority
Water tightness of the temporary dike - Use of GCL - Bentonite Pellets Plug - Bentonite Pellets Powder	- Inspection of GCL - Bentonite Pellets testing - Polymer ? - Use of powder to enhance plug ?

Supplementary work / Concerns

Supplementary works / Concerns

- Existing crack on the dike
  - *Needs surveying to know if the dike is moving*
  - *Geotechnical studies (including surveys, boreholes and more as required)*
  - *Based on information that we have right now, probably a surface problem in a zone of snow accumulation during construction.*

- Holes in the geomembrane
  - *One hole corresponds to a puncture by machinery in the geomembrane*
  - *Two holes corresponds to holes undertaken during the site expertise visit to inspect underlying material*
  - *Can be repaired this year with Colétanche ES-2 or GCL. If you have expertise on site for Colétanche, this is the way to go.*

Thank you !

wsp.com

Appendix IV. Air Quality Bioevaluation Report

EVINERUDE
Etudes, Gestion en Environnement

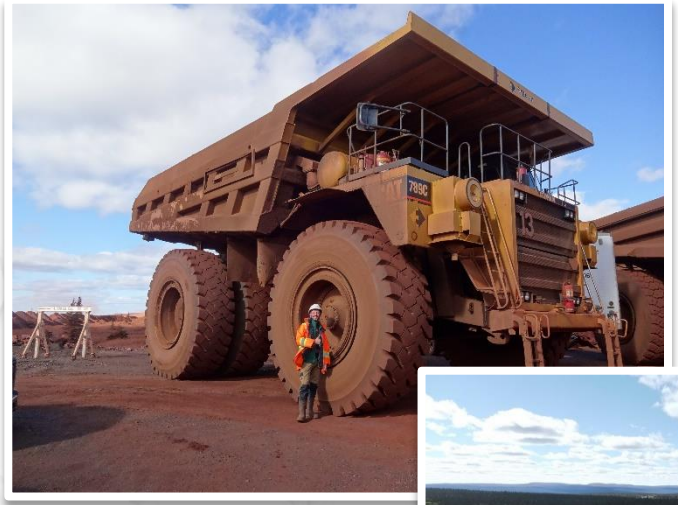
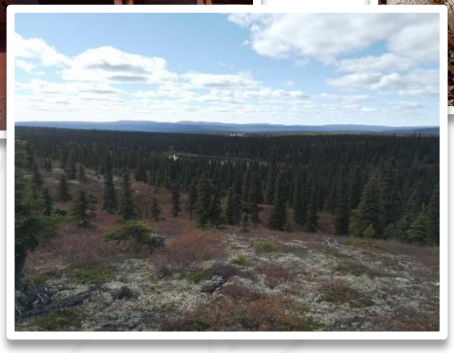
Version 2
22/01/2019

BUREAU D'ÉTUDES ENVIRONNEMENTALES

RAPPORT D'ÉTUDE

BIOACCUMULATION LICHENIQUE : CAMPAGNE 2018
CARACTERISATION DES RETOMBEES ATMOSPHERIQUES AUTOUR DU PROJET DSO –

Québec / Terre-Neuve & Labrador (Canada)



N° de Dossier : Tatasteel17EV014_3Bioacc20180601

A l'attention de :

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Montréal, QC H3A3G4

Auteur : Grégory AGNELLO
Relecteur : Muriel BOTTON-TOURNIER



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I. Contexte de l'étude

1. Présentation de l'étude

Tata Steel Minerals Canada Ltd (TSMC) extrait du minerai de fer de fosses à ciel ouvert autour de la frontière entre les provinces du Québec (QC) et de Terre-Neuve-et-Labrador (TNL), à environ 25 km au nord-ouest de Schefferville (QC).

Une telle exploitation génère un impact sur l'environnement et notamment l'atmosphère, qui sera chargée en poussières dues à l'extraction et au transport entre les fosses et le complexe minier. TSMC doit établir un suivi annuel de la qualité de l'air afin de s'assurer si les sites d'activités ont le potentiel d'affecter la qualité de l'air dans les provinces du QC et TNL et si les poussières générées peuvent entraîner une contamination des plans d'eau des deux provinces.

La méthodologie proposée ici (détaillée § II) correspond à l'analyse des retombées environnementales autour de secteurs en cours d'exploitation ou très prochainement exploités, par l'application d'un plan d'échantillonnage des lichens aboutissant aux dosages des métaux lourds.

Des prélèvements ont lieu depuis 2016 et bien que de nombreux métaux aient été dosés dès cette date, les résultats n'ont pas été exploités dans les rapports des campagnes précédentes car la plupart de leurs dosages se trouvaient en dessous de la limite de détection des appareils analytiques. Ils seront toutefois présentés dans l'étude temporelle § III.6, ces métaux ayant sur de nombreux points des concentrations quantifiables depuis 2017 pour certains ou seulement depuis 2018 pour d'autres.

Les objectifs de la campagne 2018 sont donc les suivants :

1) Déterminer le niveau actuel de déposition atmosphérique sur plus d'une trentaine de points de surveillance ;
2) Statuer sur l'influence de la route principale ;
3) Analyser les résultats sur les 3 campagnes de suivis (2016-2017-2018) ;
4) Proposer un protocole complémentaire d'étude des retombées.

2. Intervenants

a) EraTec Inc.

ERATEC Inc. est la filiale canadienne de la société ERATEC basée en France. Toutes deux poursuivent les mandats suivants :

- recherche de la maitrise des consommations d'énergie dans des contextes industriels ;
- fabrication, ingénierie et fourniture de radiants infrarouges pour procédés industriels (proposition d'une solution plus respectueuse de l'environnement – bas taux de NO_X) ;
- incinération des Composés Organiques Volatiles (qualité de l'air) ;
- traitement des plantes envahissantes (herbe à poux par exemple) par un procès breveté de chocs thermiques.

Mathilde MONNIER a servi de lien entre les différentes sociétés.

Eric ROGEMOND, gérant de ces deux sociétés, est également gérant d'Evinerude – bureau d'étude français spécialisé en environnement. Le lien entre les deux sociétés intervient notamment autour de la thématique de la qualité de l'air. Ce partenariat fort permet à ERATEC Inc. et Evinerude de fournir des solutions "clé en main" aux industriels et institutionnels.

b) Evinerude

Evinerude, bureau d'étude spécialisé dans l'analyse et la gestion des milieux naturels, a été mandaté pour réaliser cette mission afin d'appréhender l'impact éventuel de l'exploitation minière sur son proche environnement, par l'application d'un plan d'échantillonnage et d'une campagne d'analyses de métaux lourds sur des échantillons de lichens. Au sein d'Evinerude, 2 personnes ont participé au travail de terrain et/ou de bureau :

- Grégory AGNELLO, lichénologue, responsable du dossier, a mis en place le protocole de récolte, a procédé à la récolte des lichens ainsi qu'à leur tri, et a rédigé le rapport.
- Muriel BOTTON-TOURNIER, directrice, a agi à titre de réviseur.

c) Maxxam

Maxxam est le leader du marché canadien en services et solutions d'analyse pour les secteurs de l'énergie, de l'environnement, de l'alimentation et de l'ADN et appartient au groupe Bureau Veritas, un chef de file mondial des tests, de l'inspection et de la certification.

II. Méthodologie

1. Zone d'étude

Les prélèvements biologiques ont été effectués au nord-ouest de Schefferville, de part et d'autre de la frontière entre le Québec et Terre-Neuve & Labrador.

Les sites de prélèvements correspondent soit à un point d'échantillonnage officiel (nommé AQS pour Air Quality Station) de la qualité de l'air (référencé par Tatasteel), soit à un point de surveillance pour lequel il n'existe pas aujourd'hui de suivi physico-chimique. Le détail est présenté au § II.2.

La distance entre les deux points les plus éloignés (AQS1au nord et AQS6 au sud) est de 34 km.

Sur l'ensemble du secteur, les vents dominants proviennent d'un cadran ouest/sud-ouest à ouest/nord-ouest. Les différents prélèvements pour chaque site d'étude ont donc été effectués dans la zone d'influence au vu des vents et donc de la zone de déposition atmosphérique.

D'après le rapport d'étude du bureau *Groupe Hémisphère* qui a cartographié les habitats naturels du secteur en 2011, nous nous trouvons à la transition entre la forêt subarctique et la toundra subarctique. Cela se traduit par la raréfaction de la strate arborée au profit de la strate arbustive basse voire herbacée. L'augmentation de l'altitude, bien que faible (cf. Figure 2), amplifie nettement ce phénomène de transition.

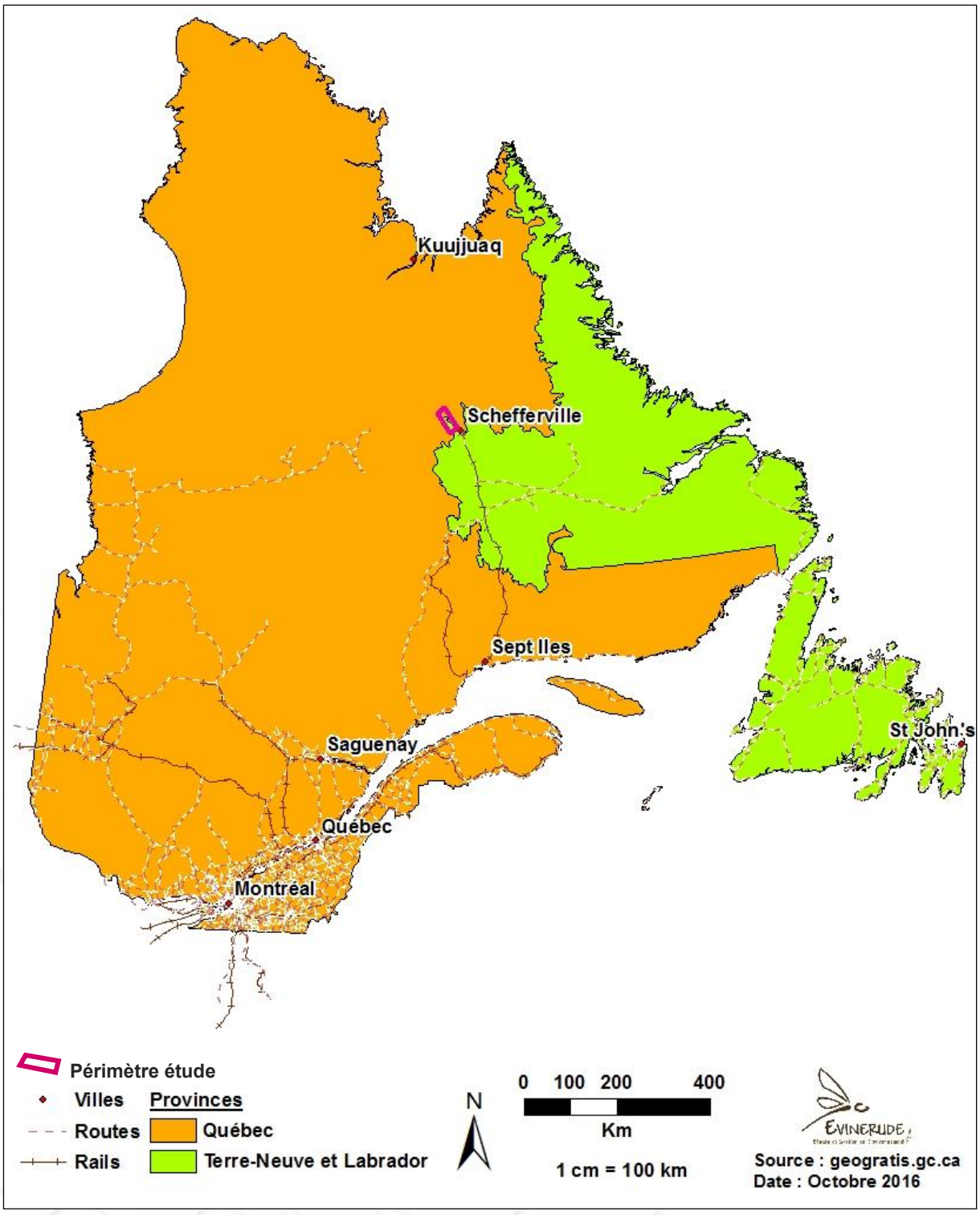


Figure 1 : Localisation de la zone d'étude.

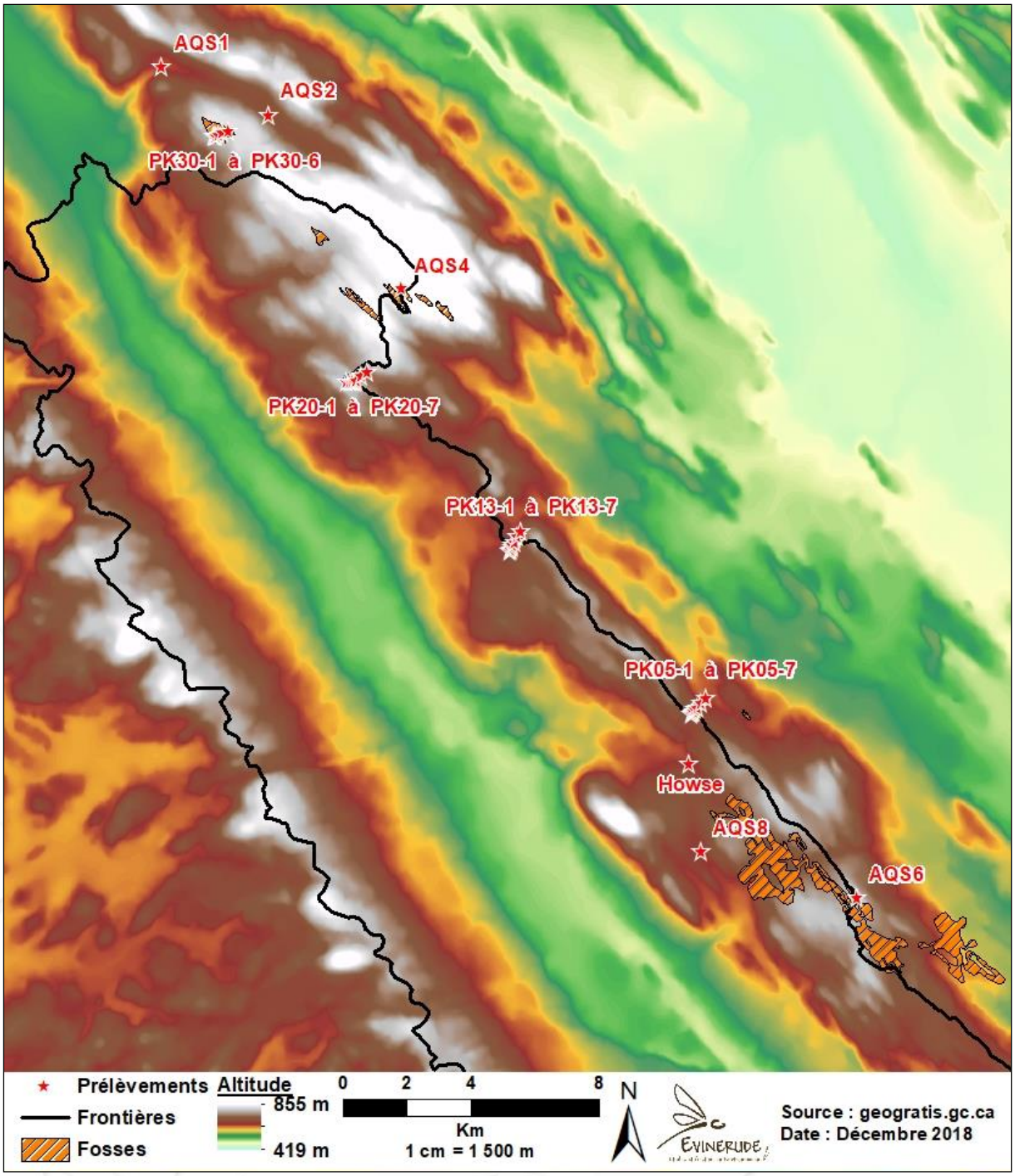


Figure 2 : Relief de la zone d'étude.

Le minerai est transporté à l'aide de camions circulant sur une voie de halage non asphaltée. Cette circulation en continu assèche rapidement la route dès lors que les conditions climatiques ne sont pas humides. Ce point sera repris au § III.4.

Une voie de contournement est positionnée plus ou moins loin et plus ou moins parallèlement à la route principale (Figure 3). Elle permet l'accès au territoire par les Communautés.



Photo 1 : Camion de transport du minerai.



Photo 2 : Remorque chargée de minerai.

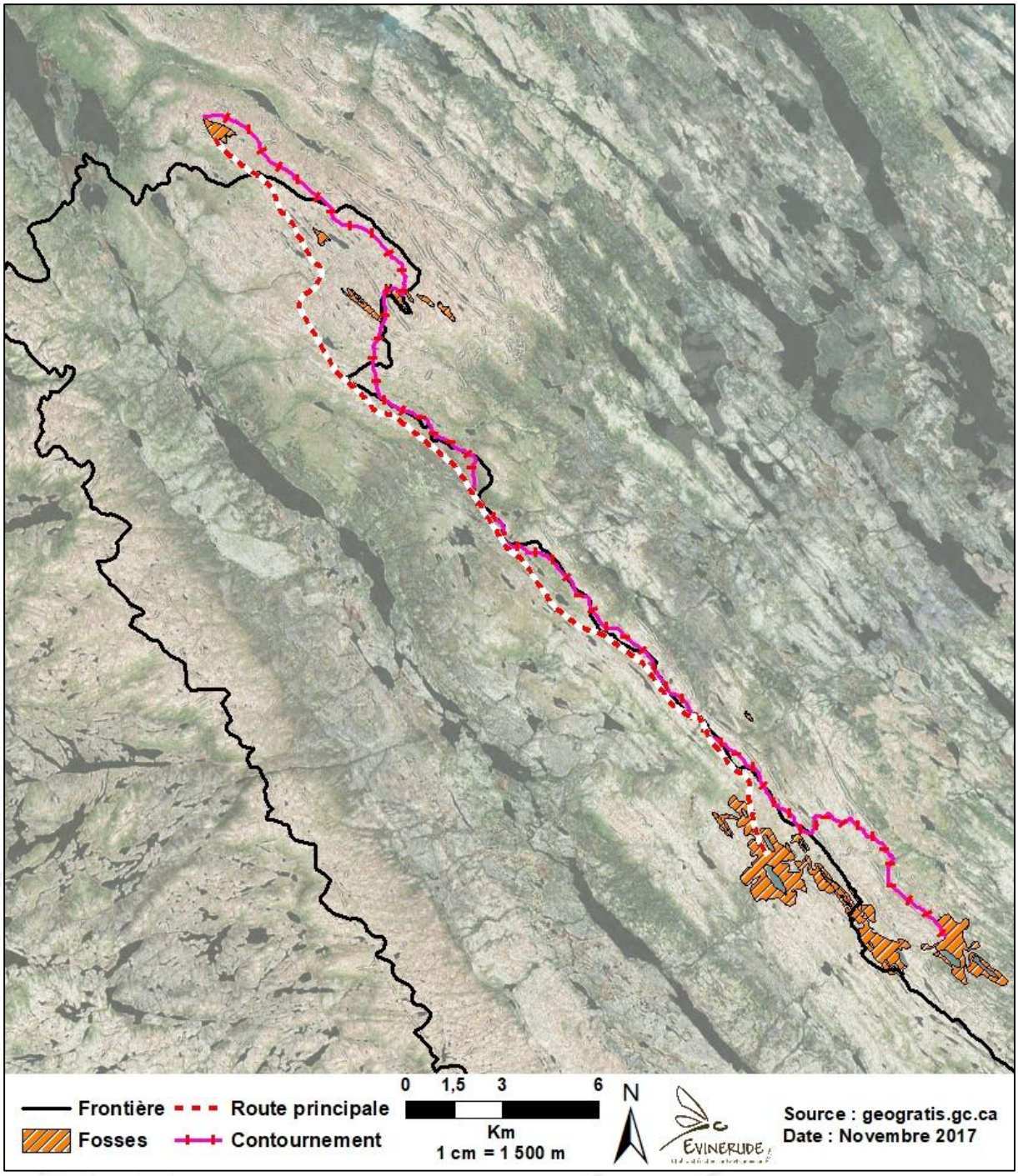


Figure 3 : Localisation des routes.

2. Sites de prélèvements

Depuis 2016, la localisation des points est définie par repérage au GPS, ce qui permet de revenir exactement au même endroit d'une année sur l'autre.

Les premiers sites sont positionnés autour de points de surveillance de qualité de l'air déjà référencés dans les études menées par la compagnie et son nommés sous les références AQS1/2/4/5/6/8/9, et Howse.). Ils sont dispersés à proximité de secteurs en activité ou devant l'être peu après la présente campagne.

Afin de déterminer l'impact de la circulation des camions, le protocole dit de "transects" a été établi ainsi : à partir de la route et dans la direction des vents dominants (selon la rose des vents fournie), des prélèvements ont été réalisés à proximité même de la route (< 5 m), puis à 50 m, 100 m, 150 m, 300 m, 500 m et 700 m. Le premier lot de prélèvements fut réalisé au point kilométrique 5 (PK05, numérotation officielle de l'axe routier), le deuxième lot à 13 km (PK13), le troisième lot à 20 km (PK20) et enfin le dernier à 30 km (PK30).

NB : lors de cette campagne 2018, 3 points n'ont pas pu être prospectés, il s'agit d'AQS5, AQS9 et PK30-7. Les deux premiers étaient inaccessibles suite à de très importantes chutes de neige survenues en plein milieu de la campagne de prélèvements (cf. Photo 3) ; quant au dernier, l'agrandissement de la fosse la plus proche a détruit le site sur une surface suffisamment grande pour empêcher son déplacement vers un secteur équivalent et à égale distance de la route.



Photo 3 : Paysage de neige.

L'ensemble des informations concernant ces points sont précisés ci-après (tableau, figures et photos).

Tableau 1 : Informations sur les sites de prélèvements.

Nom	Longitude	Latitude	Altitude.	Province	Secteur
AQS1	-67,37	55,12	628,70	Québec	Goodwood
AQS2	-67,32	55,10	742,00	Québec	Goodwood
AQS4	-67,26	55,05	738,00	T-N&L	Kivivic
AQS5	-67,23	55,04	698,20	Québec	Kivivic
AQS6	-67,04	54,88	764,90	Québec	Fleming
AQS8	-67,12	54,89	636,00	T-N&L	Timmins
AQS9	-67,07	54,90	737,00	Québec	Timmins
HOWSE	-67,12	54,92	626,60	T-N&L	Howse
PK05-1	-67,12	54,93	656,70	T-N&L	Route
PK05-2	-67,12	54,93	651,30	Québec	Route
PK05-3	-67,12	54,93	652,70	Québec	Route
PK05-4	-67,12	54,93	653,80	Québec	Route
PK05-5	-67,12	54,93	638,80	Québec	Route
PK05-6	-67,12	54,94	613,70	Québec	Route
PK05-7	-67,12	54,94	602,50	Québec	Route
PK13-1	-67,21	54,98	652,00	T-N&L	Route
PK13-2	-67,21	54,98	649,60	T-N&L	Route
PK13-3	-67,21	54,98	661,70	T-N&L	Route
PK13-4	-67,21	54,98	662,80	T-N&L	Route
PK13-5	-67,21	54,98	667,30	Québec	Route
PK13-6	-67,21	54,98	665,30	Québec	Route
PK13-7	-67,20	54,98	672,40	Québec	Route
PK20-1	-67,29	55,03	748,60	T-N&L	Route
PK20-2	-67,29	55,03	741,60	Québec	Route
PK20-3	-67,28	55,03	747,20	Québec	Route
PK20-4	-67,28	55,03	748,70	Québec	Route
PK20-5	-67,28	55,03	745,60	Québec	Route
PK20-6	-67,28	55,03	707,50	Québec	Route
PK20-7	-67,28	55,03	716,80	Québec	Route
PK30-1	-67,35	55,10	747,70	Québec	Route
PK30-2	-67,35	55,10	751,10	Québec	Route
PK30-3	-67,35	55,10	753,00	Québec	Route
PK30-4	-67,35	55,10	753,00	Québec	Route
PK30-5	-67,34	55,10	761,40	Québec	Route
PK30-6	-67,34	55,10	766,90	Québec	Route
PK30-7	-67,34	55,10	782,90	Québec	Route

Tableau 2 : Habitats des points de prélèvements.

Toundra subarctique supérieure		**Forêt subarctique moyenne**	
Arbustaie	Arbustaie et lichens	Epinette et lichens	Epinette et milieux humides
AQS2	AQS4 AQS6 PK05-1 à PK05-4 PK20-1 à PK20-7 PK30-1 à PK30-6	AQS8 PK05-5 à PK05-7 PK13-1 à PK13-7	HOWSE

Les lichens étant peu compétitifs, ils ne peuvent pousser en milieu fermé par les végétaux supérieurs, ici les arbustes. Les prélèvements ont donc eu lieu dans des milieux semi-ouverts où ils ont la place de se développer.

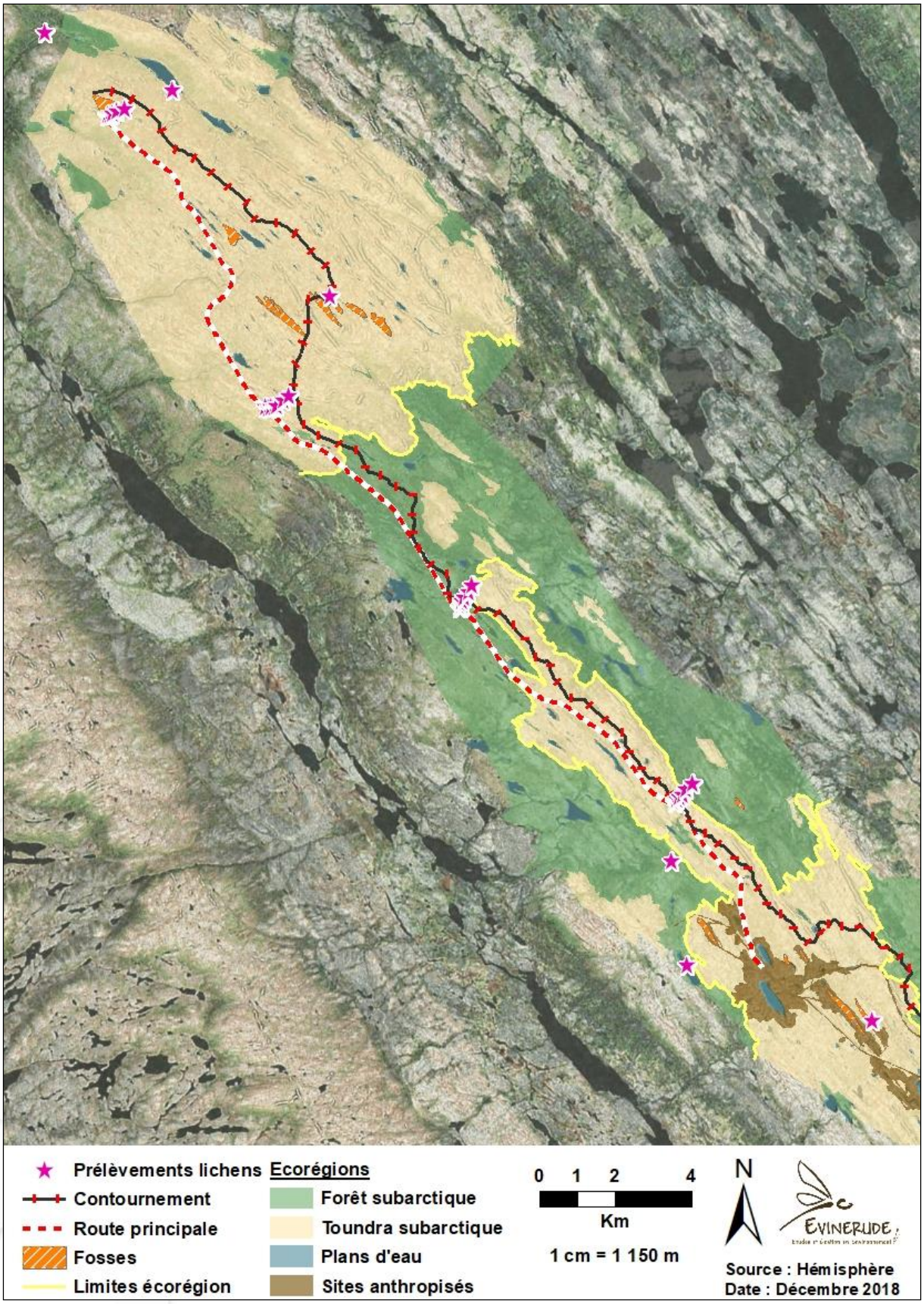


Figure 4 : Habitats de la zone d'étude.

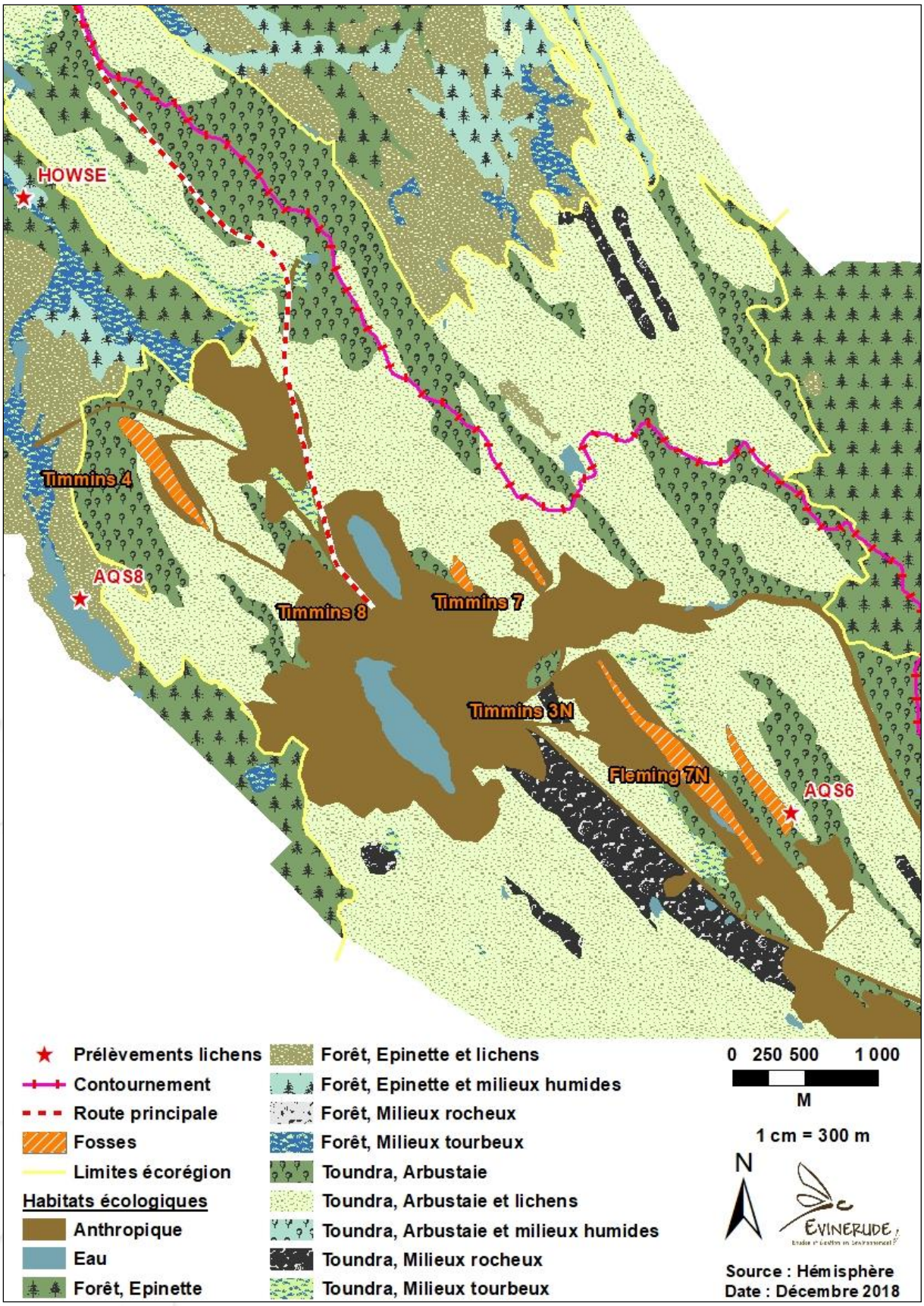


Figure 5 : Habitats, zoom 1 (sud).



Photo 4 : AQS6.



Photo 5 : AQS8.



Photo 6 : Howse (futur gisement).

Il est important de préciser que la neige n'a pas altéré les résultats obtenus ! En effet cette neige est solide et n'a donc pas "nettoyé" les lichens prélevés, qui contenait ainsi les mêmes quantités de polluants qu'auparavant. Il a suffi de retiré la couche neigeuse pour accéder aux lichens toujours présents en-dessous et en bon état car parfaitement adaptés à ce climat.

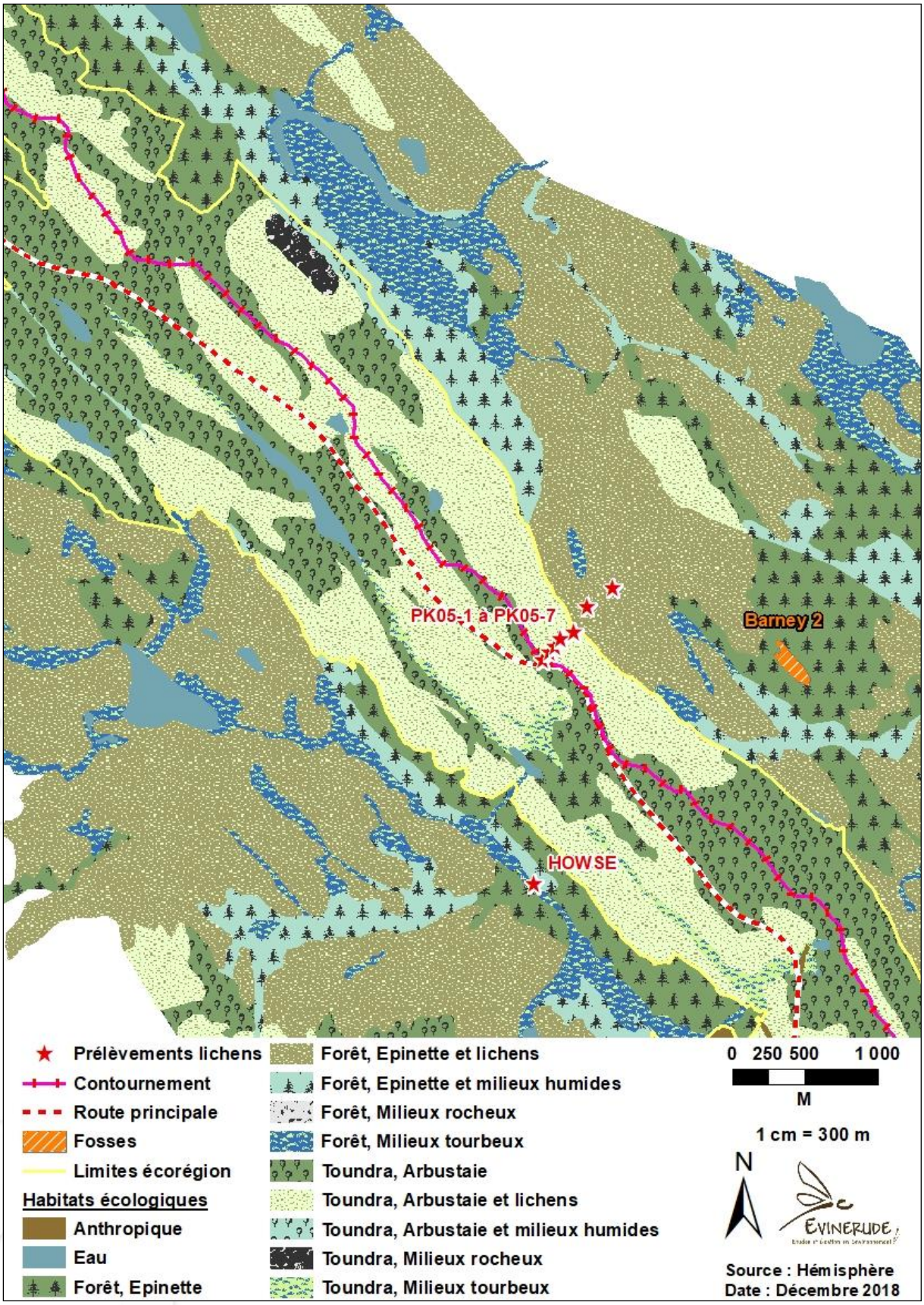


Figure 6 : Zoom 2.



Photo 7 : 1ère vue de PK05.



Photo 8 : 2ème vue de PK05.



Photo 9 : 1ère vue de PK13.



Photo 10 : 2ème vue de PK13.

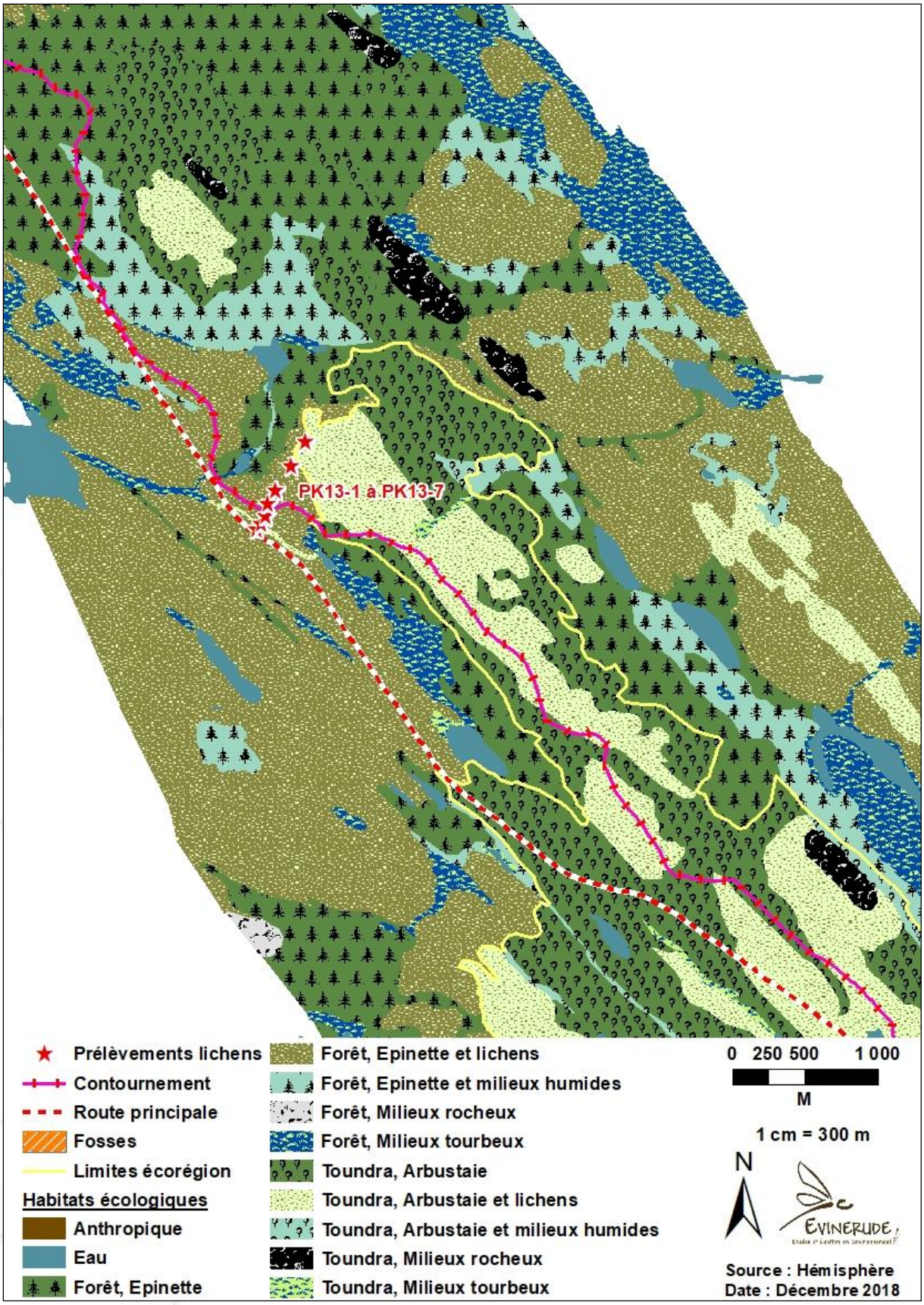


Figure 7 : Zoom 3.

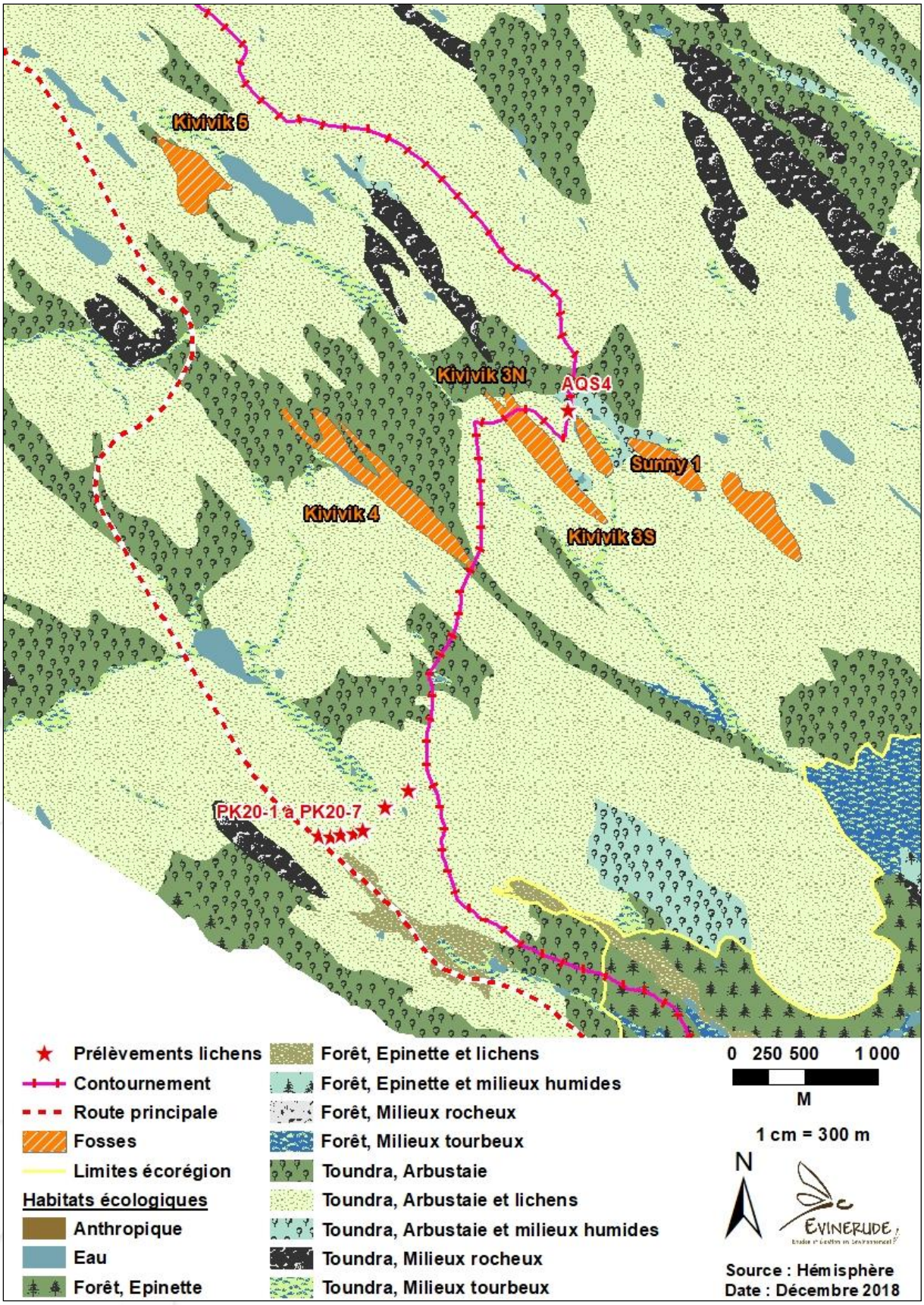


Figure 8 : Zoom 4.



Photo 11 : AQS4.



Photo 12 :1ère vue de PK20.

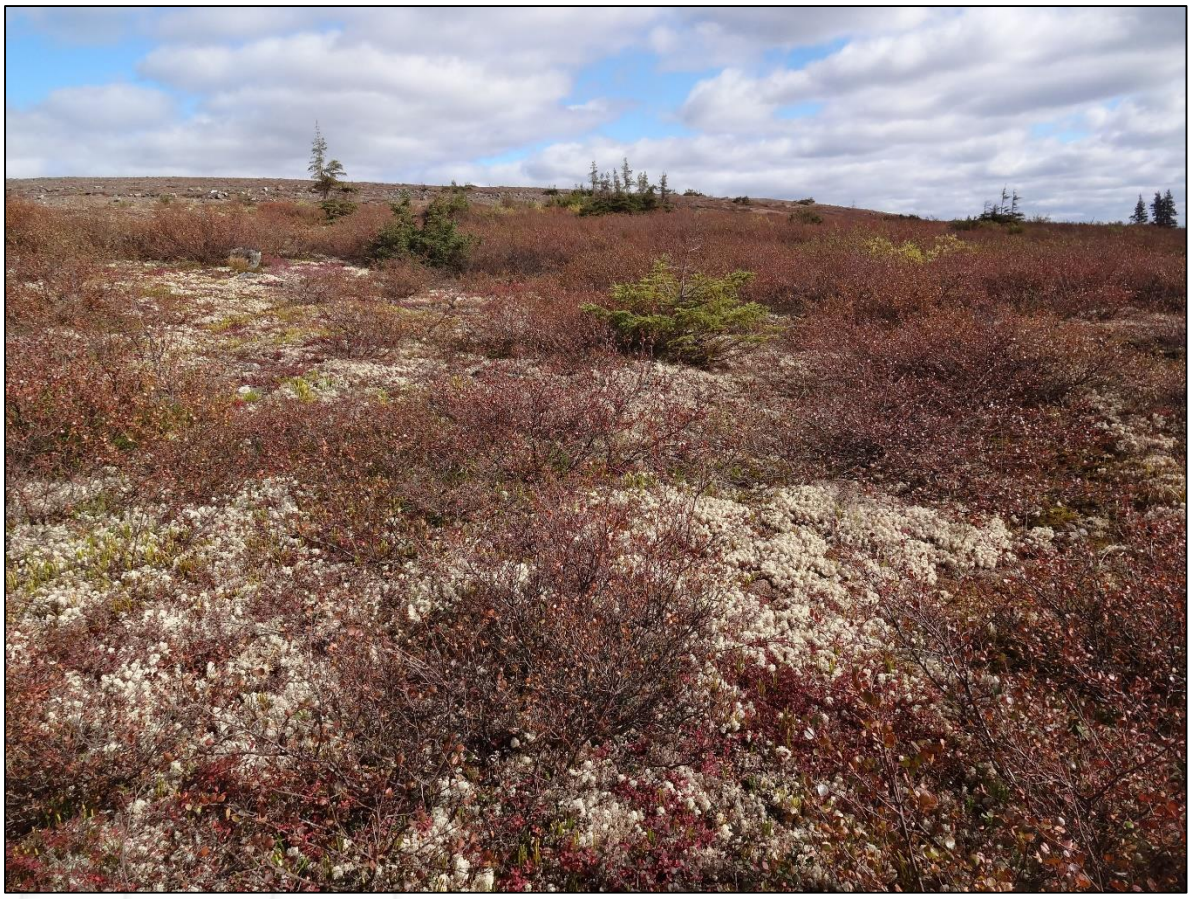


Photo 13 : 2ème vue de PK20.



Photo 14 : 1ère vue de PK30.

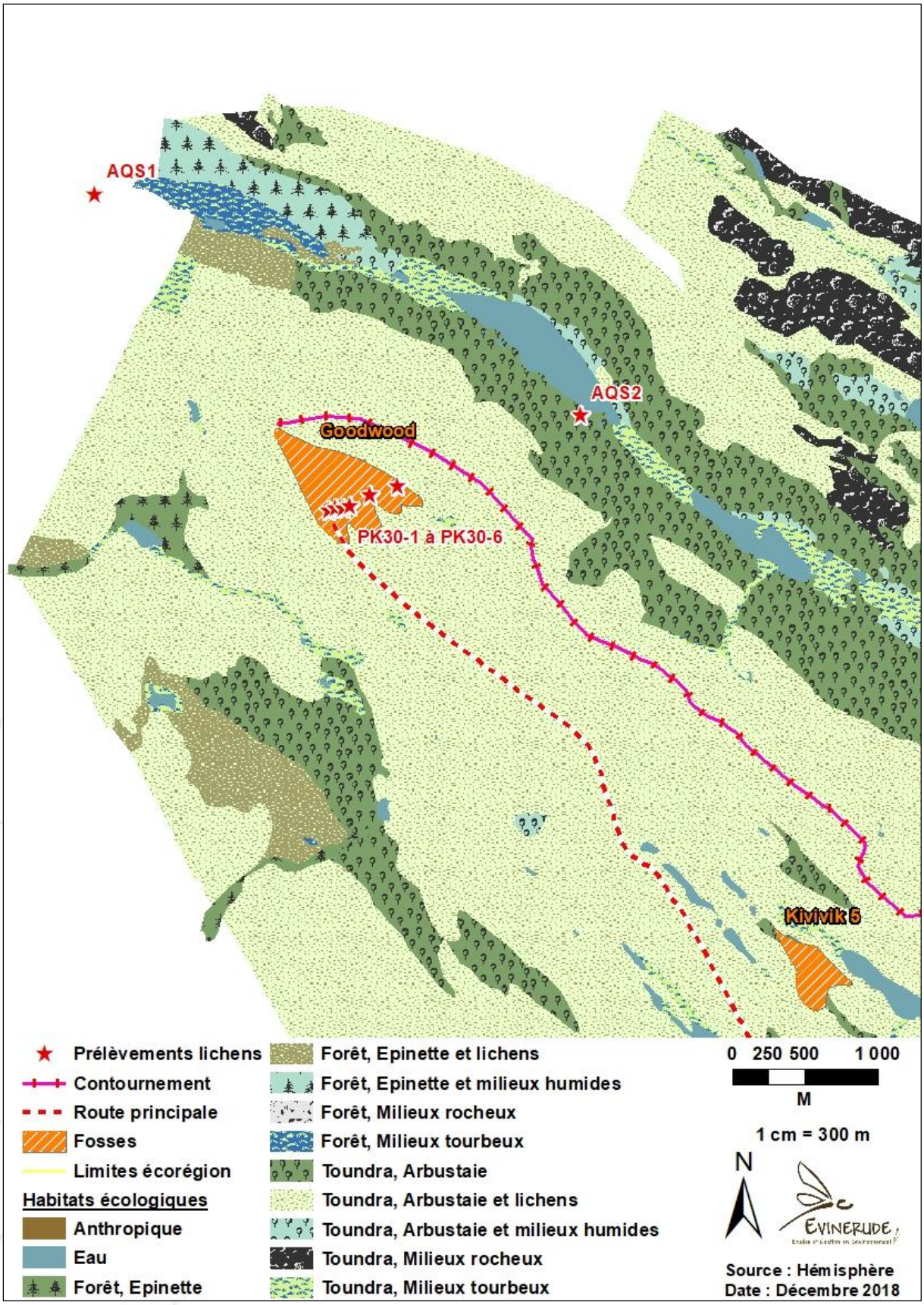


Figure 9 : Zoom 5.



Photo 15 : 2ème vue de PK30.



Photo 16 : AQS1.



Photo 17 : AQS2.

3. Principe de la bioaccumulation lichénique

Pour surveiller la qualité de l'air, des réseaux de capteurs sont couramment utilisés. Ils permettent de réaliser des mesures physico-chimiques et de donner une valeur numérique, sans pour autant indiquer avec certitude un effet toxique associé à ces valeurs numériques et leurs effets de synergie. La biosurveillance permet de combler cette lacune : grâce à des organismes résistants (ici les lichens), on peut estimer la quantité totale d'un polluant accumulé dans cet organisme au bout d'un temps donné, sans que cette accumulation ne perturbe le métabolisme de l'organisme. L'individu devient alors un capteur vivant et non plus un modèle d'étude. Le choix des lichens comme bioindicateurs est motivé par plusieurs points :

- Contrairement aux végétaux supérieurs, ils sont dépourvus de moyens de lutte contre la pollution (pas de cuticule cireuse, pas de stomates, pas de système d'excrétion, structure végétative sous forme de thalle se traduisant par un ratio surface/volume très élevé) ;
- N'ayant ni racine, ni tige, ni feuille, ni appareil conducteur, ils sont incapables d'effectuer une régulation hydrique. Ils sont soumis aux fluctuations du milieu et peuvent absorber et accumuler sans distinction des quantités très importantes de substances prélevées dans l'atmosphère (air, eau, poussières, substances et gaz dissous). Ils sont ainsi soumis obligatoirement aux retombées des contaminants présents à la fois dans les dépôts secs et dans les dépôts humides, aussi bien gazeux que particulaires ;
- Leur activité photosynthétique continue, leur taux de croissance très faible, leur grande longévité et leur productivité très faible font des lichens des espèces particulièrement sensibles utilisées dans la détection des pollutions (pollution acide, fluorée, métaux lourds, radioactivité…).

Compte-tenu du climat, la région présente une végétation de forêt/toundra subarctique. Les arbres sont donc peu fréquents et se limitent à quelques arbustes et résineux (Epinette noire). En revanche la végétation du sol est plus abondante, principalement constituée de mousses et surtout de lichens. Prélever une espèce terricole est une adaptation de la méthode européenne (qui préconise les lichens poussant sur écorce à 1 m du sol) mais qui reste conforme aux travaux scientifiques développés sous de telles latitudes (Puckett & Finegan, 1980 ; Nash III & Gries, 1995 ; Chiarenzelli *et al.*, 2001 ; Salemaa *et al.*, 2004 ; Théau *et al.*, 2005).

Les lichens ne sont pas soumis à la saisonnalité mais du fait de la présence de neige, l'été est privilégié comme saison d'étude. Cela permet à la fois l'accès facile aux sites d'échantillonnage mais aussi aux lichens de bioaccumuler pendant plusieurs mois avant la période d'étude (4 mois pour une récolte en septembre).

Quatre types de lichens ont été trouvés au sol.



Photo 18 : Type fruticuleux, Alectoria ochroleucha.

⇨ Il possède une forme buissonnante.



Photo 19 : Type foliacé, Nephroma arcticum.

⇨ Il s'étale au sol tel une feuille.



Photo 20 : Type complexe 1, Cladonia deformis.

⇨ Poussant en forme de "trompettes" plus ou moins déformées.



Photo 21 : Type complexe 2, Cladonia stellaris.

Cette dernière espèce est celle qui fut choisie dans le cadre de cette étude. Elle cumule en effet plusieurs intérêts :

- ✓ particulièrement abondante, elle fut trouvée en grande quantité sur chaque site ;
- ✓ facilement reconnaissable, même en cas de mélange avec d'autres espèces elle se distingue rapidement ;
- ✓ volumineuse, elle se récolte très facilement ;
- ✓ avec une croissance continue, les parties supérieures sont les moins exposées vis-à-vis du sol (contamination édaphique limitée).

L'analyse de la qualité de l'air par la bioaccumulation se décompose alors en 5 temps :

- La première partie de terrain consiste à s'imprégner de la flore présente et de choisir quelle espèce sera utilisée (ici *Cladonia stellaris*). Cette étape trop souvent ignorée est pourtant essentielle car il est important de prélever des spécimens d'une seule espèce afin de ne pas biaiser les résultats : toutes les espèces n'accumulent pas dans les mêmes proportions, aussi **aucune publication scientifique internationale de référence ne traite de plus d'une seule et même espèce par échantillon analysé**. Sans quoi, il n'est pas possible de comparer fiablement deux prélèvements. Certaines publications décrivent toutefois les (fortes) similitudes d'accumulation pour certains éléments sur des espèces bien précises.

Aussi, il est nécessaire d'avoir une très bonne connaissance des lichens pour réaliser les bons prélèvements.



Photo 22 : Prélèvements de terrain.

- Vient ensuite la récolte en elle-même avec toutes les précautions nécessaires pour éviter la contamination des échantillons (gants non talqués, scalpels stériles ou couteaux en céramique…). Un minimum de 10 g fut prélevé à partir de plusieurs sous-prélèvements ± éloignés les uns des autres (sous-échantillons ensuite poolés) afin d'être bien représentatifs de l'ambiance. Une attention fut portée au fait que les échantillons n'avaient pas été piétinés au préalable par les opérateurs ou par les animaux (aucune trace visible d'écrasement). Les échantillons constitués sont alors placés dans des sachets zip de type congélation alimentaire (pour une fermeture hermétique) puis stockés en conditions de température basse, conditions fraîches (il n'est pas nécessaire de les congeler mais de les maintenir à une température au moins inférieure à 20°C).
- L'étape suivante consite au nettoyage des impuretés (débris, bois, insectes…). Le tri des échantillons est là encore crucial : il ne doit rester dans l'échantillon que de la masse lichénique débarassée des résidus de terre, de mousses, des autres espèces de lichens… Les résultats des analyses étant ramenées à un poids sec d'échantillon, il faut donc évidemment veiller à la seule présence de lichen dans l'échantillon.
- Après envoi en laboratoire, les résultats des analyses chimiques sont alors interprétés à partir des analyses précédentes et/ou de la bibliographie.
- Un important travail cartographique est réalisé par logiciel de Systèmes d'Informations Géographiques afin de restituer une représentation visuelle des résultats.



Photo 23 : Echantillon trié (à gauche) et déchets (à droite).

4. Éléments analysés

Les métaux lourds, dits ETM (Éléments Traces Métalliques) sont particulièrement surveillés lors de la réalisation de plans de surveillance de la qualité de l'air.

Ils ont une masse volumique supérieure à 5 kg/dm^3. Certains comme le chrome, le cobalt, le cuivre, le manganèse, le nickel, le sélénium, le vanadium et le zinc sont aussi appelés oligo-éléments et sont vitaux à petite dose pour l'homme. D'autres comme le cadmium, l'étain, le mercure ou le plomb sont considérés comme toxiques.

Les analyses portent sur 22 métaux. Les limites de quantification relatives aux métaux sont présentées dans le Tableau 3 ci-après (d'après MAXXAM). Elles correspondent aux seuils en-dessous desquels la quantité de substance ne peut plus être détectée à partir de la méthode analytiques utilisée.

Tableau 3 : Présentation des éléments dosés et des limites de quantification des métaux.

Elément	Nom	LQ* mg/kg de MS**	Elément	Nom	LQ* mg/kg de MS**
Ag	Argent	0,005	**Mg**	Magnésium	5
Al	Aluminium	1	**Mn**	Manganèse	0,050
As	Arsenic	0,020	**Mo**	Molybdène	0,020
Ba	Baryum	0,050	**Ni**	Nickel	0,050
Be	Béryllium	0,010	**Pb**	Plomb	0,010
Cd	Cadmium	0,005	**Sb**	Antimoine	0,005
Co	Cobalt	0,020	**Se**	Sélénium	0,050
Cr	Chrome	0,100	**Sr**	Strontium	0,050
Cu	Cuivre	0,050	**Ti**	Titane	0,500
Fe	Fer	5	**V**	Vanadium	0,100
Hg	Mercure	0,010	**Zn**	Zinc	0,200

*LQ: limite de quantification
**MS : matière sèche

Les résultats sont présentés de manières synthétiques dans le rapport. Certains métaux n'ayant pas fait l'objet d'une interprétation en 2016 et 2017 ne seront traités que dans le chapitre § III.6.Étude temporelle. En effet, lors de ces campagnes un grand nombre de leurs concentrations étaient en-dessous la LQ, rendant une interprétation non pertinente. Toutefois, leurs concentrations ont désormais augmenté ce qui permet de travailler sur ces valeurs.

III. Résultats et interprétation

1. Résultats des dosages

Ci-dessous, Tableau 4, sont présentés les résultats d'analyses chimiques. L'unité est le µg/g de matière sèche. Quand une case est vide, cela signifie que la concentration du métal au sein du lichen était inférieure à la capacité de détection de l'appareil analytique (< LQ).

En rouge sont précisées les concentrations maximales et en bleu les minimales.

Ce qui avait été observé en 2016 et 2017 se confirme lors de cette troisième campagne, à savoir qu'il y a une nette différence entre les points AQS/Howse (1er groupe) et les points PK (2nd groupe). Sur les premiers, les concentrations sont globalement faibles et hormis pour le zinc (qui concerne ici PK05-4), on y retrouve tous les minimas, principalement chez AQS1 qui en cumule 7.

A l'inverse, les valeurs maximales se retrouvent très majoritairement dans le second groupe, et notamment chez les points PK30-1 (7 métaux) et PK05-1 (3 métaux). A noter que le point AQS4 montre deux maximas pour le cadmium et le zinc.

Hormis pour le mercure (150 mètres), dans le second groupe les maximas se situent toujours à moins de 50 mètres de la route.

Certains métaux varient énormément d'un site à l'autre (tous groupes confondus), il s'agit :

- du fer avec un ratio C_{max}/C_{min} de 200 entre PK20-1 et AQS1 ;
- du cobalt avec un ratio de 99 entre PK30-1 et AQS1 ;
- de l'arsenic avec un ratio de 78 entre PK05-1 et AQS1 ;
- ou encore le vanadium avec un ratio de 72 entre PK30-1 et AQS8.

Les résultats sont présentés Figure 10 où les unités sont en logarithmes. Ainsi les métaux dont les concentrations sont régulièrement (très) élevées (fer, manganèse, zinc…) sont placés sur le haut des histogrammes où l'échelle est plus écrasée, quand elle sera au contraire dilatée sur le bas. Petites et grande concentrations peuvent de ce fait apparaître sur le même graph.

Les points AQS6 et AQS4 montrent respectivement les deux cumuls les plus élevés du premier groupe, ce qui est concordant avec les observations des années antérieures. Ce sont les deux points dont les profils se rapprochent le plus des points du second groupe.

Pour le 2nd groupe, une nouvelle fois une décroissance apparaît en fonction de la distance à la route ce qui laisse supposer dès cette observation que la circulation a un impact (direct ou indirect ?) sur les taux mesurés. Ce n'est qu'en s'éloignant de la route (entre 300 et 500 mètres) que les profils relevés commencent à montrer des similarités avec les points AQS.

Tableau 4 : Dosages des métaux lourds (µg/g MS).

	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Ti	V	Zn
AQS1	0,047	**0,067**	6,12	0,037	**0,044**	**0,66**	**0,578**	**275**	0,016	77	**0,278**	0,286		**1,70**		14,40
AQS2	**0,020**	0,146	**2,41**	0,068	0,088	1,00	0,783	895	**0,013**	111	0,447	0,343	**0,007**	5,06	0,22	21,60
AQS4	0,052	0,733	4,56	**0,108**	0,347	2,00	1,320	4260	0,017	178	0,871	0,596	0,023	10,70	0,98	**23,90**
AQS6	0,040	2,020	6,93	0,035	0,725	3,43	3,410	10900	0,032	179	1,180	0,949	0,035	21,90	2,01	17,10
AQS8	0,043	0,145	3,86	**0,015**	0,064	0,77	2,500	814	0,013	57	0,355	0,239	0,007	1,83	**0,11**	12,80
HOWSE	0,032	0,188	3,62	0,027	0,080	1,02	1,200	855	0,023	142	0,356	0,344	0,010	4,76	0,41	13,50
PKO5-1	**0,096**	**5,230**	16,30	0,060	3,620	14,00	4,960	46700	0,031	886	**3,880**	2,320	0,082	38,60	5,62	19,60
PKO5-2	0,071	2,860	8,94	0,035	1,800	**15,10**	3,500	26600	0,022	455	3,020	1,140	0,044	20,90	2,84	18,70
PK05-3	0,041	1,740	5,84	0,029	1,160	7,82	2,170	14200	0,018	295	1,660	0,847	0,028	13,70	1,89	18,60
PK05-4	0,029	1,390	7,12	0,029	1,060	7,87	2,250	11500	0,030	287	1,490	0,844	0,024	11,80	1,49	**10,60**
PK05-5	0,031	1,600	6,25	0,027	1,100	7,24	2,010	12900	0,026	297	1,590	0,850	0,027	13,40	1,83	11,90
PK05-6	0,029	0,649	3,96	0,018	0,448	3,47	2,150	5170	0,019	242	0,964	0,430	0,012	5,45	0,69	14,20
PK05-7	0,049	0,353	4,16	0,024	0,250	1,93	2,660	2600	0,019	106	0,605	0,379	0,009	3,81	0,41	15,50
PK13-1	0,082	4,110	17,30	0,030	2,700	9,56	4,100	33600	0,029	898	1,980	1,320	0,054	19,80	2,90	17,10
PK13-2	0,052	1,960	8,31	0,024	0,991	4,83	2,010	14600	0,022	383	0,842	0,561	0,022	8,76	1,25	15,70
PK13-3	0,032	1,380	6,67	0,024	0,669	6,72	1,630	10400	0,022	244	1,050	0,594	0,019	7,90	0,98	13,80
PK13-4	0,024	0,963	4,44	0,022	0,454	4,51	1,520	6700	0,015	175	0,664	0,398	0,016	5,73	0,74	14,00
PK13-5	0,031	0,696	5,03	0,040	0,369	3,29	1,040	5840	0,015	126	0,704	0,454	0,014	5,59	0,65	14,50
PK13-6	0,036	0,474	6,11	0,027	0,218	1,50	1,275	3295	0,018	108	0,412	0,367	0,010	3,87	0,38	16,45
PK13-7	0,025	0,352	4,34	0,022	0,178	1,37	1,390	2920	0,014	113	0,375	0,373	0,009	3,36	0,34	13,30
PK20-1	0,095	5,090	14,50	0,061	3,530	11,80	4,260	**55200**	0,032	**1620**	2,250	1,540	0,083	42,80	4,91	21,30
PK20-2	0,072	2,990	7,62	0,058	1,530	13,90	2,150	29800	0,027	637	1,460	1,110	0,048	22,60	2,71	15,30
PK20-3	0,040	2,070	6,23	0,044	1,000	3,94	2,190	18800	0,028	516	0,874	0,711	0,033	15,10	1,74	16,60
PK20-4	0,042	2,170	6,31	0,043	0,972	3,81	1,940	19900	**0,033**	463	0,925	0,868	0,039	17,70	2,02	14,20
PK20-5	0,033	1,610	5,58	0,037	0,676	4,00	1,840	14100	0,030	325	0,854	0,848	0,028	12,90	1,39	13,20

	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Ti	V	Zn
PK20-6	0,040	0,608	4,39	0,057	0,261	1,55	1,180	5080	0,014	146	0,447	0,307	0,011	4,55	0,51	16,20
PK20-7	0,026	0,419	4,25	0,043	0,198	1,40	1,750	3400	0,015	178	0,342	0,401	0,009	3,86	0,36	16,50
PK30-1	0,078	4,200	**22,50**	0,096	**4,350**	10,50	**5,260**	29300	0,030	1210	3,140	**2,480**	**0,120**	**69,00**	**7,94**	23,30
PK30-2	0,050	3,010	12,30	0,096	1,610	5,81	3,440	27400	0,025	496	2,020	1,560	0,079	50,50	4,76	23,20
PK30-3	0,031	2,020	8,11	0,073	0,955	4,92	2,300	20000	0,024	349	1,300	0,998	0,043	25,80	2,69	19,30
PK30-4	0,032	1,690	8,89	0,062	0,662	3,60	3,180	16800	0,021	234	0,941	0,880	0,039	20,80	2,14	18,90
PK30-5	0,028	1,310	6,52	0,069	0,536	2,50	2,060	11400	0,022	253	0,782	0,706	0,043	15,10	1,52	16,40
PK30-6	0,027	1,070	8,57	0,089	0,492	2,68	1,790	8660	0,014	275	0,976	0,609	0,026	16,90	1,43	21,50
Moyenne	*0,044*	*1,676*	*7,52*	*0,046*	*1,004*	*5,106*	*2,297*	*14 390*	*0,022*	*365*	*1,183*	*0,808*	*0,033*	*15,95*	*1,87*	*16,76*

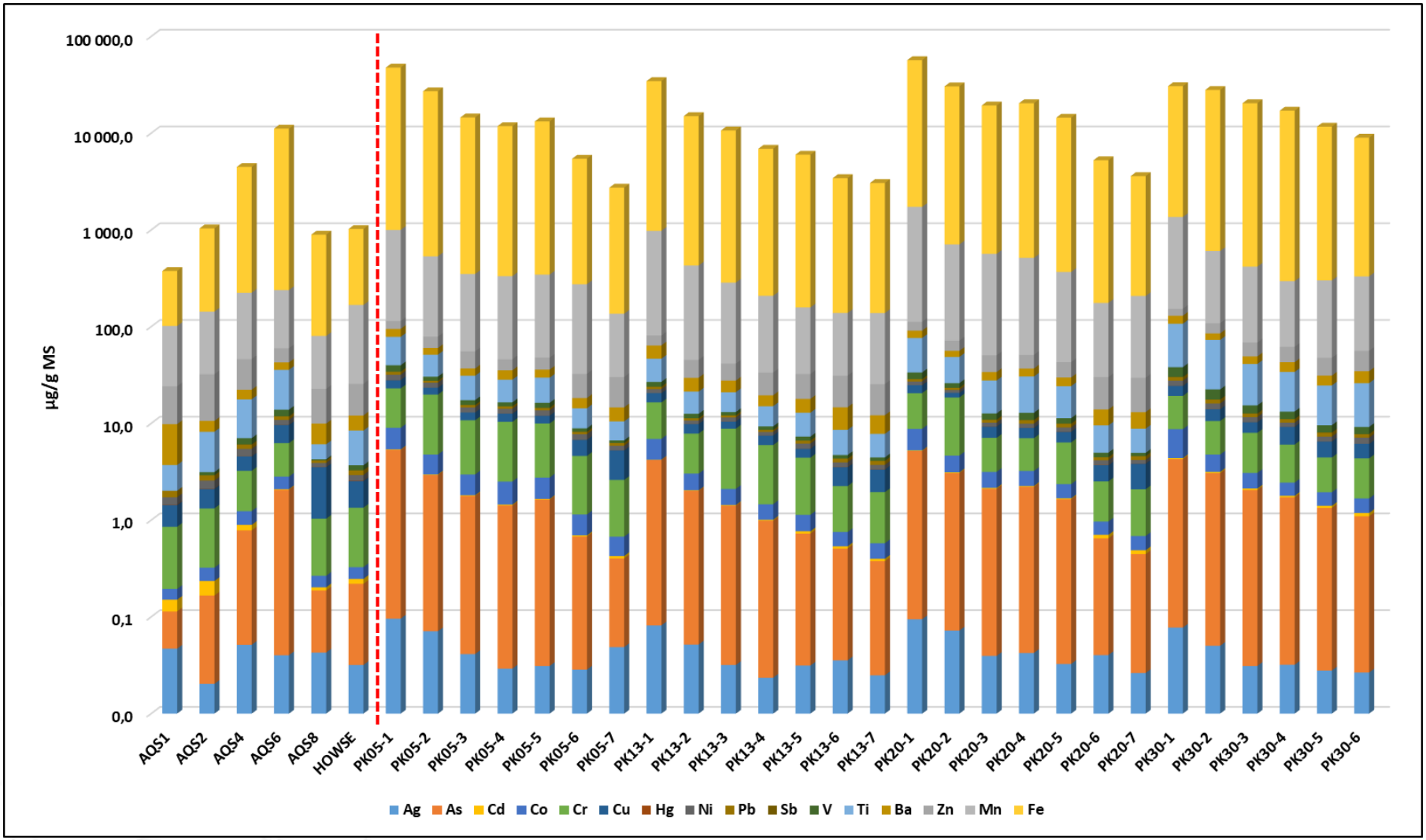


Figure 10 : Histogrammes des dosages.

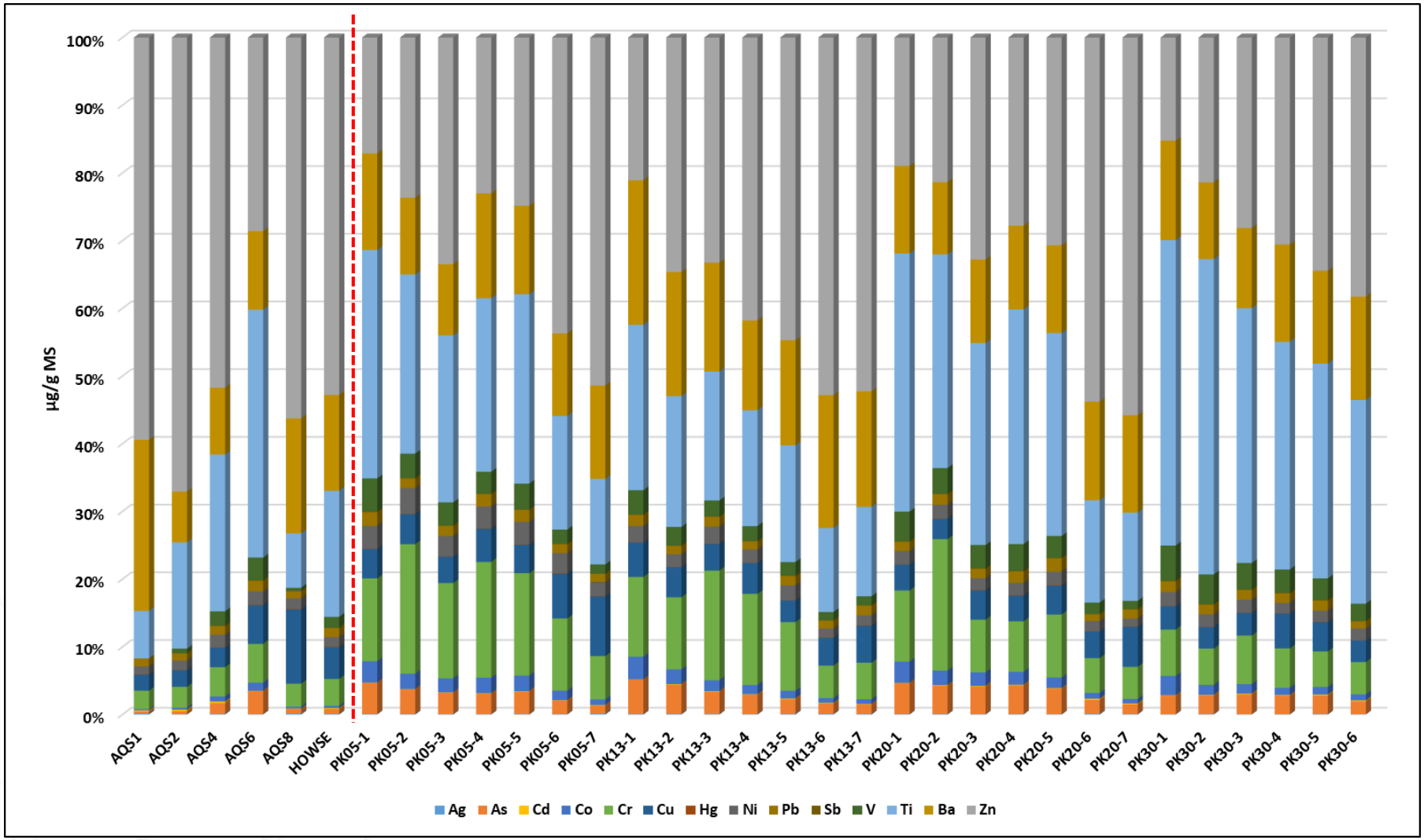


Figure 11 : Pourcentage des métaux (or Mn et Fe) dans les dosages.

Une nouvelle fois les dosages de fer et de manganèse montrent qu'ils sont très fortement prédominants dans nos échantillons, ils ne sont donc pas représentés Figure 11 pour ne pas écraser la représentation des autres métaux. C'est sur le point AQS1 qu'ils sont toutefois un tout petit peu moins représentés (94 % de la masse totale des métaux à eux deux, contre > 99 % pour les points PK et > 97 % pour les autres points du premier groupe).

A la lecture de la figure ci-dessus, quatre remarques peuvent être faites :

- ✓ une distinction est claire entre les points du premier et de second groupe ;
- ✓ l'arsenic et le chrome ont tendance à être en plus grande proportion à proximité de la route principale (points du second groupe) ;
- ✓ à l'inverse, la part du zinc augmente avec l'éloignement à la route ;
- ✓ le point AQS6 montre un profil qui se rapproche des points du second groupe les plus proches de la route.

2. Écart à la moyenne

Bien que l'espèce *Cladonia stellaris* soit utilisée depuis plusieurs années dans les études de bioaccumulation, il n'existe pas à ce jour de base de données de dosages chimiques afin de réaliser une étude statistique des résultats. Afin de pouvoir établir des comparaisons, nous nous basons par rapport aux concentrations moyennes (dernière ligne du tableau) des métaux suivants retrouvés régulièrement dans la littérature scientifique : Al, As, Ba, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Sb, Ti, V, Zn. Les dosages ont tous été réalisés à partir de la même espèce de lichen (afin de pouvoir procéder à des comparaisons) récoltée en zone boréale européenne ou nord-américaine.

Un ratio C/C_{moy} peut être considéré comme hors-norme à partir d'une valeur de 5. Au-delà de 10, une réflexion doit être amorcée afin d'en déterminer la raison.

Dans le tableau, les ratios entre 2 et 5 sont en bleu, ceux entre 5 et 10 sont en orange, ceux entre 10 et 50 sont en rouge et ceux supérieurs à 50 en violet.

Tableau 5 : Ratios C/C_{moy}.

	Al	As	Ba	Cd	Co	Cr	Cu	Fe	Mn	Ni	Pb	Sb	Ti	V	Zn
AQS1	0,1	0,2	0,4	0,2	0,1	0,3	0,0	0,5	**2,6**	0,0	0,0	0,0	0,0	0,0	0,5
AQS2	0,1	0,4	0,1	0,3	0,1	0,5	0,0	1,6	**3,7**	0,0	0,0	0,1	0,1	0,1	0,8
AQS4	0,4	**2,1**	0,3	0,5	0,6	1,0	0,0	**7,5**	**5,9**	0,1	0,1	0,2	0,2	0,3	0,9
AQS6	0,6	**5,7**	0,4	0,2	1,2	1,7	0,1	**19,2**	**5,9**	0,1	0,1	0,4	0,3	0,7	0,6
AQS8	0,1	0,4	0,2	0,1	0,1	0,4	0,1	1,4	1,9	0,0	0,0	0,1	0,0	0,0	0,5
HOWSE	0,1	0,5	0,2	0,1	0,1	0,5	0,0	1,5	**4,7**	0,0	0,0	0,1	0,1	0,1	0,5
PKO5-1	**2,6**	**14,7**	1,0	0,3	**5,8**	**7,1**	0,1	**82,1**	**29,3**	0,4	0,3	0,9	0,6	1,9	0,7
PKO5-2	1,4	**8,0**	0,6	0,2	**2,9**	**7,7**	0,1	**46,8**	**15,1**	0,3	0,2	0,5	0,3	0,9	0,7
PK05-3	1,0	**4,9**	0,4	0,1	1,9	**4,0**	0,0	**25,0**	**9,8**	0,2	0,1	0,3	0,2	0,6	0,7
PK05-4	0,9	**3,9**	0,4	0,1	1,7	**4,0**	0,0	**20,2**	**9,5**	0,2	0,1	0,3	0,2	0,5	0,4
PK05-5	1,0	**4,5**	0,4	0,1	1,8	**3,7**	0,0	**22,7**	**9,8**	0,2	0,1	0,3	0,2	0,6	0,4
PK05-6	0,4	1,8	0,2	0,1	0,7	1,8	0,0	**9,1**	**8,0**	0,1	0,1	0,1	0,1	0,2	0,5
PK05-7	0,3	1,0	0,3	0,1	0,4	1,0	0,1	**4,6**	**3,5**	0,1	0,1	0,1	0,1	0,1	0,6
PK13-1	1,3	**11,5**	1,1	0,1	4,4	**4,9**	0,1	**59,1**	**29,7**	0,2	0,2	0,6	0,3	1,0	0,6
PK13-2	0,5	**5,5**	0,5	0,1	1,6	**2,5**	0,0	**25,7**	**12,7**	0,1	0,1	0,2	0,1	0,4	0,6

	Al	As	Ba	Cd	Co	Cr	Cu	Fe	Mn	Ni	Pb	Sb	Ti	V	Zn
PK13-3	0,5	**3,9**	0,4	0,1	1,1	**3,4**	0,0	**18,3**	**8,1**	0,1	0,1	0,2	0,1	0,3	0,5
PK13-4	0,4	**2,7**	0,3	0,1	0,7	**2,3**	0,0	**11,8**	**5,8**	0,1	0,1	0,2	0,1	0,2	0,5
PK13-5	0,3	**2,0**	0,3	0,2	0,6	1,7	0,0	**10,3**	**4,2**	0,1	0,1	0,1	0,1	0,2	0,5
PK13-6	0,2	1,3	0,4	0,1	0,4	0,8	0,0	**5,8**	**3,6**	0,0	0,1	0,1	0,1	0,1	0,6
PK13-7	0,2	1,0	0,3	0,1	0,3	0,7	0,0	**5,1**	**3,7**	0,0	0,1	0,1	0,0	0,1	0,5
PK20-1	1,3	**14,3**	0,9	0,3	**5,7**	**6,0**	0,1	**97,1**	**53,6**	0,2	0,2	0,9	0,6	1,6	0,8
PK20-2	0,7	**8,4**	0,5	0,3	**2,5**	**7,1**	0,0	**52,4**	**21,1**	0,2	0,2	0,5	0,3	0,9	0,6
PK20-3	0,5	**5,8**	0,4	0,2	1,6	**2,0**	0,0	**33,1**	**17,1**	0,1	0,1	0,3	0,2	0,6	0,6
PK20-4	0,5	**6,1**	0,4	0,2	1,6	1,9	0,0	**35,0**	**15,3**	0,1	0,1	0,4	0,3	0,7	0,5
PK20-5	0,4	**4,5**	0,3	0,2	1,1	2,0	0,0	**24,8**	**10,8**	0,1	0,1	0,3	0,2	0,5	0,5
PK20-6	0,2	1,7	0,3	0,3	0,4	0,8	0,0	**8,9**	**4,8**	0,0	0,0	0,1	0,1	0,2	0,6
PK20-7	0,1	1,2	0,3	0,2	0,3	0,7	0,0	**6,0**	**5,9**	0,0	0,1	0,1	0,1	0,1	0,6
PK30-1	**2,5**	**11,8**	1,4	0,4	**7,0**	5,3	0,1	**51,5**	**40,1**	0,3	0,3	1,3	1,0	2,6	0,8
PK30-2	1,7	**8,4**	0,8	0,4	**2,6**	**3,0**	0,1	**48,2**	**16,4**	0,2	0,2	0,8	0,7	1,6	0,8
PK30-3	0,9	**5,7**	0,5	0,3	1,5	**2,5**	0,0	**35,2**	**11,6**	0,1	0,1	0,4	0,4	0,9	0,7
PK30-4	0,7	**4,7**	0,5	0,3	1,1	1,8	0,1	**29,5**	**7,7**	0,1	0,1	0,4	0,3	0,7	0,7
PK30-5	0,5	**3,7**	0,4	0,3	0,9	1,3	0,0	**20,0**	**8,4**	0,1	0,1	0,5	0,2	0,5	0,6
PK30-6	0,5	**3,0**	0,5	0,4	0,8	1,4	0,0	**15,2**	**9,1**	0,1	0,1	0,3	0,2	0,5	0,8
Cmoy.	**940,7**	**0,4**	**16,2**	**0,2**	**0,6**	**2,0**	**49,1**	**568,7**	**30,2**	**9,5**	**7,2**	**0,1**	**68,5**	**3,0**	**27,6**

Sur les 15 métaux pour lesquels il est possible de trouver de la bibliographie, 9 n'ont aucun ratio supérieur à 2.

Le fer est le métal qui ressort le plus avec 27 ratios $C/C_{moy}>2$ sur 33 dosages (soit 82 %). Parmi ceux-ci, 16 ont un ratio entre 10 et 50 et 5 sont supérieurs à 50. Vient ensuite le manganèse avec 28 dépassements, dont 11 sont supérieurs à 5 et 11 à 10. Le troisième métal à montrer de tels dépassements est l'arsenic avec 7 ratios supérieurs à 5 et 4 ratios supérieurs à 10. Dans une bien moindre mesure, le chrome, le cobalt et l'aluminium montrent aussi quelques dépassements.

En ce qui concerne les points de prélèvements, seuls les PKx-1 montrent des ratios de fer supérieurs à 50 (ainsi que pour le manganèse sur PK20-1). Le transect PK20 est celui avec les plus importants dépassements, il est aussi le seul à avoir un ratio > 50 pour PK20-2, soit à 50 mètres de la route. Cette année encore, les dépassements sont plus importants à proximité de la route et une baisse des dépassements s'observe à partir de 300 mètres environ, excepté pour le transect PK30 où une fosse créée en 2017 est désormais contigüe et influence donc une partie des résultats. Ceci laisse penser que la route est une source importante d'émission car une décroissance apparaît nettement (cf. Figure 12), sans que le mode d'émission soit établi (ré-envol de poussières du sol ou émissions des pots d'échappement ?).

Concernant les points du premier groupe, seul AQS6 montre des dépassements notables avec 2 ratios supérieurs à 5 et 1 supérieur à 10.

Dans la figure ci-après, le cumul arithmétique des écarts à la moyenne (somme arithmétique) est présenté.

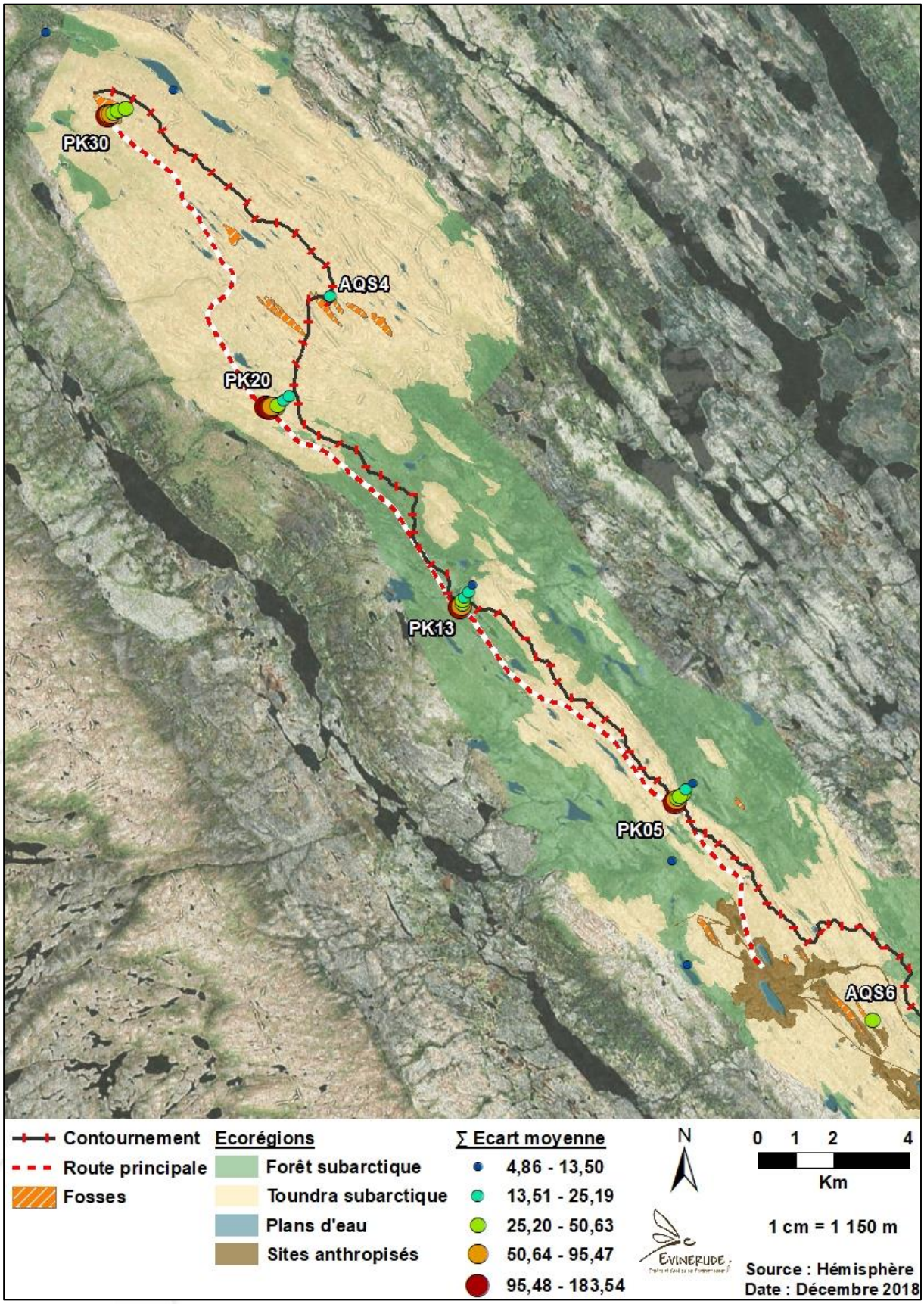


Figure 12 : Cumul des écarts à la moyenne.

3. Impact du à l'activité

La Figure 13, ci-après, présente le cumul massique des métaux lourds. De par la présence de métaux dont la concentration est de base élevée (tel le fer dont la concentration minimale est de 275 µg/g quand la concentration maximale du mercure est de 0.033 µg/g), la concentration totale est conditionnée par ces derniers.

Afin de prendre en compte la part de chaque métal dans le cumul total, nous choisissons l'utilisation d'un indice arbitraire construit tel que suit : pour un métal donné, la concentration maximale est ramenée à 1, les autres étant proportionnelles et allant de 0 à 1. Pour chaque site, nous additionnons ensuite ces "participations" des métaux au calcul de l'indice puis nous regroupons en classes les résultats obtenus dans le tableau ci-dessous et la Figure 13 présentée page suivante.

Tableau 6 : Importance du cumul des métaux.

Site	Participation
AQS1	**Très faible participation**
AQS2	**Faible participation**
AQS4	Participation moyenne
AQS5	*Ne participe pas*
AQS6	Participation moyenne
AQS8	**Très faible participation**
AQS9	*Ne participe pas*
HOWSE	**Faible participation**
PK05-1	**Très forte participation**
PK05-2	**Participation forte**
PK05-3	Participation moyenne
PK05-4	Participation moyenne
PK05-5	Participation moyenne
PK05-6	**Faible participation**
PK05-7	**Faible participation**
PK13-1	**Très forte participation**
PK13-2	Participation moyenne
PK13-3	Participation moyenne

Site	Participation
PK13-4	**Faible participation**
PK13-5	**Faible participation**
PK13-6	**Faible participation**
PK13-7	**Très faible participation**
PK20-1	**Très forte participation**
PK20-2	**Participation forte**
PK20-3	Participation moyenne
PK20-4	Participation moyenne
PK20-5	Participation moyenne
PK20-6	**Faible participation**
PK20-7	**Faible participation**
PK30-1	**Très forte participation**
PK30-2	**Très forte participation**
PK30-3	**Participation forte**
PK30-4	Participation moyenne
PK30-5	Participation moyenne
PK30-6	Participation moyenne
PK30-7	*Ne participe pas*

En considérant la synthèse ci-dessus, il apparaît que globalement :

- ✓ AQS1 est le point le moins touché par l'accumulation métallique ;
- ✓ PK30-1 est le plus touché ;
- ✓ Les points du premier groupe montrent un impact moins élevé que pour les transects, avec une participation très faible (AQS1 et AQS8) ou faible (Howse et AQS2) ;
- ✓ AQS4 puis AQS6 se classent en répartition moyenne au même titre que les points du second groupe ;
- ✓ Les PK indicés 1 et 2 (< 50 m) ont les plus fortes participations métalliques ;
- ✓ Les transects ayant les plus importantes participations sont par ordre décroissant PK05, PK30, PK20 et finalement PK13.

L'influence de la route reste là encore fortement supposée pour expliquer de telles observations.

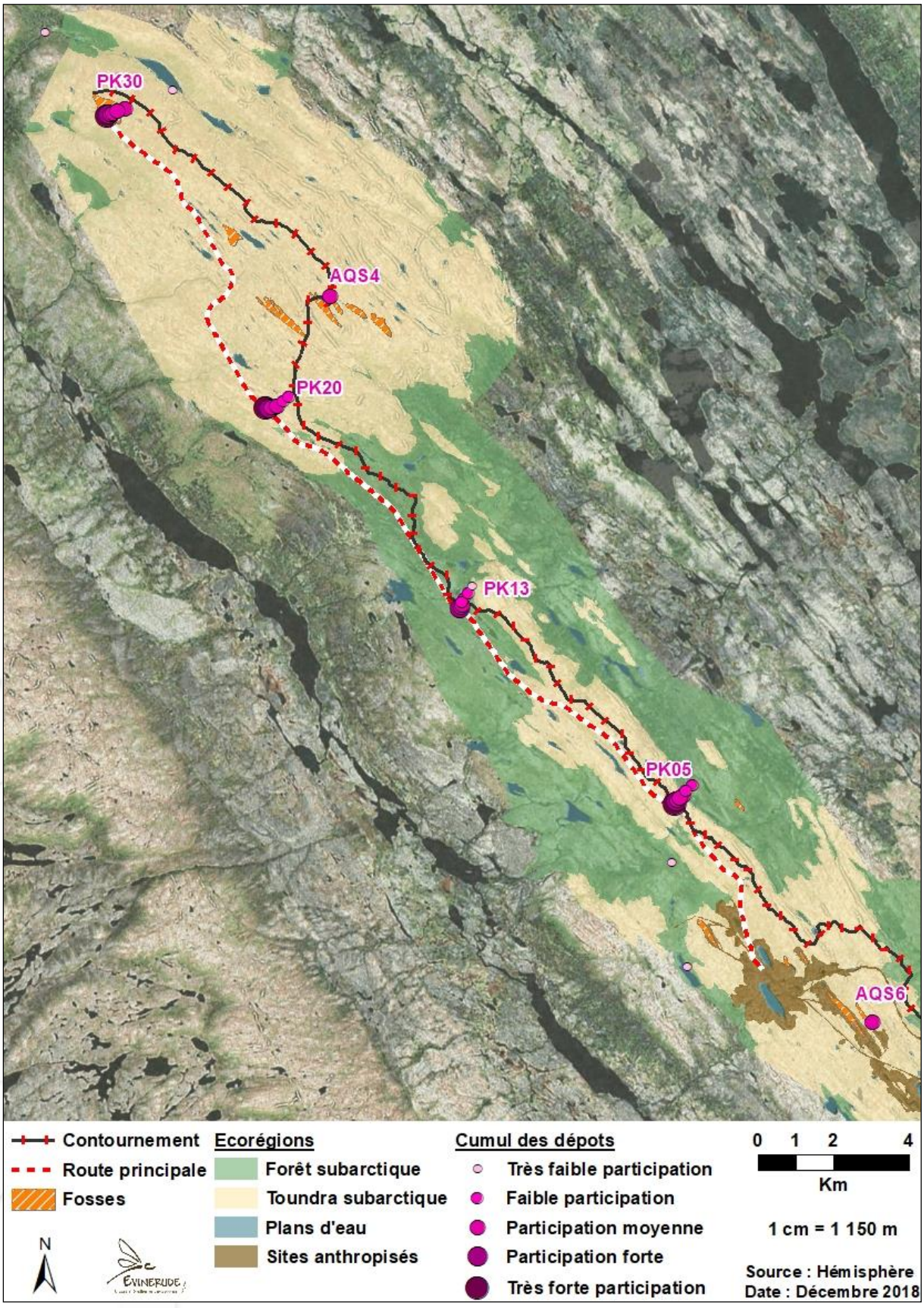


Figure 13 : Cumul des dépôts de métaux lourds.

4. Impact dû au trafic

Suite à l'impact supposé de la route vis-à-vis de la pollution atmosphérique, depuis 2016 des transects sont réalisés à partir de la route en suivant les vents dominants. Les résultats sont présentés de la Figure 14 à la Figure 17. De par ses concentrations très élevées et afin de ne pas écraser les autres courbes, le fer est représenté à part, de la Figure 18 à la Figure 21.

Cadmium, **mercure** et **zinc** montrent des profils (très) aléatoires avec des alternances d'augmentation et diminution sans rapport avec la distance à la route.

Les concentrations du **cadmium** varient donc de façon peu significative entre les points les plus proches et les plus éloignés ; il est aussi intéressant d'observer que ses concentrations totales augmentent de manière continue : PK05 < PK13 < PK20 < PK30.

Argent, **cadmium**, **mercure** et **antimoine** sont les quatre métaux diminuant peu le long du transect, voire augmentent en PK05 et PK30 pour le **mercure**.

Une tendance globale à la baisse est observable pour les autres métaux en fonction de l'éloignement à la route, principalement jusqu'à 300 mètres. Entre 300 mètres et 500 mètres, les profils sont plus aléatoires, certains vont même augmenter (**argent**, **cuivre** et **baryum** sur PK05 ; **cuivre** sur PK13 ; **cadmium**, **mercure** et **baryum** sur PK20 ; **cadmium**, **chrome**, **nickel**, **vanadium**, **titane**, **baryum** et **manganèse** pour PK30). Ces augmentations sur PK30 doivent pouvoir s'expliquer avec le creusement de la fosse le long de celui-ci.

Le fer garde un profil particulier avec une très forte diminution quel que soit le transect et la distance à la route. Ce métal est discriminant sur le secteur d'étude de par sa richesse et la coloration rouille qu'il donne aux paysages, particulièrement visible sur les épinettes et les lichens (Photo 24 à Photo 26).

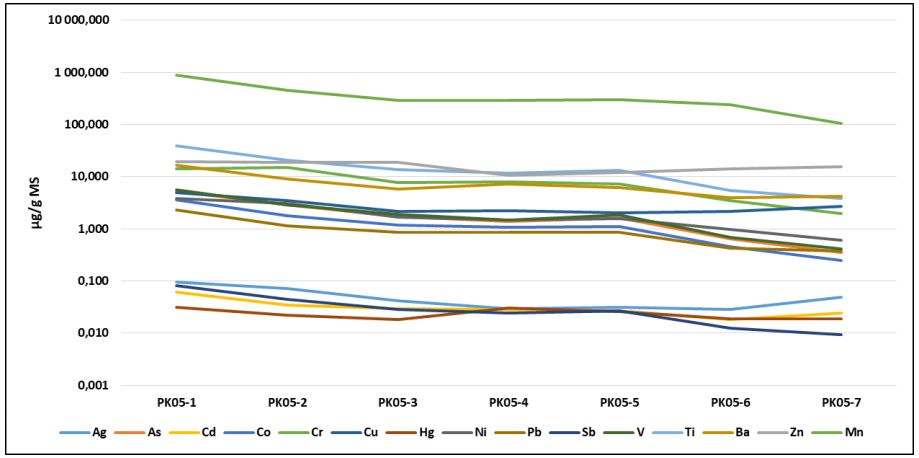


Figure 14 : Concentrations le long du transect PK05.

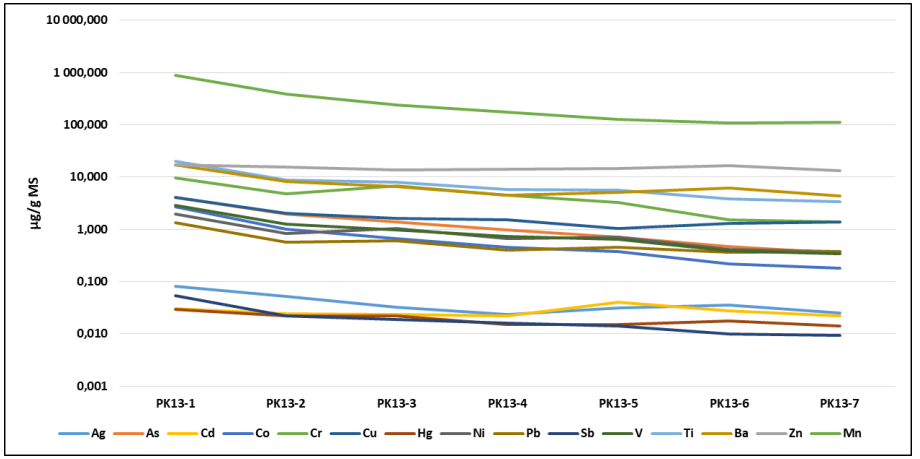


Figure 15 : Concentrations le long du transect PK13.

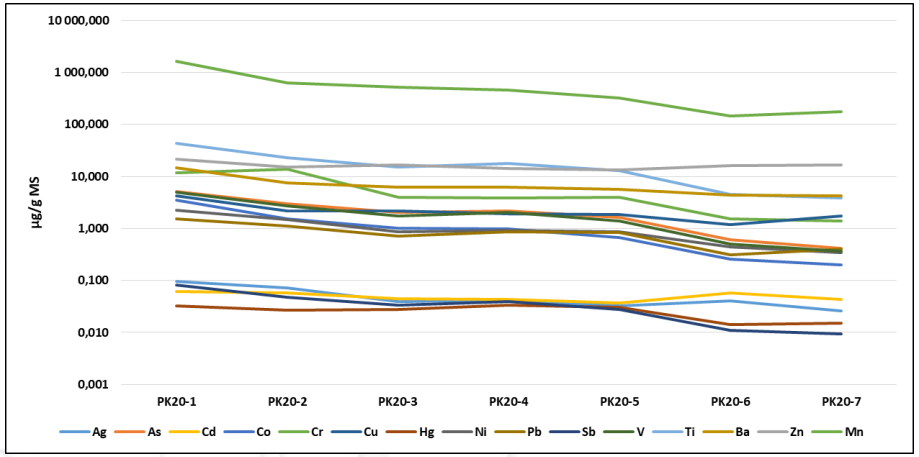


Figure 16 : Concentrations le long du transect PK20.

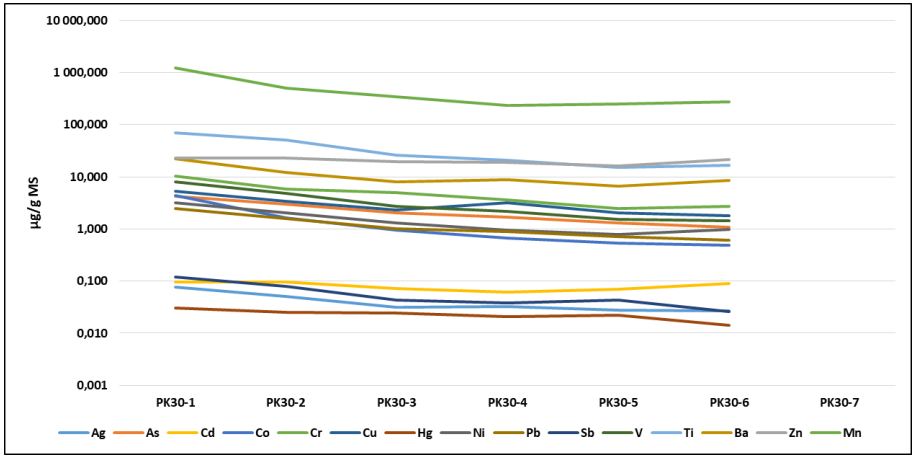


Figure 17 : Concentrations le long du transect PK30.

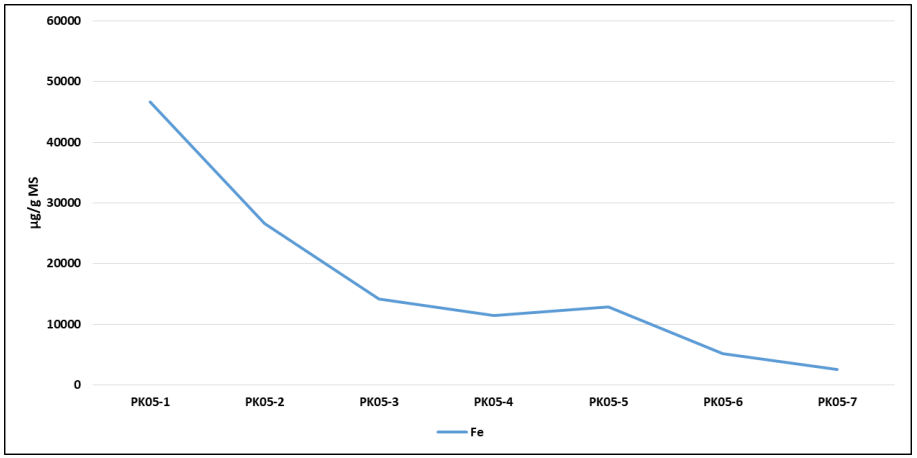


Figure 18 : Concentrations de fer le long du transect PK05.

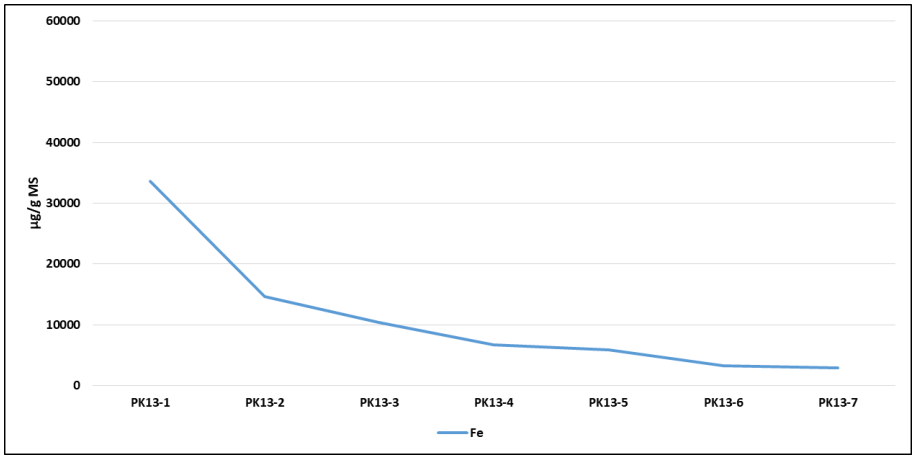


Figure 19 : Concentrations de fer le long du transect PK13.

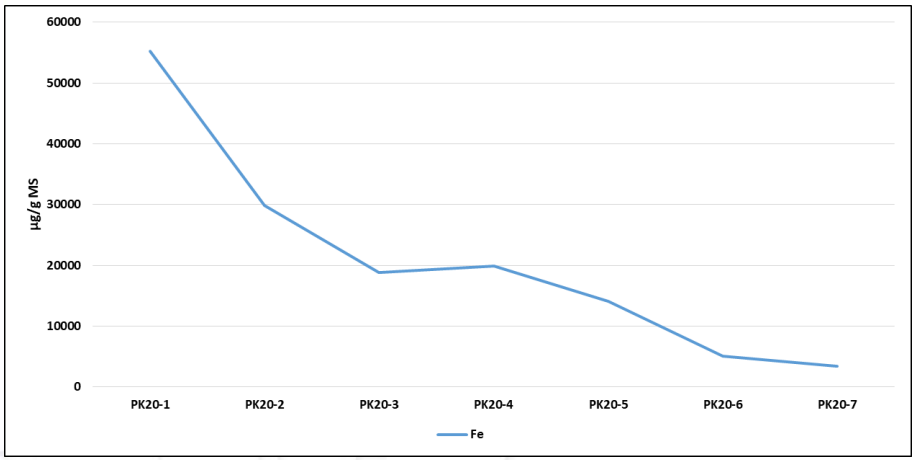


Figure 20 : Concentrations de fer le long du transect PK20.

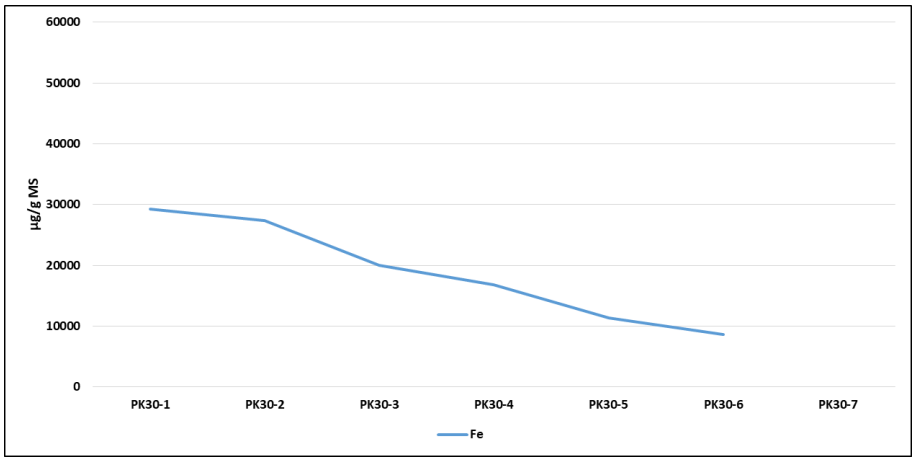


Figure 21 : Concentrations de fer le long du transect PK30.



Photo 24 : Dégagement de poussières au passage des camions.



Photo 25 : Ambiance colorée aux abords de la route.



Photo 26 : Coloration des lichens selon l'éloignement à la route.

5. Facteur d'enrichissement

Le facteur d'enrichissement est une valeur qui compare les teneurs d'un métal contenu dans notre matrice d'accumulation (ici, un lichen) par rapport à sa teneur dans le sol. Il se calcule d'après la formule suivante :

$$EF = \frac{(Cx/Cal)\ lichen}{(Cx/Cal)\ sol}$$

Où EF est le facteur d'enrichissement

C_x représente la concentration de l'élément analysé

C_{al} représente la concentration en aluminium

L'aluminium est considéré comme un élément de référence car il est très rarement présent dans l'atmosphère suite à une émission anthropique. Ainsi, selon ce calcul il est admis dans la littérature scientifique qu'une valeur EF >10 sous-entend que les concentrations issues des dosages dans les lichens ont pour origine une source éloignée.

Tatasteel a procédé à des dosages de métaux dans le sol non loin des points de prélèvements. Une moyenne établie à partir des 6 sites les plus proches (HOW-LT-3-S, GB-LT-1-S, GB-LT-2-S, GB-LT-3-S, GB-LT-4-S, GB-LT-5-S) sert de référence pour C_x et C_{al} au dénominateur. Parallèlement, l'aluminium a aussi été dosé dans chaque échantillon de lichen (non représenté dans le Tableau 4), correspondant au C_{al} du numérateur.

Les résultats de ce calcul sont présentés dans le tableau ci-après.

Tableau 7 : Facteurs d'enrichissement.

	Ag	As	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	V	Ti	Zn
AQS1	6,32	0,81	**18,32**	0,00	**32,96**	1,01	5,34	**10,62**	0,66	**30,80**	8,92	4,59	2,96	0,00	2,23	0,00	**61,59**
AQS2	1,61	1,04	4,24	0,00	**36,13**	1,19	4,75	8,46	1,25	**14,71**	7,53	4,34	2,09	1,54	3,90	0,49	**54,33**
AQS4	0,92	1,17	1,81	1,28	**12,86**	1,06	2,14	3,21	1,35	4,34	2,72	1,90	0,82	1,22	1,86	0,49	**13,55**
AQS6	0,45	2,04	1,73	1,90	2,62	1,39	2,32	5,23	2,17	5,14	1,72	1,63	0,82	1,18	2,40	0,63	6,11
AQS8	3,24	0,98	6,48	0,00	7,31	0,83	3,49	**25,77**	1,09	**14,04**	3,71	3,29	1,39	1,61	1,35	0,23	**30,72**
HOWSE	1,80	0,95	4,56	0,00	**10,36**	0,77	3,47	9,28	0,86	**18,64**	6,89	2,47	1,50	1,74	2,63	0,65	**24,31**
PKO5-1	0,26	1,29	0,99	2,59	1,10	1,70	2,30	1,86	2,27	1,22	2,08	1,30	0,49	0,68	1,03	0,43	1,71
PKO5-2	0,38	1,36	1,06	2,58	1,23	1,63	4,82	2,54	2,50	1,67	2,07	1,97	0,47	0,70	1,08	0,42	3,16
PK05-3	0,30	1,14	0,95	2,19	1,43	1,45	3,43	2,16	1,84	1,88	1,85	1,49	0,48	0,62	0,97	0,39	4,32
PK05-4	0,24	1,04	1,32	2,20	1,59	1,51	3,94	2,56	1,70	3,58	2,05	1,52	0,54	0,60	0,96	0,35	2,81
PK05-5	0,23	1,08	1,05	2,07	1,34	1,42	3,28	2,07	1,72	2,80	1,92	1,47	0,49	0,60	0,98	0,39	2,85
PK05-6	0,52	1,06	1,60	1,92	2,23	1,39	3,79	5,33	1,66	4,94	3,77	2,15	0,60	0,67	0,96	0,35	8,20
PK05-7	1,33	0,86	2,52	1,63	4,35	1,16	3,15	9,87	1,25	7,39	2,47	2,02	0,79	0,75	1,01	0,31	**13,39**
PK13-1	0,46	2,07	2,16	3,74	1,12	2,59	3,23	3,14	3,35	2,33	4,32	1,36	0,57	0,92	1,08	0,46	3,05
PK13-2	0,69	2,33	2,45	3,33	2,14	2,24	3,84	3,63	3,43	4,17	4,35	1,37	0,57	0,89	1,13	0,46	6,61
PK13-3	0,48	1,85	2,22	2,57	2,36	1,71	6,05	3,33	2,76	4,71	3,13	1,93	0,69	0,84	1,15	0,41	6,57
PK13-4	0,48	1,75	2,01	2,38	2,97	1,58	5,50	4,21	2,41	4,36	3,04	1,65	0,62	0,96	1,13	0,42	9,04
PK13-5	0,72	1,44	2,58	2,04	6,14	1,45	4,55	3,27	2,38	4,94	2,48	1,99	0,80	0,97	1,25	0,42	**10,60**
PK13-6	1,31	1,56	5,00	2,21	6,71	1,37	3,32	6,41	2,15	9,22	3,39	1,86	1,04	1,10	1,39	0,39	**19,26**
PK13-7	1,17	1,48	4,52	2,41	6,91	1,42	3,85	8,88	2,42	9,38	4,53	2,15	1,34	1,31	1,53	0,45	**19,79**
PK20-1	0,54	2,61	1,84	4,97	2,33	3,45	4,05	3,32	5,59	2,62	7,93	1,58	0,68	1,42	2,38	0,79	3,87
PK20-2	0,76	2,82	1,78	4,87	4,05	2,75	8,78	3,09	5,55	4,06	5,74	1,88	0,90	1,52	2,31	0,80	5,11
PK20-3	0,63	2,95	2,20	4,37	4,71	2,72	3,76	4,75	5,30	6,37	7,03	1,70	0,87	1,59	2,34	0,78	8,39
PK20-4	0,59	2,69	1,94	3,79	4,00	2,30	3,16	3,66	4,87	6,52	5,48	1,57	0,92	1,63	2,38	0,78	6,24
PK20-5	0,63	2,77	2,38	3,68	4,78	2,22	4,62	4,83	4,80	8,24	5,35	2,01	1,25	1,61	2,41	0,75	8,06
PK20-6	1,55	2,10	3,76	2,98	**14,71**	1,72	3,59	6,21	3,47	7,71	4,82	2,11	0,91	1,26	1,71	0,55	**19,84**
PK20-7	1,39	1,98	4,98	2,71	**15,15**	1,78	4,43	**12,58**	3,17	**11,30**	8,03	2,21	1,63	1,49	1,98	0,53	**27,62**

	Ag	As	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	V	Ti	Zn
PK30-1	0,23	1,10	1,46	2,06	1,88	2,17	1,84	2,10	1,52	1,25	3,03	1,12	0,56	1,05	1,96	0,65	2,16
PK30-2	0,22	1,17	1,18	1,55	2,75	1,19	1,51	2,03	2,10	1,55	1,84	1,07	0,52	1,03	2,12	0,58	3,19
PK30-3	0,26	1,51	1,51	1,84	4,04	1,36	2,47	2,62	2,96	2,86	2,49	1,33	0,64	1,07	2,10	0,63	5,12
PK30-4	0,33	1,55	2,02	1,69	4,19	1,15	2,21	4,43	3,04	3,06	2,04	1,18	0,69	1,18	2,07	0,61	6,13
PK30-5	0,41	1,72	2,13	1,68	6,76	1,34	2,20	4,12	2,96	4,61	3,18	1,41	0,80	1,91	2,15	0,63	7,64
PK30-6	0,38	1,38	2,75	1,57	8,57	1,21	2,32	3,52	2,21	2,88	3,39	1,72	0,68	1,11	2,37	0,58	9,84

En rouge sont représentées les valeurs supérieures à 10.

Pour la troisième année ce sont les points du premier groupe qui montrent de telles valeurs, principalement pour le **zinc**, le **cadmium**, le **mercure**, le **cuivre** et le **baryum**. AQS6 reste le seul site sans aucun facteur d'enrichissement > 10.

Concernant les transects, les facteurs d'enrichissement sont > 10 à partir de 500 voire 300 mètres pour le **zinc** sur PK05/13/20, et pour le **cadmium**, le **cuivre** et le **mercure** sur PK20. Seul PK30 n'a de valeur supérieure à 10.

Ces observations corroborent les résultats des années antérieures et des paragraphes précédents, à savoir que la route semble avoir une influence certaine sur son environnement avec une déposition avérée jusqu'à 300 mètres environ.

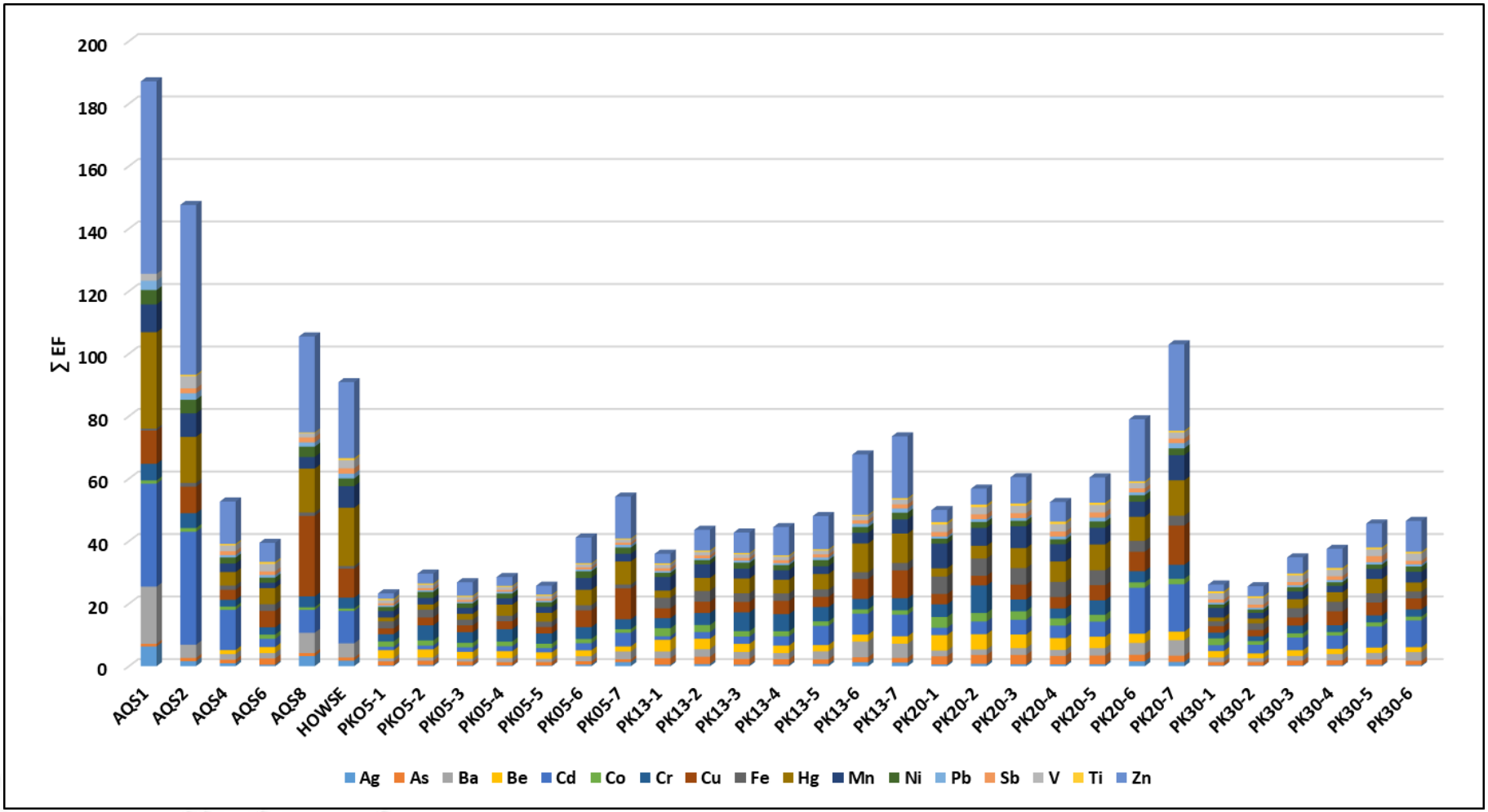


Figure 22 : Histogrammes des facteurs d'enrichissements cumulés.

Si l'on additionne les facteurs d'enrichissement, nous obtenons la Figure 22. AQS1 puis AQS2 ont les cumuls les plus importants notamment par les valeurs du **baryum**, **cadmium**, **cuivre**, **mercure** et **zinc**. Viennent ensuite AQS8 puis Howse ; et enfin AQS4 et AQS6 dont les EF se rapprochent de ceux des transects.

Le cumul des valeurs d'EF sur les points PK augmente lorsque l'on s'éloigne de la route principale, avec notamment une différence nette à partir de 300 m de distance.

PK05 et PK30 ont les EF les plus bas comparativement à PK13 et PK20.

La Figure 23 présente les valeurs cumulées d'EF où l'influence de la route ressort de manière notable.

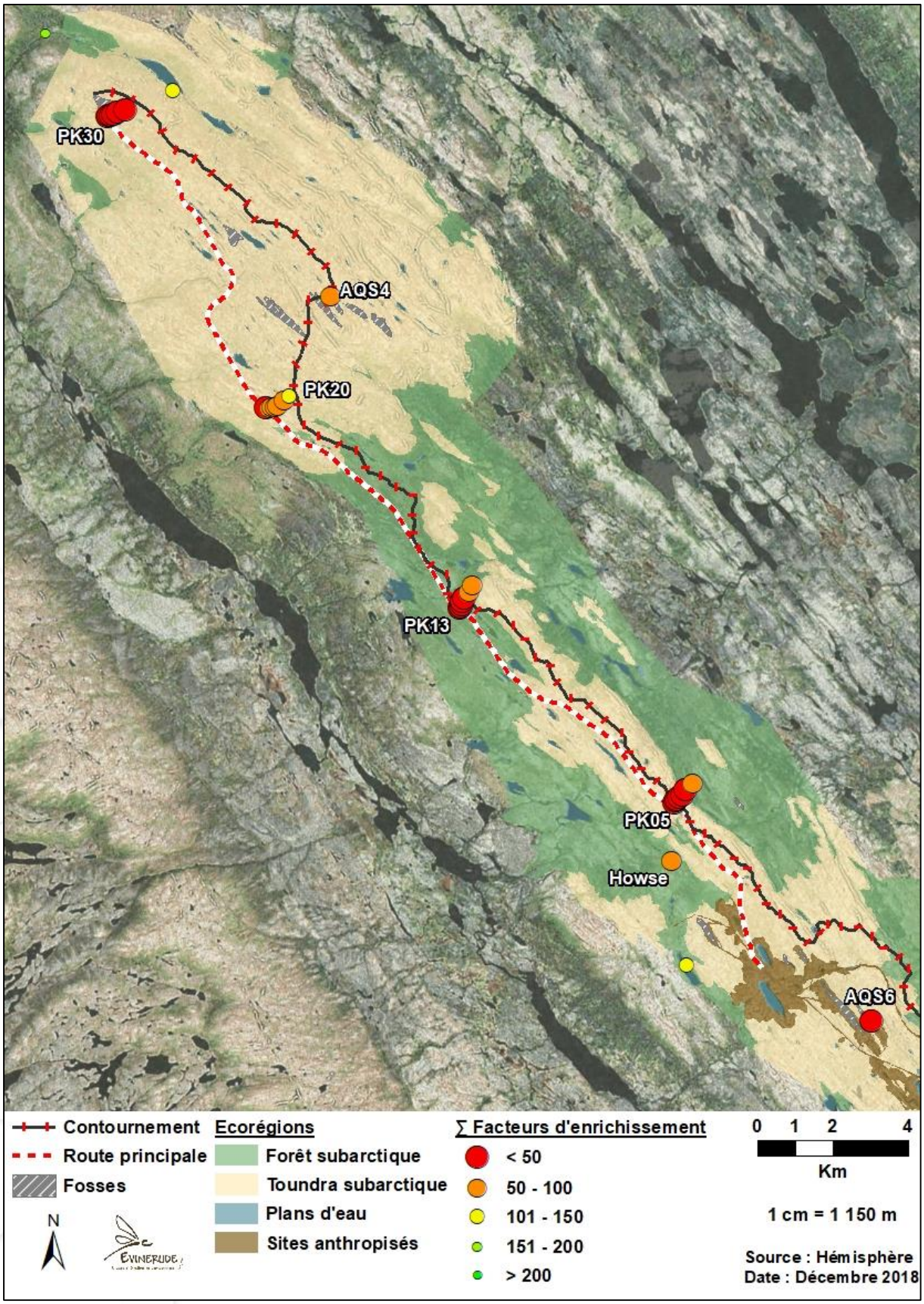


Figure 23 : Représentation des facteurs d'enrichissement.

6. Étude temporelle

Pour rappel, une étude temporelle n'est pertinente qu'après un suivi sur au moins 3 campagnes, toutefois :

- de nombreux dosages n'ont pas donné de valeurs en 2016, voire 2017 (car en dessous de la limite de quantification) ;
- les points PK allaient jusqu'à 5 et non 7, et PK20 n'avait que 4 prélèvements en 2016 ;
- le point PK30-7 a été créé en 2017 mais était détruit en 2018.

Malgré tout il a été décidé d'initier une première étude des tendances dont les résultats des campagnes ultérieures viendront compléter les informations et affiner les premières observations. Ainsi, même si plusieurs métaux n'ont pas été détaillés depuis 2016 (trop peu de concentrations mesurées), leurs tendances sont interprétées ici.

Sur l'ensemble des dosages réalisés depuis 2016 et à partir des 1860 résultats obtenus :

- 19 % de ces résultats ont diminué sur les 3 campagnes de suivi (tous métaux et sites confondus) ;
- **arsenic**, **béryllium**, **cobalt**, **chrome**, **fer**, **mercure** et **antimoine** n'ont montré aucune baisse globale de leurs concentrations sur aucun des sites ;
- **zinc**, **cadmium**, **mercure**, **sélénium** et **strontium** ont tous les quatre montré une diminution sur près de la moitié des sites ;
- à l'inverse **fer**, **aluminium** et **manganèse** ont les plus importantes augmentations ;
- aucune diminution n'est visible pour l'ensemble des métaux sur **AQS6**, **PKO5-1**, **PK13-1**, **PK13-2**, **PK30-2** et **PK30-3** ;
- le transect **PK20** montre le plus grand nombre de baisse des concentrations quand **PK30** montre le plus de hausse (par rapport aux autres transects).

De la Figure 24 à la Figure 34, les courbes des concentrations sont présentées par groupe : celles des points AQS/Howse, puis celles des quatre transects. La même échelle est utilisée afin de pouvoir les comparer plus facilement.

La première constatation est que même si les tendances citées plus haut sont à la hausse ou à la baisse, on peut voir que celles-ci ne sont pas linéaires et qu'il est possible d'avoir eu une année différente des autres (l'argent, l'arsenic ou le molybdène sur PK20-1 en 2017, ou encore le cuivre sur la plupart des sites en 2017 par exemple).

Pour un très grand nombre de métaux, c'est le point PK05-1 qui regroupe dans le temps les plus importantes concentrations.

En général, ce sont les points PK indicés 1 qui présentent les concentrations les plus élevées de leur transect.

Les points du premier groupe ont des concentrations globalement plus faibles que celles du second groupe.

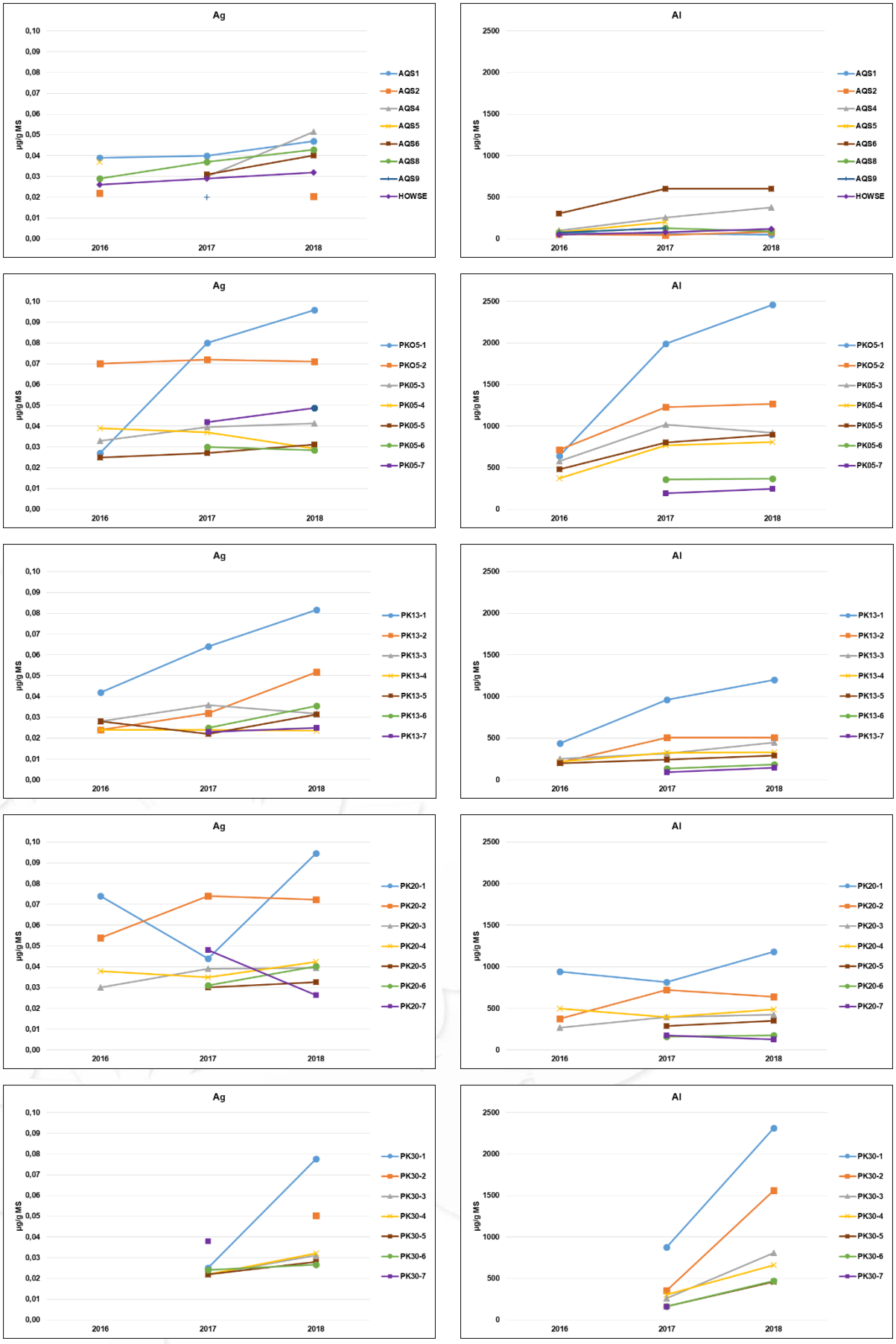


Figure 24 : Courbes temporelles des concentrations en argent et aluminium.

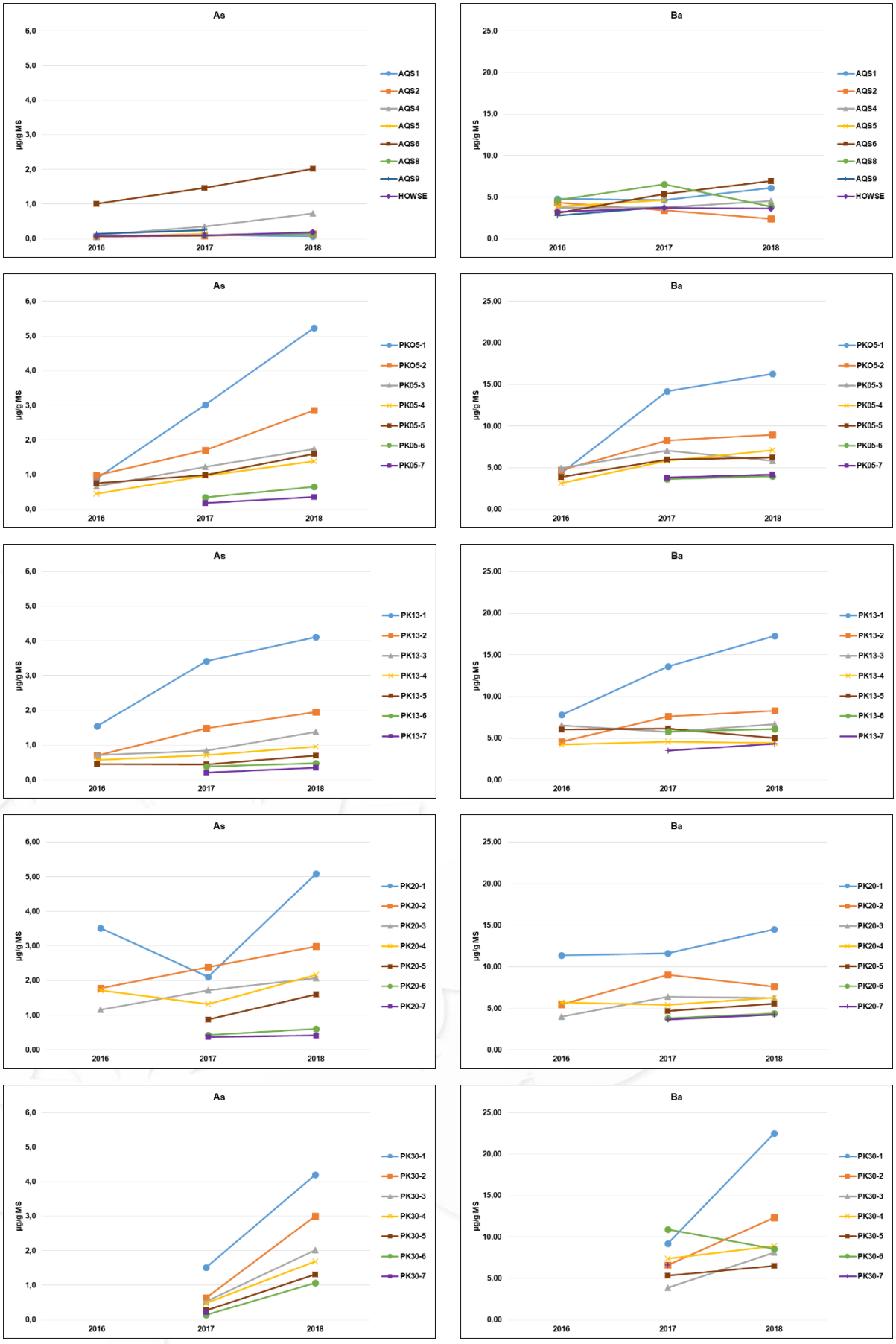


Figure 25 : Courbes temporelles des concentrations en arsenic et baryum.

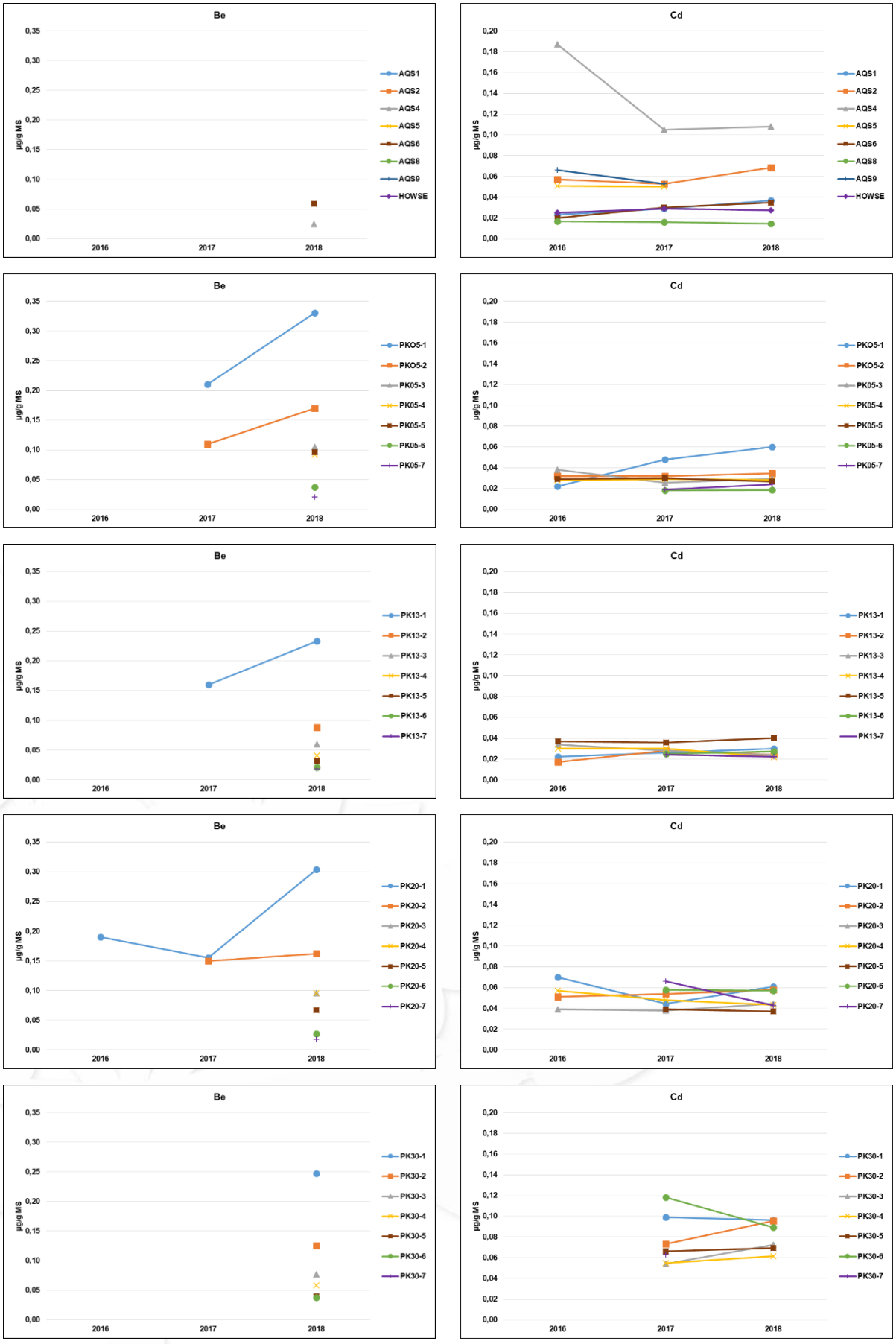


Figure 26 : Courbes temporelles des concentrations en béryllium et cadmium.

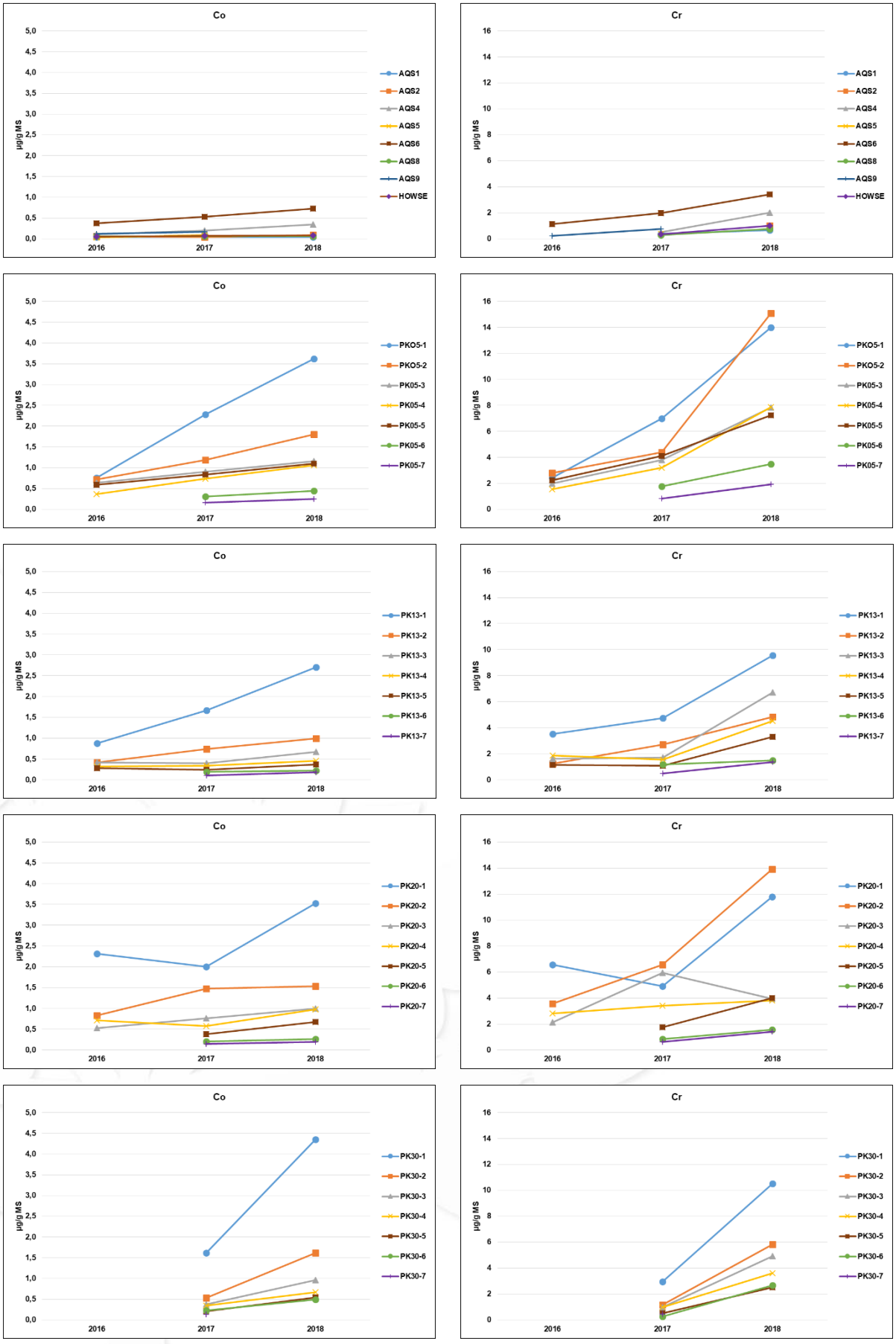


Figure 27 : Courbes temporelles des concentrations en cobalt et chrome.

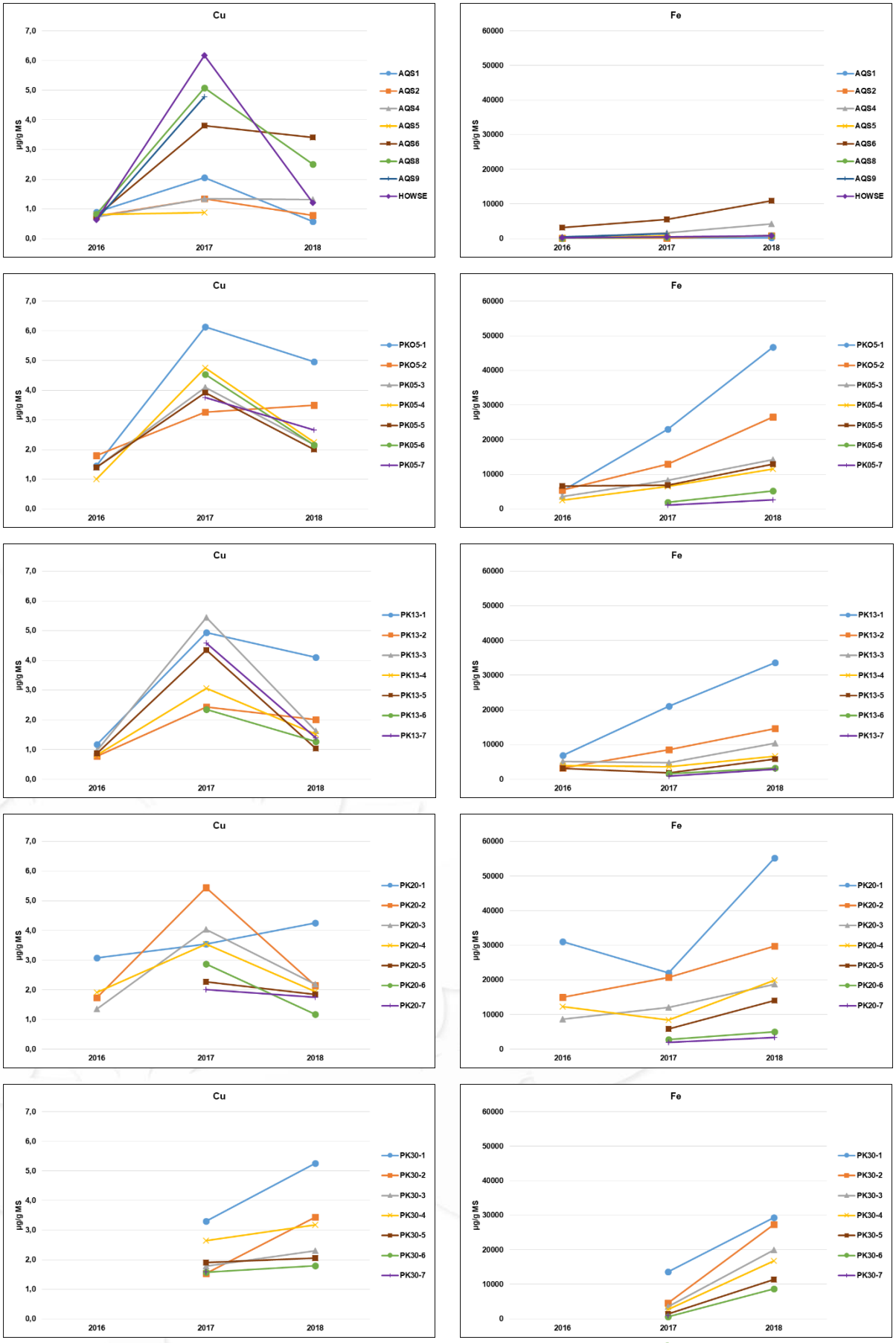


Figure 28 : Courbes temporelles des concentrations en cuivre et fer.

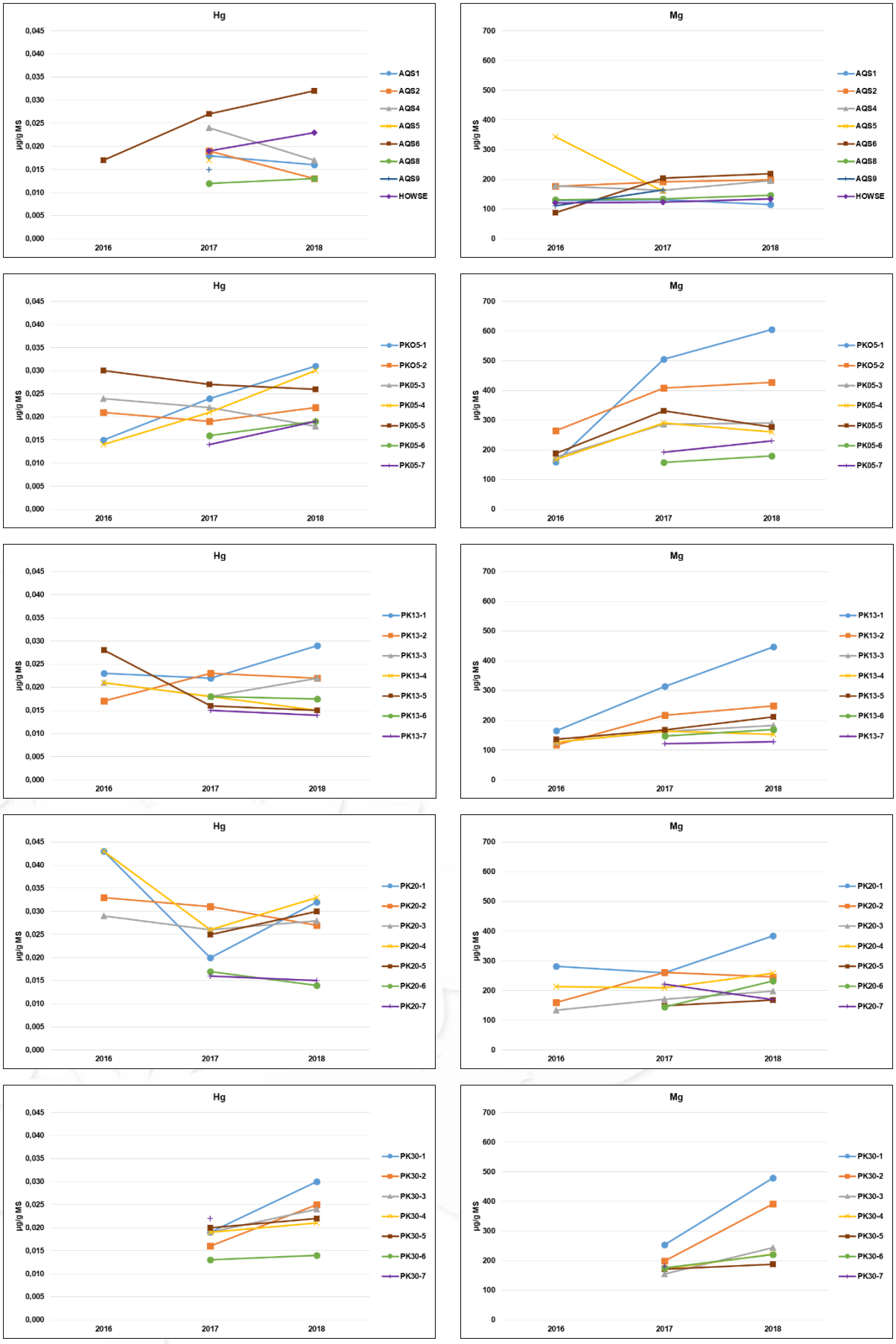


Figure 29 : Courbes temporelles des concentrations en mercure et magnésium.

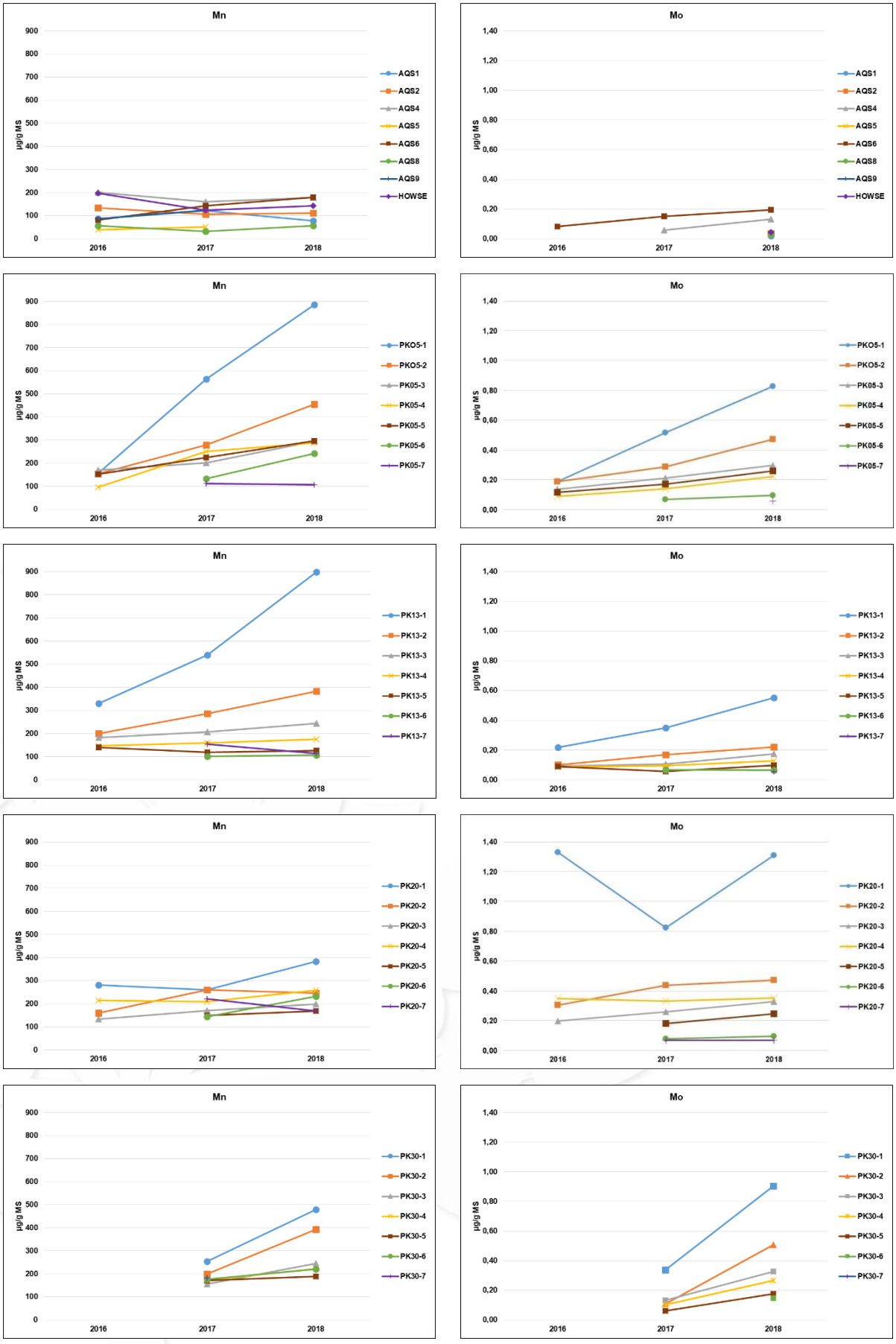


Figure 30 : Courbes temporelles des concentrations en manganèse et molybdène.

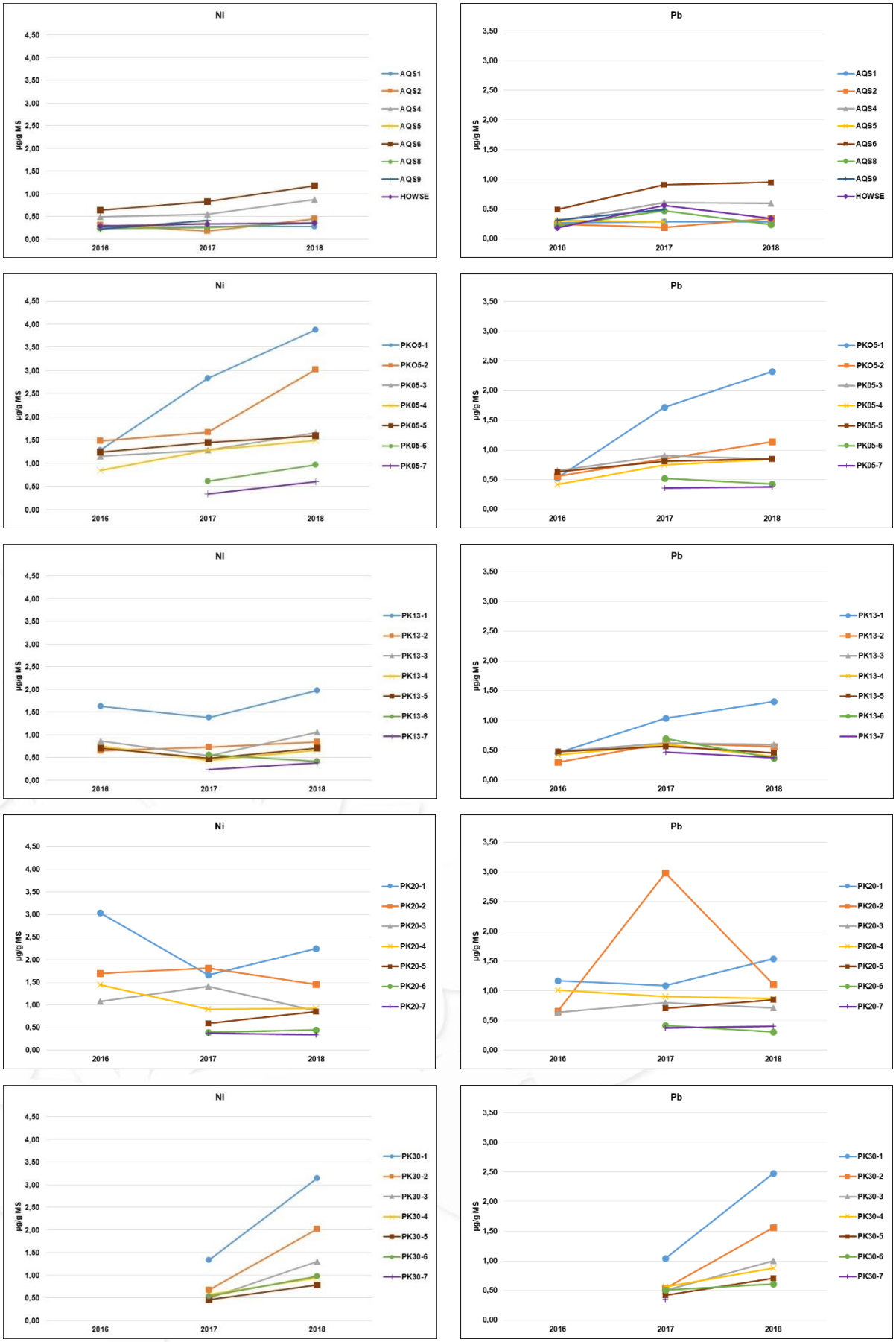


Figure 31 : Courbes temporelles des concentrations en nickel et plomb.

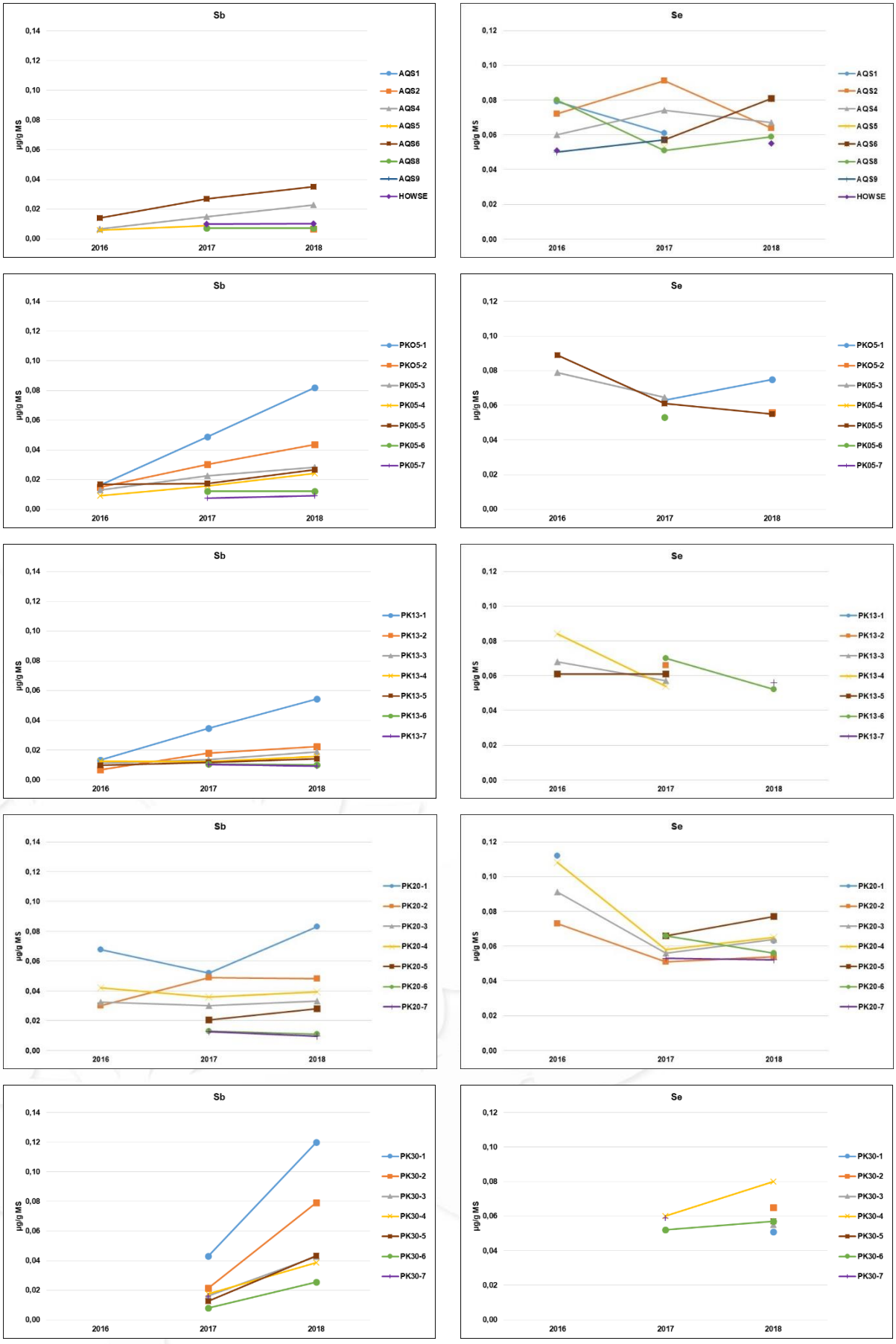


Figure 32 : Courbes temporelles des concentrations en antimoine et sélénium.

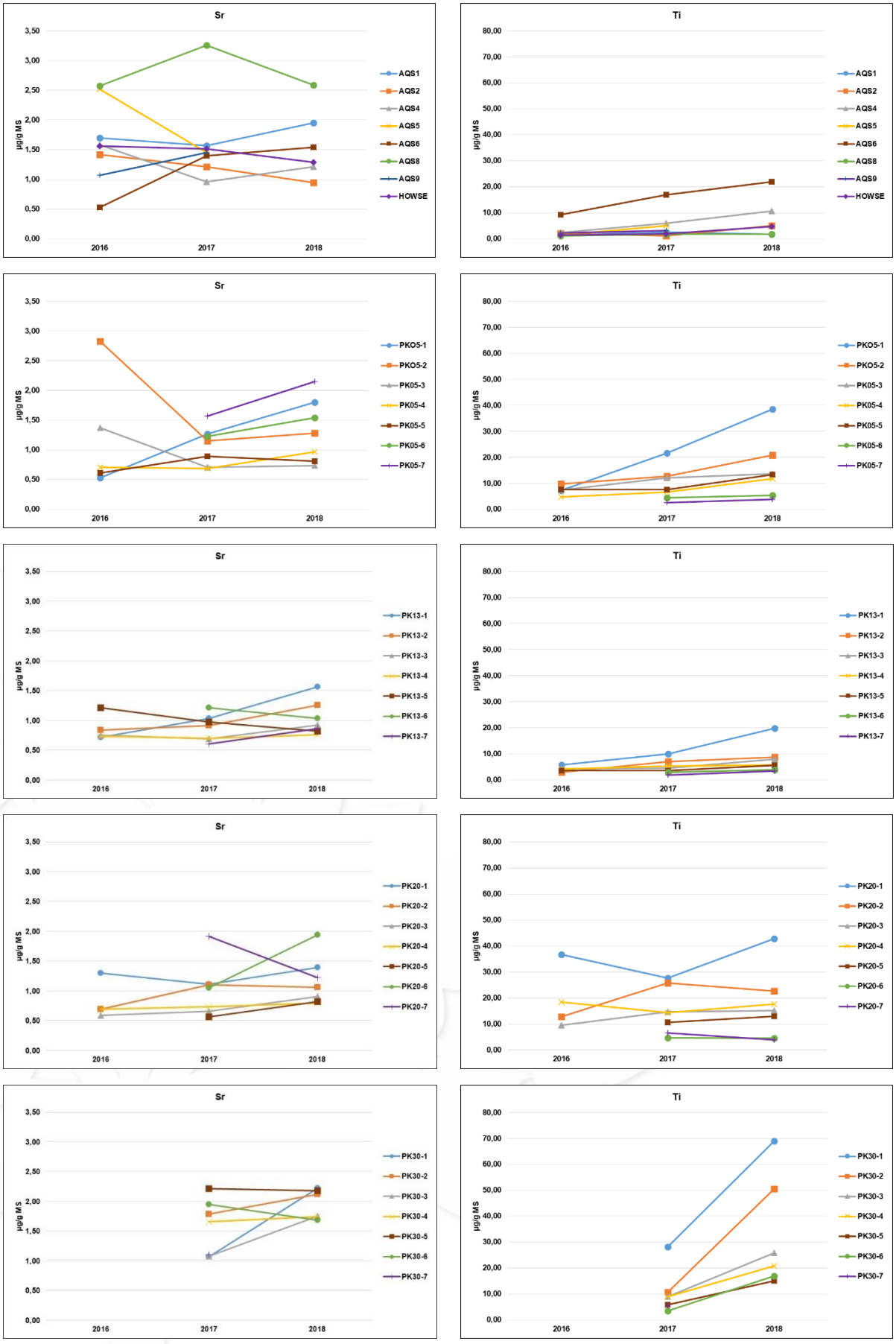


Figure 33 : Courbes temporelles des concentrations en strontium et titane.

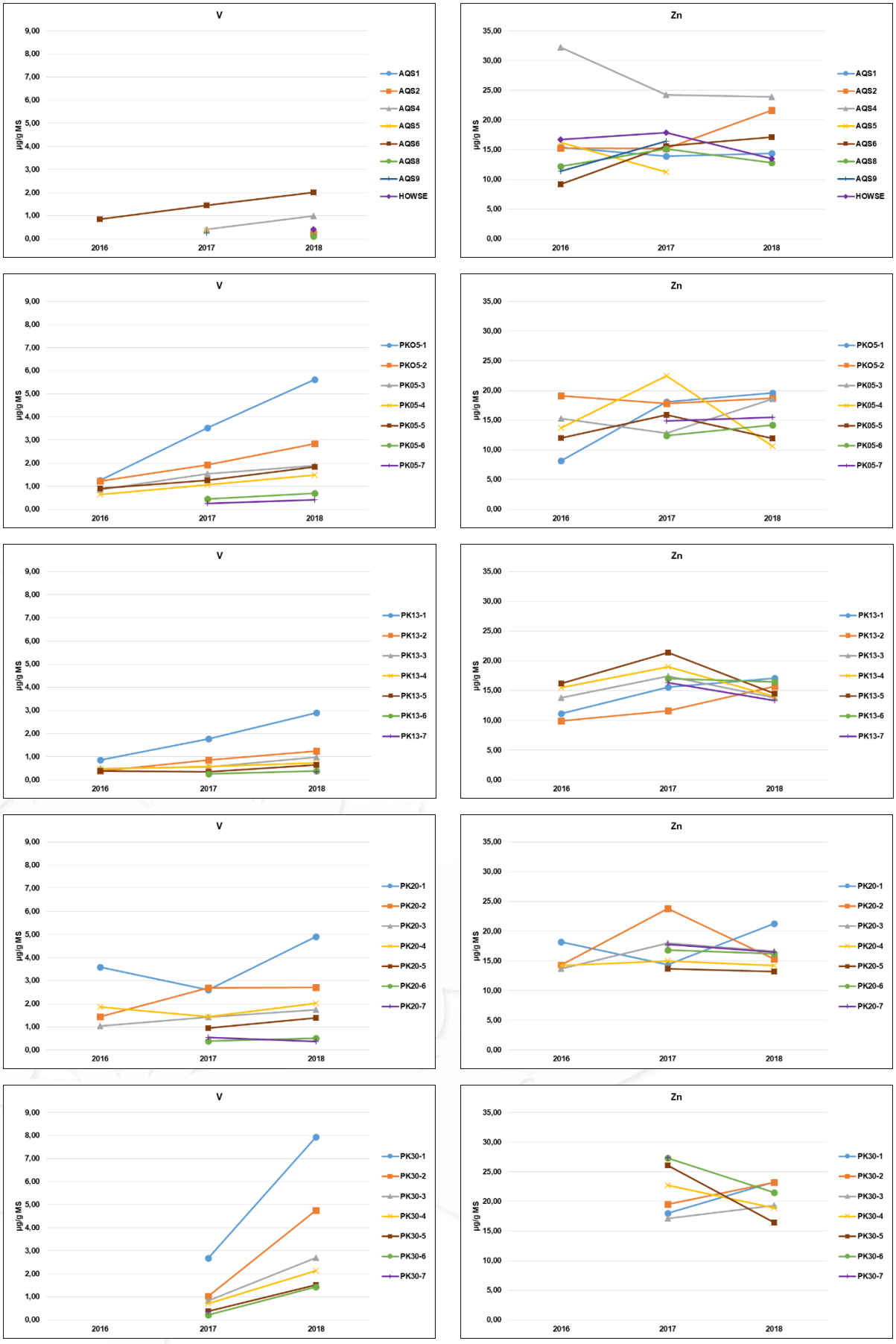


Figure 34 : Courbes temporelles des concentrations en vanadium et zinc.

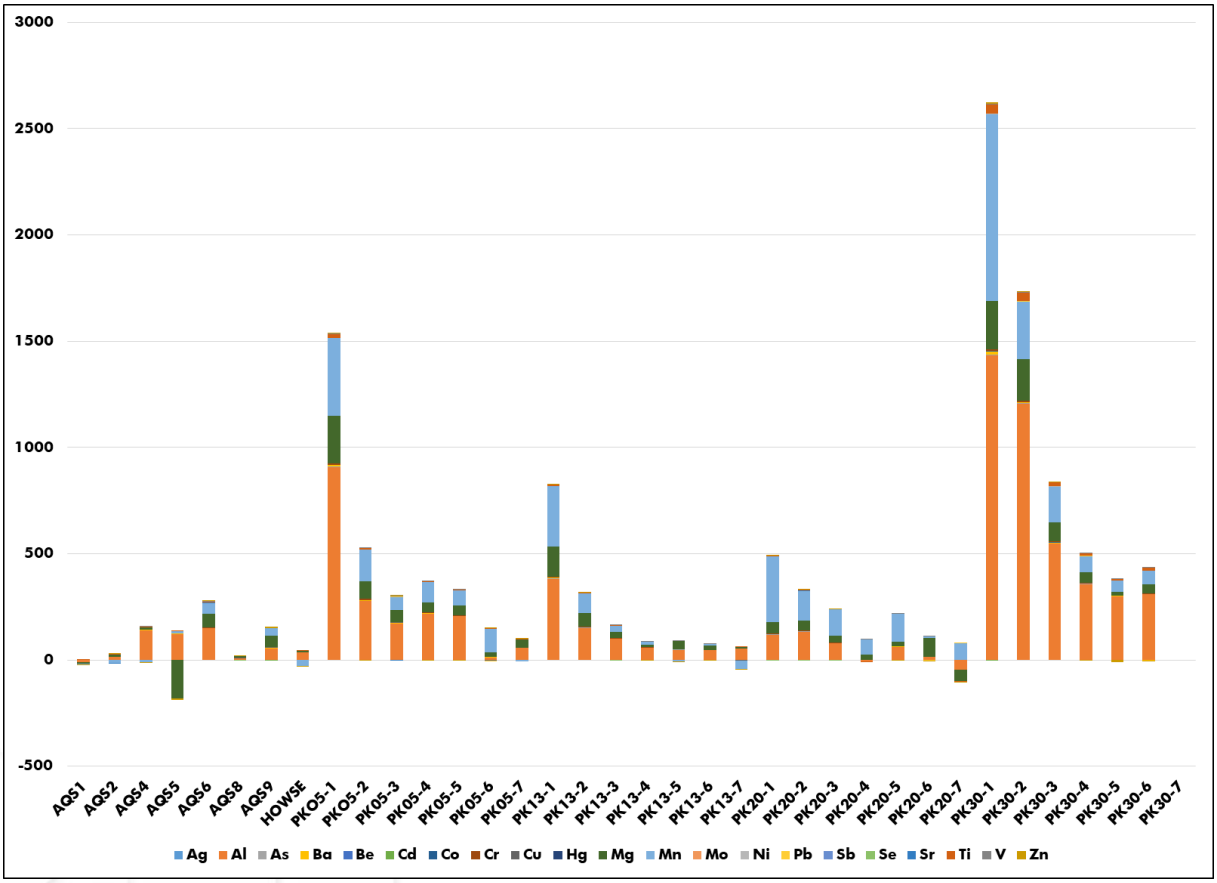


Figure 35 : Pente des métaux (hors fer).

Si l'on regarde la tendance générale, nous obtenons le graphique précédent réalisé selon un calcul statistique simple appelé "régression linéaire" dans lequel nous obtenons une valeur de "pente directrice". Si celle-ci est positive, alors le métal considéré a ses concentrations en augmentation durant les 3 campagnes de suivi. A l'inverse, si la pente est négative, les concentrations seront à la baisse. Ici les pentes sont cumulées arithmétiquement.

Une très nette différence apparaît entre les points du premier et du second groupe. En effet, pour les transects, une très importante augmentation est constatée sur tous les sites PK indicés 1, avec une décroissance selon la distance à la route, avec parfois une diminution des concentrations (pente négative) pour les points les plus éloignés. Le transect PK30 montre une fois de plus les augmentations les plus importantes.

Les diminutions/augmentations sur AQS/Howse sont soit plus faibles que sur les transects, soit plus aléatoires avec des pentes positives et négatives pour un même point (notamment pour AQS1, AQS5 et Howse). AQS6 reste le point cumulant le plus de concentrations en augmentation.

La Figure 35 est en faveur d'un impact clair de l'axe routier mais aussi d'une augmentation de cet impact dans le temps.

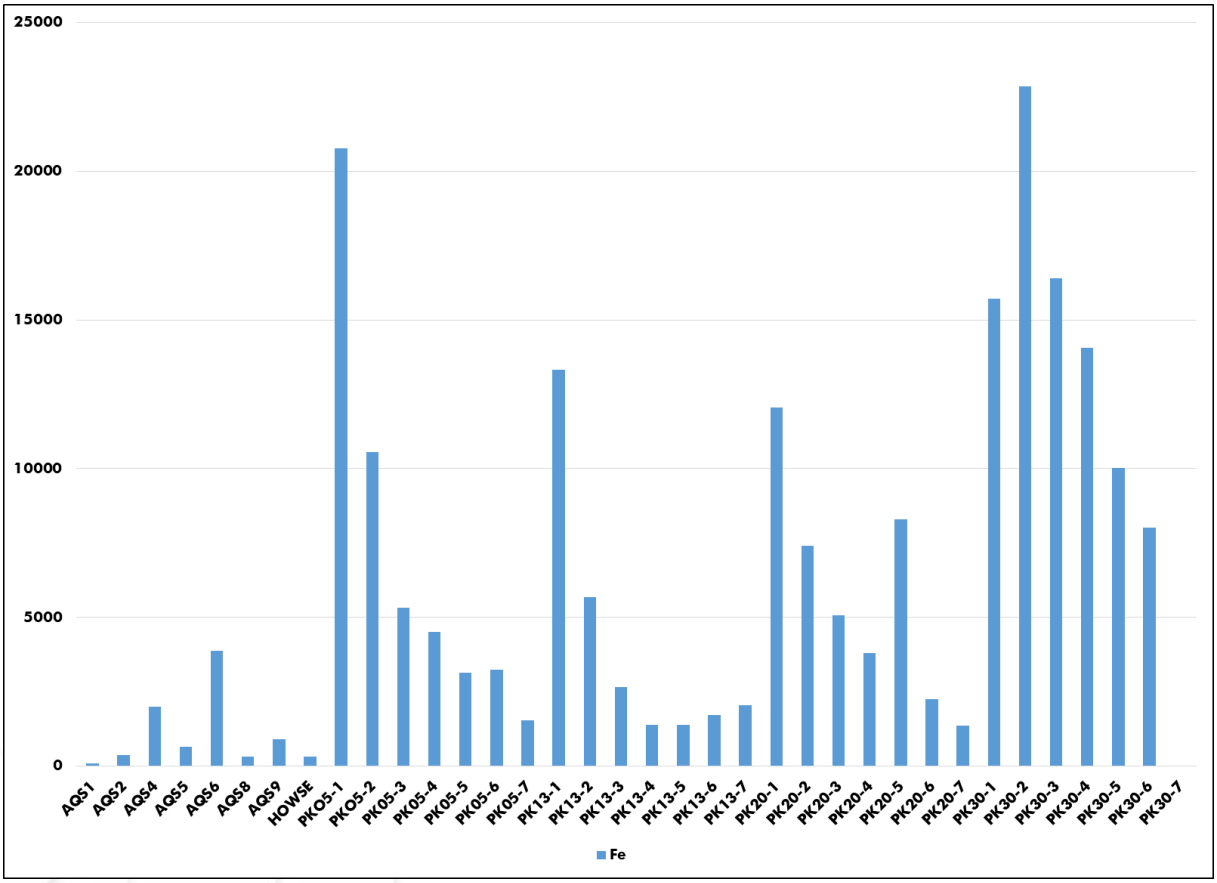


Figure 36 : Pente du fer.

Lorsque l'on regarde le même graphique dédié au fer, volontairement retiré du graphique précédent pour ne pas écraser les autres métaux, les constatations sont globalement équivalentes, à savoir une différence entre le premier et le second groupe de prélèvements, la prédominance d'AQS6 ou des points les plus proches de la route…

Toutefois, la décroissance est moins nette avec la distance à la route, notamment sur les transects PK20 et PK30, même si sur ce dernier l'existence d'une fosse le long de celui-ci peut expliquer de tels résultats.

IV. Conclusions et perspectives

Depuis 2016 Tata Steel Mineral Canada suit la qualité de l'air à partir de la bioaccumulation lichénique autour du projet DSO dans le nord du Québec.

Suite à des conditions climatiques difficiles, les points AQS5 et AQS9 n'ont pas pu être visités ; de même le point PK30-7 a été détruit par le creusement d'une nouvelle fosse. Ainsi, 33 points de prélèvements ont servi à la campagne 2018, contre 36 en 2017.

Les points du premier et du second groupe restent toujours clairement distincts au travers de toutes les approches proposées ici :

- cumul massique des dosages,
- écart à la moyenne,
- facteur d'enrichissement,
- étude temporelle.

Les transects sont donc soumis à leur propre source d'influence qui peut être, sinon différente des fosses, au moins prépondérante vis-à-vis de celles-ci.

Parmi les sites du premier groupe, AQS6 se distingue par ses valeurs d'analyses généralement plus (voire très) élevées. Il est aussi le seul site sur lequel aucun métal ne diminue en concentrations après 3 ans de suivi.

AQS4 se rapproche d'AQS6 par certaines observations, notamment le cumul massique, alors qu'AQS1 se situera à l'opposé de ces observations.

PK05 et PK30 sont les deux transects les plus impactés par les retombées atmosphériques et si le cumul massique est le plus important chez le premier, le second montre les plus importantes augmentations de concentrations.

Le fer est le métal ayant le plus d'influence sur la zone d'étude. Ses concentrations ne font qu'augmenter depuis 2016 et au taux de croissance le plus important de tous les métaux.

L'arsenic apparaît être en plus grande quantité dans les prélèvements à proximité de la route, ce qui engendre des valeurs parfois élevées. Dans une moindre mesure, la même observation est faite pour le chrome.

L'influence de la route est confirmée pour cette troisième campagne, avec des valeurs en concentrations métalliques parfois très élevées. Cela peut s'expliquer de diverses manières :

- l'envol de poussières lors du passage des véhicules ;
- le dégagement de gaz issus des moteurs des camions ;
- une autre cause non encore trouvée.

A l'aide d'une méthode développée en collaboration avec l'université de Grenoble (France), nous pouvons aujourd'hui différencier une pollution métallique issue des poussières du sol (ré-envol lors du transport), de celle due aux moteurs. Des tables sont placées selon le même gradient vis-à-vis de la route ou des fosses. Les poussières déposées sur ces dispositifs sont ensuite analysées en

microscopie électronique et la forme des particules donne l'information sur son origine. Une illustration est présentée ci-dessous.



Figure 37 : Tables utilisées pour le suivi des poussières atmosphériques.

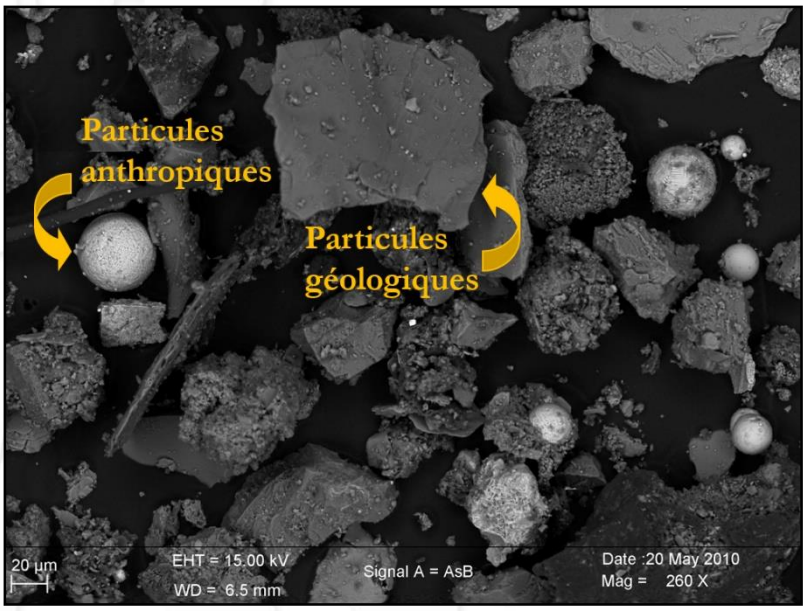


Figure 38 : Particules observées en microscopie.

Une expérimentation menée à Genève (Suisse) a, par exemple, permis d'identifier la source d'émission de chrome/fer/nickel (inox) comme étant une usine de fabrication de pièces d'horlogerie, alors que l'incinérateur d'ordures ménagères de la ville était la source supposée initialement.

Cela présente aussi l'avantage de mesurer la taille des particules afin de savoir si celles-ci peuvent avoir un impact sur la fonction respiratoire et à terme l'organisme entier.

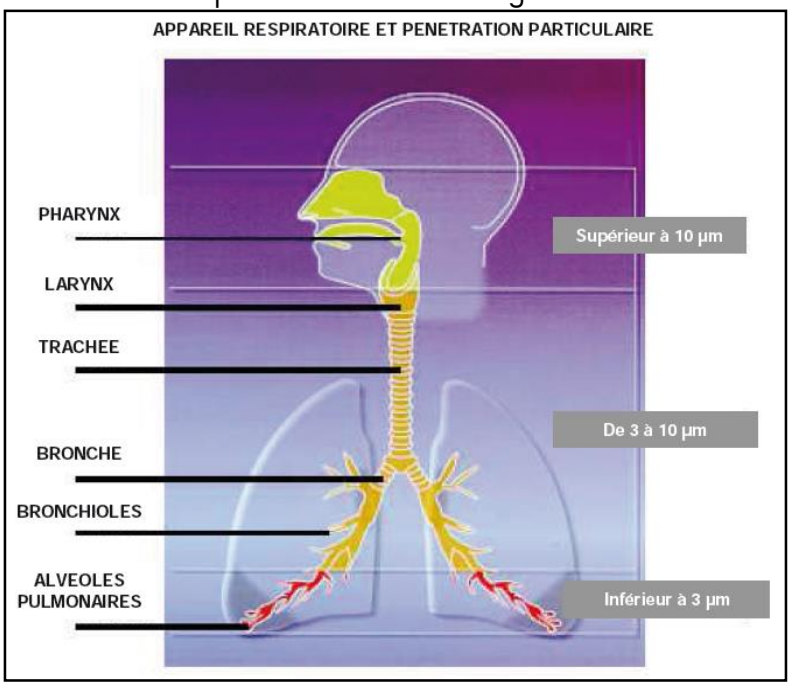


Figure 39 : Dispersion des particules dans le système respiratoire.

L'abondance du lichen *Cladonia stellaris* utilisé ici est telle qu'un suivi sur plusieurs années est totalement envisageable pour de prochaines campagnes de bioaccumulation, à raison d'une campagne annuelle. Au vu des conditions climatiques à Schefferville, des prélèvements début septembre sont pertinents et restent dans une logique de suivi de date à date vis-à-vis de la présente campagne.

Il serait intéressant d'augmenter le nombre de prélèvements aux alentours des fosses et confirmer ainsi le périmètre d'impact de celles-ci, comme cela a été réalisé pour la circulation. Une répartition de ces prélèvements plus homogène dans l'espace permettrait aussi d'établir une modélisation des retombées pour chaque métal.

La carte ci-jointe est une illustration de ce qui est possible avec nombre suffisant de points de mesures et une répartition homogène.

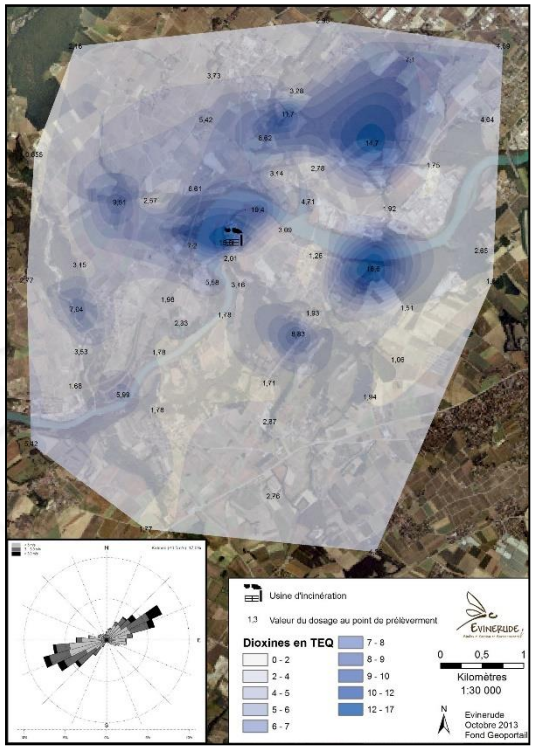


Figure 40 : Modélisation des retombées atmosphériques métalliques.

D'un point de vue sanitaire, nous pouvons rappeler que les lichens, et particulièrement *Cladonia stellaris*, sont mangés par les caribous. Dans le cas d'une consommation de lichens ayant longuement accumulé des métaux lourds, l'animal pourrait à son tour les stocker dans son organisme, avec à terme des conséquences ± importantes si les concentrations sont élevées (intoxication voire empoisonnement). En fin de chaîne alimentaire, l'homme pourrait à son tour être impacté s'il consomme une telle viande.

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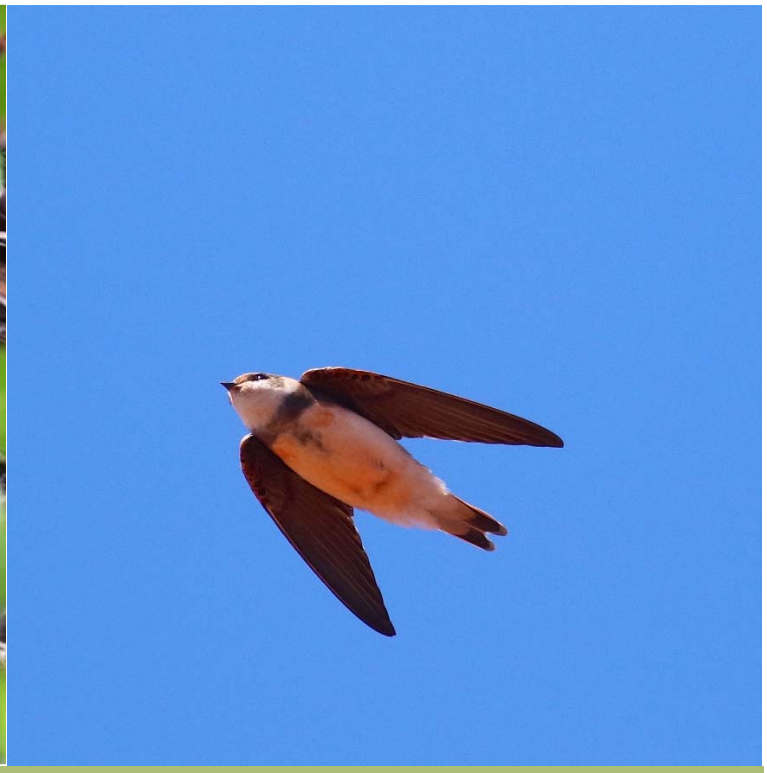
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Appendix V. Avifauna Monitoring Report

GroupeHemispheres





DSO quinquennial avifauna survey

TATA **Tata Steel Minerals Limited**

Technical report

N/D: PR185-30-17

December 22nd, 2017

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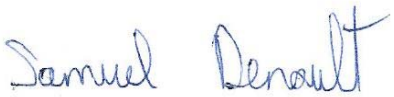
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Review and publication		
Version	**Date**	**Modification or publication detail**
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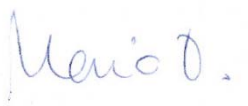
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1 INTRODUCTION AND BACKGROUND

1.1 Study context

Tata Steel Minerals Canada (TSMC) must monitor the potential effects of its activities at the DSO mining complex on biophysical components. Environment Canada is concerned with the potential effects of mining projects on migratory birds, as well as on bird species at risk. Under section 5 of the *Canadian Environmental Assessment Act* (CEAA 2012), the potential adverse environmental effects that are to be taken into account in relation to a physical activity, a designated project or a project, include any change that may be caused to the components of the environment that are within the legislative authority of Parliament. The latter includes Environment Canada (EC), which is the federal entity that is concerned with the potential effects of mining projects on migratory birds as well as on bird species at risk. With respect to effects of mining projects on avifauna, EC recommends that proponents conduct:

- Pre-construction baseline surveys;
- A desktop analysis to predict the effects of the project on migratory birds and species at risk; and
- **Post-construction surveys in the context of a follow-up program to validate the predictions.**

The present report relates to post-construction surveys on TSMC's DSO3 and DSO4 (e.g. DSO) project areas. It follows up on 2008-2009 surveys and aims to describe how the composition and the abundance of migratory birds have changed since that time.

1.2 Mandate and objectives

Insofar a possible, the post-construction monitoring should follow the same protocols as baseline surveys so that the data will be comparable. In a survey conducted at the DSO complex in 2008-2009, the objectives of the breeding surveys were:

- To conduct a quantitative survey of terrestrial breeding birds by evaluating their densities;
- To conduct a qualitative survey of birds that are present during the breeding season by assessing the diversity of species found in the study area;
- To assess potential use for any species at risk in the area; and
- To cover the entire area of the Phase 1 and Phase 2 deposits.

The same objectives are respected here. The post-construction surveys conducted in 2017 provide the opportunity to assess the impacts on bird communities since the implementation of the DSO project.

2 METHODOLOGY

2.1 Classification

The English, French and Latin names of birds are based on the 7th edition and 58th supplement to the list of birds North America (AOU, 2017).

2.2 Bird Communities

This report describes the bird communities that were encountered during the breeding season (June-July 2017). Their classification is presented below.

2.2.1 Terrestrial Birds

Terrestrial birds include songbirds and woodpeckers, as well as cuckoos, Hummingbirds, Galliformes (partridges, grouse and ptarmigan), pigeons, doves, nighthawks, kingfishers and swifts.

2.2.2 Aquatic Birds

This group includes the Anatidae family (ducks, swans and geese), as well as loons, grebes, cormorants, herons, cranes, rails, shorebirds, gulls and terns.

2.2.3 Birds of Prey

This group includes three taxonomic groups. Among diurnal birds of prey (Falconidae and Accipitridae), 12 species are found regularly in Labrador. Among nocturnal birds of prey (Strigidae), 6 species of owls can be expected in Labrador.

2.3 Study Area

The local study area for the avifauna described in Groupe Hémisphères (2010) is replicated here. Figures 1-3, Appendix I, show the location of the deposits and the assessment groups in relation to the Québec/Labrador border and the 55th parallel of latitude.

2.4 Field Work Preparation

Habitat mapping was carried out to identify appropriate survey sites. Three biotopes were selected for point-counts: coniferous forest, tundra and barren ground. A fourth biotope, shrubland, was merged with the tundra biotope so as to stay consistent with the 2008-2009 analysis. Consequently, the tundra biotope includes open habitat dominated by lichen, rock and scattered shrubs as well as areas with dense glandular birch *(Betula glandulosa*) and willow (*Salix* spp.) with sparse Black Spruce (*Picea mariana*). Coniferous forest consists mainly of Black Spruce stands with feathermoss or lichen. The Barren ground biotope is characterized by rock outcrop and/or old waste piles.

Wetlands were also located to survey aquatic birds separately. Wetland surveys include marshy habitats, ponds and lakes.

2.5 Survey Techniques

Survey techniques are species and site-specific and detailed below.

2.5.1 Point-count

Breeding bird surveys target mainly songbirds and woodpeckers and are conducted using the point-count method. This technique is a combination of the fixed-radius count method (Bibby et al., 1992), which allows to estimate bird densities, and the unlimited-count-radius method (Blondel et al., 1981), which provides information on total diversity. The latter method increases the chances of detection for less common species. Point-counts consist of two consecutive five-minute passive-listening periods for a total time of 10 minutes per point-count. The presence of birds within a 50-m radius of the sampling location was separated from the ones outside this radius on the Bird Survey Loadform. The locations of the point-counts can be seen on Figures 1-3, Appendix I. Appendix II contains site photos. A total of 118 points were done in 2017.

Any Aquatic bird that were seen during point-counts were noted and recorded separately, as they were not associated with any terrestrial habitat.

2.5.2 Wetland surveys

Lakes, ponds and wetlands were visited during the same period as the point-counts. Each visit was 10 minutes long and every species were noted during surveys called “wetland surveys”. In 2017, 33 surveys stations were conducted using this protocol while there were 35 in 2008. As wetlands are important for bird diversity, high quality wetlands, with permanent water, were targeted in 2017. This method differs from point-counts by not taking into consideration the bird’s distance in order to estimate their densities. Wetland survey sites are shown on Figures 1-3, Appendix I.

2.5.3 Opportunistic sampling

A daily loadform was used to note any opportunistic sighting or hearing while traveling between stations within the study zone (incidental observations). Some species are more commonly seen while moving (i.e. raptors and grouses) and this method allows to get a complete survey of the birds found in the study area.

2.6 Data analysis

Every observation of birds detected in every biotope was compiled in a database program called SYSGIO©. SYSGIO is a proprietary management system for bird inventories. It allows multiple analyses that relevant to the assessment of the potential impacts of a project, some of which are specifically adapted to specific projects and also generates descriptive statistics. Birds were automatically classified as terrestrial birds (songbirds and woodpeckers), aquatic birds or raptors.

2.6.1 Statistics

Ecological communities are complex entities and often must be simplified to assess their states. Diversity indices are used to reduce the multidimensional object that is a community to a single dimension. Hence, a change in the index value informs us on this single aspect, but is hard to explain without taking into account all the other facets.

Species richness (*S*) is the number of species in the observed community. It is the simplest index and it informs on how rich is a community. Since richness alone can’t inform of species distribution, it is often used with another index, the evenness (*J’*). The later quantifies how close in number, or how equal each species in the community is, and is calculated using the Shannon-Weaver diversity index (*H’*; Eq. 1). Evenness range from 0 to 1, with 1 meaning an equal proportion of all species within the community.

$$J' = \frac{H'}{\ln S} \qquad \text{Eq. 1}$$

The Shannon-Weaver diversity index is a frequently used diversity index which provides information on both the number of species (*S*) and their proportion within the community (p_i; Eq. 2): the richer a community is, and the more equally distributed its species are, the higher *H'* is. Shannon-Weaver can be used even when some species are absent in some samples (Buckland *et al.*, 2005). As many northern bird species display fluctuating patterns, it appears particularly relevant to use this index as a tool for this mandate.

$$H' = -\sum p_i \ln p_i \qquad \text{Eq. 2}$$

The indices were calculated for each point-counts and globally for each biotope. Statistical differences in diversity indices between both sampling (2008-2009, and 2017) were assessed using Student's t test, and significance is obtained when $p < 0.05$.

2.7 Strategy and previous report

The quinquennial bird monitoring for the DSO Project is based on differences in avifauna in the DSO study area before and after the implementation of mining projects. Breeding bird density and diversity in 2017 were compared to data acquired in 2008-2009. The survey focuses on breeding birds from songbirds and waterfowl groups by using point-counts and wetland surveys. Birds of prey were also looked for during the different survey methods as all species of interest were recorded. The methodology is adapted to monitor the effects of open pit mining operations on bird populations, as recommended by the Canadian Wildlife Service in Hanson et al. (2009).

Total richness and average density of nesting pairs per group of birds per biotope is used as an indicator of population variability.

The proposed methodology also allows us to follow species at risk such as Rusty Blackbird, since surveying wetlands makes possible to detect this species. The Bank Swallow, a newly designated species under the Species at Risk Act (SARA) was also targeted as part of the follow-up program.

3 RESULTS

The following sections summarize the breeding bird surveys carried out in the DSO study area in 2017, between June 22nd and July 4th. Data are presented by group of birds and each observation of any species at risk is discussed. In all, 118 point-counts and 36 wetland survey stations were completed during this campaign. A total of 68 species of birds were observed in 2017.

3.1 Description of the Study Area

The study area is located between 10 and 45 km north-west of the city of Schefferville in the provinces of Quebec and Newfoundland and Labrador. The elevation varies from 500 m to 840 m, with the culminating point being Irony Mountain. Mature Black Spruce/lichen-feathermoss forests are found at lower elevations while shrubland and tundra ecosystems are found at higher elevations. Most of the study area is in tundra habitat, notably in the area situated between Joan Lake and Goodwood Lake. Several other lakes and numerous wetlands are also part of the study area. Finally, waste piles, active mining sites and old mining pits are also part of the existing environment. The survey effort was greatest in the tundra since it is the most common habitat in the study area. More than 50% of the study area is tundra, whereas approximately 40% is coniferous forest and 10% is barren.

3.2 Survey conditions

During sampling, the ambient air temperature varied between 4° and 9° C. Fog, strong wind and drizzle were encountered frequently during surveys. However, hearing conditions were generally good and birds were at their peak activity during the field campaign. Most likely used to such conditions in this region, songbirds stayed surprisingly active and were easily detected during point-counts except during morning with heavy rain, when surveys were not conducted. Point-counts were generally held between dawn and 5 hours after dawn. However, considering how scarce proper weather conditions were for surveying birds, point-counts were sometimes held as late as 11h00 am but only when singing activity was judged to be excellent by the field crew.

3.3 Survey effort

Table 1 shows the distribution of point-counts according to the different biotopes for each period of bird survey. In all, 50 point-counts were visited in 2008 between July 11 and July 16 while 33 others were surveyed in 2009 between July 10 and July 15. The 2008-2009 data were compiled and analyzed together since both years represents pre-mining conditions. During this period, 13 point-counts were located in coniferous forest, 57 in tundra and 13 others in barren (total of 83 point-counts). Wetland surveys also included 35 additional stations that were visited in 2008.

In 2017, 118 point-counts were visited between June 22nd and July 4th. During this period, 44 point-counts were conducted in coniferous forest, 69 in tundra and 5 others in barren. More stations were surveyed in the coniferous forest considering that this biotope was underrepresented in 2008-2009 and also its regional importance (40% of the study area is coniferous forest, 50% is tundra, and 10% is barren ground). The effort in the barren areas was also reduced since previous results have shown this habitat is mostly unused by birds. Finally, 33 additional stations were visited during the wetland surveys.

Table 1. Point-counts according to habitats

Biotope	Number of point-counts		Percentage of point-counts (%)	
	2008-2009	2017	2008-2009	2017
Coniferous forest	13	44	15.7	37.2
Tundra	57	69	68.6	58.4
Barren	13	5	15.7	4.2
TOTAL	83	118	100	100

3.4 Potential Species at risk in the study area

Special attention was paid to species at risk, especially those who were known to occur in the regional study area. Table 2 shows the species at risk that were identified as potentially present in the study area. It should be noted that birds designated under the SARA are legally protected.

Table 2. Species at risk potentially present in the study area

English name	Scientific name	Status				Potential period of observation
		NF&L	Quebec	Canada (SARA)	Canada (COSEWIC)	
Barrow's Goldeneye	*Bucephala islandica*	Vulnerable	Vulnerable	Special concern, Schedule 1 (eastern population)	Special concern (eastern population)	Migration ?
Bald Eagle	*Haliaeetus leucocephalus*	—	Vulnerable	—	—	Migration, breeding period ?
Golden Eagle	*Aquila chrysaetos*	—	Vulnerable	—	—	Migration, breeding period ?
Red-necked Phalarope	*Phalaropus lobatus*	—	—	—	Special concern	Breeding period
Bank Swallow	*Riparia Riparia*	—		Threatened, Schedule 1	Threatened	Breeding period
Rusty Blackbird	*Euphagus carolinus*	Vulnerable	SLDTV[1]	Special concern, Schedule 1	Special concern	Breeding period

1. Species likely to be designated as threatened or vulnerable

3.4.1 Barrow's Goldeneye (eastern population)

In eastern North America, breeding areas for Barrow's Goldeneye consists of high plateau lakes along the north shore of St. Lawrence River (Laurentian Highlands), from the Saquenay River to at least Mingan (Eadie *et al.*, 2000). It is considered of special concern under SARA and vulnerable under Quebec as well as Newfoundland and Labrador legislation (Government of Canada, 2017; MFFP, 2017; Government of Newfoundland-and-Labrador, 2017). It has never been reported in the Schefferville region but could reasonably be found in migration as males are known to leave their breeding ground in the Laurentian Highlands in June to undertake a molt migration to the Ungava bay. Knowledge of the species ecology leads to the conclusion that DSO site has no potential breeding sites for this species.

3.4.2 Bald Eagle

The Bald Eagle is associated with aquatic habitats (coastal areas, rivers, lakes, and reservoirs) with forested shorelines (Fradette, 1998; Buehler, 2000). It has undergone dramatic population fluctuations over the past two centuries. Often reported as abundant by early North American explorers, this species became rare in the mid to late 1900s in the contiguous United States and Canada due to anthropogenic causes, primarily Dichlorodiphenyltrichloroethane (DDT), which significantly lowered the reproduction rates. However, the reduction in DDT use have allowed populations to recover since 1980 (Buehler *et al.*, 2000). The species is still considered "vulnerable" in Quebec but is no longer considered at risk in Newfoundland and Labrador, or federally.

3.4.3 Golden Eagle

The Golden Eagle breeds on cliffs surrounded by open and semi-open habitats: tundra, shrublands, grasslands, woodland-brushlands, and coniferous forests (Kochert *et al.*, 2002). It is not considered a species at risk in Newfoundland and Labrador, nor in Canada, but it is vulnerable in Quebec (MFFP, 2017). Although the species has been observed in the region in the past, no breeding habitat can be found in the study area as there is no suitable cliff. Nevertheless, open habitat could be used as hunting grounds for this species and active search for this bird of prey was carried out during and after the breeding bird survey.

3.4.4 Red-necked Phalarope

The Red-necked Phalarope exhibits circumpolar breeding across the Low Arctic and Subarctic in tundra or tundra-forest transition vegetation near freshwater lakes, pools, bogs, and marshes and amid or near small streams. Its population has declined over the last 40 years in some important staging areas at sea, during migration. This species is considered of special concern by COSEWIC (2017). Overall population trends in Canada during the last three generations are unknown. The species faces potential threats on its breeding grounds, including habitat degradation associated with climate change. An agitated male was found on Burnetta Creek on July 15th, 2015 (Groupe Hémisphères, 2015). Wetlands with ponds were targeted and inspected in 2017 in order to verify if this species still uses the area.

3.4.5 Bank Swallow

The Bank Swallow is well known for nesting in the riparian banks and bluffs of rivers and streams. This species is a highly social landbird with a Holarctic breeding distribution. It nests in colonies ranging from 10 to almost 2,000 active nests. This widespread species has exhibited a severe long-term decline of 98% of its Canadian population over the last 40 years and has recently been added to SARA's Schedule 1 as a threatened species (Government of Canada, 2017).

There are no known occurrences of this species in the Schefferville region prior to 2015. However, the species was known to occur near Labrador City and Kuujjuaq and was not completely unexpected regionally. On June 25th, 2015, a small colony (approximatively 10 nests) was found on a vertical bank of the mining pit Timmins 4 south. Sandy vertical banks, stockpiles and mining pits were inspected in 2017 to verify if former and new colonies were present.

3.4.6 Rusty Blackbird

The Rusty Blackbird can be found during the breeding season in wet coniferous and mixed forests from northern edge of tundra southward to beginning of deciduous forests and grasslands. It frequents fens, alder–willow (*Salix*) bogs, muskegs and beaver ponds (Avery, 2013). The Canadian population represents approximately 70% of the global breeding population and numbers between 110 400 and 1,4 million individuals. Long-term population trends based on the Christmas Bird Count indicated that the population has declined by about 85% since the 1960s, with a drop of 18% over the last decade (COSEWIC, 2006).

There is also evidence of long-term historical declines (Greenberg and Droege, 1999). The species is listed under SARA (special concern) and is designated as vulnerable under the *Endangered Species Act* of Newfoundland and Labrador (where the Howse project is planned). It is also likely to be designated as threatened or vulnerable by the Government of Quebec.

One individual was noted at Inukshuk Lake in 2008 while a family group was observed in 2009 near Big Star Lake (Groupe Hémisphères, 2010). A pair of adult birds carrying food was reported in July 2009 on the location where the Howse Property is planned (AECOM, 2009). Two additional breeding sites were located in 2016 in the vicinity of the project (Groupe Hémisphères, 2016). In 2017, wetlands were visited during adapted visits to verify its presence and/or any evidence of breeding.

3.5 Point-counts and terrestrial birds (grouses, songbird and woodpeckers)

3.5.1 Diversity

Diversity indices were measured for the different biotopes within the 50 m radius. Table 3 shows the richness, evenness and Shannon-Weaver diversity index results for the different biotopes. Barren sites were not included as no bird were found breeding in this biotope in 2017. The results of the Student's t-test indicated a significant ($p < 0.05$) evenness in the coniferous forest. Evenness indicates how species are distributed at the station and the high number shows that species have a similar proportion. It does not provide any indication on a change in the community between the two sampling periods.

Richness and Shannon-Weaver diversity index are both similar between the two survey periods and presents no significant difference. These indices tend to show that population surveyed in 2008-2009 and 2017 have a similar composition and distribution.

Table 3. Diversity indices according to biotopes within the 50 m radius

Biotope	Richness		Evenness		Shannon-Weaver	
	2008-2009	2017	2008-2009	2017	2008-2009	2017
Coniferous forest	3.4 ± 2.0	3.2 ± 1.6	0.95 ± 0.04	0.98 ± 0.03	1.0 ± 0.7	1.0 ± 0.6
Tundra	1.8 ± 1.0	1.8 ± 1.4	0.93 ± 0.11	0.96 ± 0.08	0.5 ± 0.4	0.5 ± 0.6

Values are mean ± standard deviation

Yellow cells show significant differences ($p < 0.05$) between sampling year

3.5.2 Density and occurrence

Table 4 shows total bird density for each biotope visited, calculated from the number of pairs within the 50 m radius. The densities are relatively similar for tundra and coniferous forests. However, for the few barren habitats that were visited, none yielded any breeding species in 2017. However, only two species were found in barren habitat in 2017: the White-crowned Sparrow and the Semipalmated Plover. Table 5 shows species density per biotope calculated from the number of pairs within the 50 m radius. Table 6 shows species occurrence for conifer forest and tundra at unlimited radius. Aquatic birds and raptors were not considered for species occurrence in these biotopes because their breeding ecology is not directly related to these habitats. Barren was also not included for occurrence as the overwhelming majority of birds detected from point-counts conducted on the barren biotope were heard as being a long distance away, and thus are not believed to have been associated with this habitat during the field work. In general, it seems that coniferous forest showed higher diversity in 2017 mainly because new point counts were added

in richer and more productive habitat in the Howells River Valley. Tundra also showed a higher diversity in 2017 possibly because some parklands with scattered trees were included in the tundra biotope.

Table 4. Bird density per biotope

Biotope	Number of point-counts		Breeding pair density (nb/ha)	
	2008-2009	2017	2008-2009	2017
Coniferous forest	13	44	3.48	3.88
Tundra	57	69	3.08	2.62
Barren	13	5	1.67	0

Table 5. Species density per biotope

Species	Breeding pair density (nb/ha)					
	Coniferous forest		Tundra		Barren	
	2008-2009	2017	2008-2009	2017	2008-2009	2017
Ruby-crowned Kinglet	0.1	0.3	-	0.02	-	-
White-crowned Sparrow	0.6	0.4	1.5	1.0	1.0	-
Dark-eyed Junco	0.4	0.6	-	0.3	-	-
American Robin	0.2	0.3	0.1	0.2	-	-
Gray-cheeked Thrush	0.3	0.3	0.02	0.1	-	-
Swainson's Thrush	-	0.06	-	-	-	-
Fox Sparrow	0.4	0.14	-	0.04	-	-
Yellow-rumped Warbler	0.2	0.5	-	0.02	-	-
Gray Jay	-	0.03	-	0.02	-	-
Blackpoll Warbler	0.3	0.4	-	0.15	-	-
White-throated Sparrow	-	0.2	-	-	-	-
American Tree Sparrow	0.1	0.06	0.6	0.17	-	-
Yellow-bellied Flycatcher	0.2	0.2	-	-	-	-
Wilson's Warbler	0.1	0.2	-	0.04	-	-
Common Redpoll	0.4	0.03	0.1	0.04	-	-
Pine Grosbeak	0.1	0.03	-	-	-	-
Northern Waterthrush	-	0.1	-	-	-	-
American Three-toed Woodpecker	-	0.09	-	-	-	-
Boreal Chickadee	-	0.03	-	-	-	-
Brown Creeper	-	0.03	-	-	-	-
Tennessee Warbler	-	0.03	-	-	-	-
Willow Ptarmigan	-	-	-	0.02	-	-
Horned Lark	-	-	0.3	0.14	-	-
American Pipit	-	-	0.3	0.12	-	-
Semipalmated Plover					0.1	-

Table 6. Species occurrence by biotope

Species	Species occurrence (%)			
	Coniferous forest		Tundra	
	2008-2009	2017	2008-2009	2017
Fox Sparrow	76.9	61.4	10.5	31.9
White-crowned Sparrow	61.5	68.2	70.2	89.9
American Robin	61.5	65.9	42.1	62.3
White-winged Crossbill	38.5	25	3.5	18.8
Gray-cheeked Thrush	30.8	56.8	7.0	31.9
Gray Jay	30.8	43.2	-	23.2
Common Redpoll	30.8	18.2	24.6	30.4
Pine Grosbeak	23.1	31.2	-	10.1
Yellow-bellied Flycatcher	23.1	40.9	-	11.6
Blackpoll Warbler	23.1	40.9	-	26.1
Ruby-crowned Kinglet	23.1	88.6	5.3	29.0
White-throated Sparrow	15.4	47.7	5.3	23.2
American Tree Sparrow	15.4	25	42.1	42.0
Wilson's Warbler	15.4	36.4	-	11.6
Yellow-rumped Warbler	15.4	63.6	-	11.6
Boreal Chickadee	7.7	9.1	-	1.4
Swainson's Thrush	-	13.6	-	4.3
American Three-toed Woodpecker	-	13.6	-	1.4
Tree Swallow	-	11.4	-	1.4
Rusty Blackbird	-	11.3	1.8	2.9
Lincoln's Sparrow	-	6.8	-	5.8
Brown Creeper	-	4.5	-	-
Yellow Warbler	-	4.5	-	-
Tennessee Warbler	-	4.5	-	-
Northern Waterthrush	-	27.2	-	5.8
Willow Ptarmigan	-	-	1.8	1.4
Horned Lark	-	-	36.8	29.0
American Pipit	-	-	28.0	29.0
Savannah Sparrow	-	-	5.3	4.4
Orange-crowned Warbler	-	-	-	2.9
Bank Swallow	-	-	-	1.4
Bohemian Waxwing	-	-	-	1.4
Hermit Thrush	-	-	1.8	-

3.6 Wetland surveys and aquatic birds

Twenty species of aquatic birds were found in the study area in 2017 compared to 13 species in 2008-2009. The higher number of species detected in 2017 is mostly due to the fact that known quality habitats were visited, based on the knowledge of the area acquired between the two surveys. In 2017, 12 species of waterfowls were found in the study area, including the White-winged Scoter (mostly on Star Lake). Updated knowledge on this species indicates that it is a more common breeder in the region than what was previously thought in 2009. The Lesser Scaup appears to be the most common scaup species although a single male Greater Scaup was found on a tundra lake along the hauling road. The Common Merganser and Red-breasted Merganser were also observed for the first time in the study area: the Red-Breasted Merganser may be a breeder at the Star Lake area as a pair was observed there (the male was also observed in an old pit filled with water nearby). The Arctic Tern and Ring-necked Duck are among species seen in 2008-2009 that were not found again in 2017. However, both are likely uncommon in the study area and perhaps migrating birds which do not breed locally.

More Shorebirds were detected in 2017, as Wilson's Snipe and Solitary Sandpiper were common in the study area. The Short-billed Dowitcher and Greater Yellowlegs were noted for the first time. However, the Semipalmated Plover and Black-bellied Plover were not found in 2017. It is believed that the Black-bellied Plovers observed in 2008-2009 were almost certainly migrants as they commonly breed much further north. The Semipalmated Plover is more common further north too but could reasonably be found again in the future during the breeding season in the DSO area. Table 7 presents details surrounding observations of aquatic birds in 2017.

Table 7. Aquatic birds observed in DSOP area in 2017

Species	Number of sightings	Survey method	Location
Waterfowl			
Canada Goose	25	Incidental	Near DSO camp and at Inukshuk Lake
Mallard	6	Incidental and Wetland Survey	Near DSO camp and atQM57
American Black Duck	1	Travelling	Near Howell River
Green-winged Teal	4	Wetland survey	QM121, QM73 and Star Lake
Lesser Scaup	2	Wetland survey	QM59 and QM61
Greater Scaup	1	Wetland survey	QM51
Surf Scoter	2	Wetland survey	QM79
White-winged Scoter	14	Wetland survey	QM59
Common Goldeneye	2	Point-count	Q31 and Q83
Barrow's Goldeneye	1	Wetland survey	QM59
Common Merganser	1	Wetland survey	HM168 (in flight)
Red-breasted Merganser	2	Wetland survey	QM57
Shorebirds			
Greater Yellowlegs	2	Point-count	H151 and Star Lake
Solitary Sandpiper	11	Wetland survey and point-count	H134, HM167, HM169, HM170, HM171, QM60, Q15, QM58 and QM59
Least Sandpiper	1	Wetland survey	QM121
Short-billed Dowitcher	1	Point-count	H168
Wilson's Snipe	13	Point-count and wetland survey	H128, H136, H137, HM165, HM167, Q3, Q4, Q15, QM121 and Q117
Other aquatic birds			

Species	Number of sightings	Survey method	Location
Common Loon	1	Point-count	H101
Herring Gull	9	Point-count and wetland survey	H148, H101, HM162, Q4, Q16, H101, Q99
Arctic Tern	2	Incidental	Two birds at Rosemary Lake

In bold : Species at risk

3.7 Birds of prey

Six species of birds of prey were encountered in 2017. The Bald Eagle (see section 3.8) and Ospreys were only seen flying over and most likely breed somewhere along the Howells river outside the study area. A pair of territorial Red-tailed Hawks was observed near Burnetta lake, but the nest was not located. In addition, a Northern Goshawk was seen in flight near Irony Mountain, and an adult male Northern Harrier was also noted flying over Star Creek. These species could potentially breed in nearby open sites. Finally, an agitated Merlin was seen chasing ravens near the Timmins 1 pit and another one was seen in another abandoned pit near Big Star Lake. The species has been known to breed in the Timmins 1 pit in the past, showing resilience to potential human disturbance.

In September of 2008-2009, the Golden Eagle and the Rough-legged Hawk were observed outside the breeding season and are believed to have been migrating. In general, raptor diversity was much greater in 2017. Fluctuating prey populations and their effects on avian predator population dynamics have been studied particularly at high latitudes, where prey populations, especially microtines, are known to be cyclic; raptors show both numerical and functional responses to variations in their prey (Salamolard *et al.*, 2000). Consequently, this upside change is most likely part of a natural cycle.

3.8 Species at risk

Appendix I, Figures 4-6 show the different locations of the different species at risk found in 2017.

3.8.1 Barrow's Goldeneye

Unexpectedly, a first year male Barrow's Goldeneye was seen on 24 June on Star Lake. This species had never been recorded in the past in the region. As first year males are not mature sexually, it could not breed in the area. Further, the individual was not present several days later at the lake. It is therefore assumed that it was a migrating bird making a short stop between the Laurentian highlands and the Ungava Bay where many males are known to molt (Environment Canada, 2011).

3.8.2 Bald Eagle

The Bald Eagle was observed in flight along Howells river (on the Labrador side) and over Lake Goodwood (on the Quebec side). However, no proper breeding habitat appears to exist in the study area as the species need large and tall trees to nest. It appears likely that the species could be found nesting further down in the valley, outside the study area, where such trees exist.

3.8.3 Golden Eagle

Despite extensive efforts, no Golden Eagle were found on the Howse Property in 2017. The species does not breed in the study area but could hypothetically migrate over the site from time to time.

3.8.4 Red-necked Phalarope

While an agitated Red-necked Phalarope was seen along Burnetta Creek in July 2015, no individual was found in 2017, despite a targeted search of wetlands for this species. It is likely to be found again in the future in the study area but appears to be sporadic as a potential breeder.

3.8.5 Bank swallow

Found for the first time in 2015 on the banks of Timmins 4, the colony was still active in 2017. This survey consisted of visiting pits and scrutinizing the cliffs for existing nests and the surrounding environment for foraging birds flying around. Birds from this colony were also seen foraging nearby from point-count H111. While the swallows were still present, the colony itself seems to have moved further in the pit for unknown reasons. The exact number of nests could not be counted as the field crew did not have full access to the pit for safety reasons.

Two new breeding sites were located. Birds seen foraging from QM49 (Joan Lake) were found breeding in a waste pile nearby. A few other nests were found in the active mining pit beside Joan Lake. The presence of nests in an active pit may be due to a temporarily suspension of mining activities in June, which allowed the Bank Swallow to colonize the pit. Measures should be taken to avoid this in the future in order to respect the Species at Risk Act. Also, Bank Swallows were seen foraging near the Star Creek QM57 survey station. No colonies were found there but the site can be considered as proper habitat for this species and should be checked again in the future as cliffs from past mining activities are present. Photos of these Bank Swallows colonies can be seen in Appendix II.

3.8.6 Rusty Blackbird

Rusty Blackbird presence was particularly notable in 2017 during surveys. This species is known to show interannual variation in abundance. Never in the past has the species been reported in such large densities in the area. It was detected in 8 point-counts and 7 wetland surveys. Breeding was confirmed in five of the wetlands. Unsurprisingly, the species was essentially present in forested habitat near water and absent in large tundra habitats. In comparison, the Rusty Blackbird was only detected at two locations in 2008-2009. However, more forested areas were sampled compared to the 2008-2009 survey, which could also explain the higher number of Rusty blackbirds detected. Locations of the species in 2017 can be consulted on Figures 4-6, Appendix I.

3.9 Annotated list of the birds encountered in 2017

The complete list of the birds encountered in the DSO study area in 2017 (64 species) can be seen Table 8 with their breeding status. Confirmed breeders in the study area are highlighted.

Table 8. Annotated list of the birds encountered in the Howse area in 2017

Species	Breeding status	Comments
Aquatic birds		
Common Loon	Possible	Most likely to breed on Rosemary Lake
Canada Goose	Possible	A group was seen feeding during a couple of days in a small pond
American Black Duck	Possible	Seen near Howells River
Mallard	Possible	Only males were seen in a small pond. Molt migrating birds?
Green-winged Teal	Possible	A few observations on tundra ponds and lakes

Species	Breeding status	Comments
Greater Scaup	Possible	A single male was observed on a tundra lake along the hauling road
Lesser Scaup	Probable	Most common scaup. A pair was observed on Star Lake
Surf Scoter	Probable	Pair observed on Inukshuk Lake
White-winged Scoter	Probable	Pair observed on Star Lake
Common Goldeneye	Possible	Two females observed near lakes
Barrow's Goldeneye	Migrant	A first-year male observed on Star Lake was a migrant
Common Merganser	Possible	Seen near Howell River
Red-breasted Merganser	Probable	A pair observed on Star Lake
Greater Yellowlegs	Possible	Seen in flight, most likely breed outside the study area
Spotted Sandpiper	Probable	Could potentially breed around any lake in the study area
Solitary Sandpiper	**Confirmed**	**Common in wetlands**
Least Sandpiper	**Confirmed**	**An adult performing distraction display was observed at Lake Goodwood**
Short-billed Dowitcher	Possible	Seen in flight, most likely breed outside the study area
Wilson's Snipe	Probable	Likely to breed in the different wetlands
Herring Gull	Possible	Many nonbreeding birds wandering in the study area, but could possibly breed on some lakes
Birds of prey		
Osprey	Possible	No nest in the study area, probably use the area for occasional foraging
Bald Eagle	Possible	No nest in the local study area, probably use the area for occasional foraging
Northern Harrier	Possible	Could be potentially in open habitats in the study area but the species remains rare
Northern Goshawk	Possible	A single individual was seen in flight near Irony Mountain
Red-tailed Hawk	Probable	An agitated pair seen near Irony Mountain
Merlin	Probable	Known to breed in Timmins 1 pit and could breed in the study area
Terrestrial birds		
Spruce Grouse	**Confirmed**	**Several reports of adults with young**
Willow Ptarmigan	**Confirmed**	**Scarce in tundra especially between Foggy Lake and Goodwood**
Belted Kingfisher	**Confirmed**	**No bird observed but an abandoned nest was found in an old pit in Star Creek**
American Three-toed Woodpecker	**Confirmed**	**Nests with young were found in the study area**
Yellow-bellied Flycatcher	**Confirmed**	**Common in mature forest**
Alder Flycatcher	Probable	A few singing males detected near Star Creek
Tree Swalllow	Possible	Only seen foraging but could breed in snags with cavities Known to breed in Schefferville and possibly at DSO camp
Bank Swallow	**Confirmed**	**Breeds in Timmins 4 old pit, in waste pile and in active mining pit nearJoan Lake**
Gray Jay	**Confirmed**	**Common**
Common Raven	Probable	Common near the landfill but no nests were found

Species	Breeding status	Comments
Horned Lark	**Confirmed**	**Common in tundra especially between Foggy Lake and Goodwood**
Boreal Chickadee	**Confirmed**	**Family groups observed in the bottom of Howells River valley**
Brown Creeper	Probable	Rare but present in mature coniferous forest near Burnetta Lake
Ruby-crowned Kinglet	**Confirmed**	**Common**
Gray-cheeked Thrush	**Confirmed**	**Common in open forest**
Swainson's Thrush	**Confirmed**	**Mostly found in mature coniferous forest in the bottom of Howell River valley**
Hermit Thrush	Possible	A single bird heard near Star Creek
American Robin	**Confirmed**	**Common**
American Pipit	**Confirmed**	**Common in tundra especially between Foggy Lake and Goodwood**
Bohemian Waxwing	Possible	A group of four birds observed near Star Creek
Tennessee Warbler	Possible	A single singing male was noted in suitable habitat
Orange-crowned Warbler	Possible	A single singing male was noted in suitable habitat
Yellow Warbler	Possible	Two singing males were noted in suitable habitat
Yellow-rumped Warbler	**Confirmed**	**Common**
Blackpoll Warbler	**Confirmed**	**Common**
Northern Waterthrush	**Confirmed**	**Common near water**
Wilson's Warbler	**Confirmed**	**Common in wetlands with alders**
American Tree Sparrow	**Confirmed**	**Common in shrubland and tundra**
Fox Sparrow	**Confirmed**	**Common**
Savannah Sparrow	Probable	A few singing males in tundra habitat
Lincoln's Sparrow	**Confirmed**	**Common near wetlands**
White-throated Sparrow	**Confirmed**	**Common in forest habitat**
White-crowned Sparrow	**Confirmed**	**Most common bird in the study area**
Dark-eyed Junco	**Confirmed**	**Common**
Rusty Blackbird	**Confirmed**	**Despite its « special concern » status, common near lakes and wetlands**
Pine Grosbeak	**Confirmed**	**Common in forest habitat**
White-winged Crossbill	Probable	Mostly present at the bottom of Howells River valley
Common Redpoll	**Confirmed**	**Relatively common where dwarf birch is abundant**

In bold: Confirmed breeding species
Highlighted: Species at risk

4 CONCLUSION

In order to comply with CEAA's requests for monitoring for the presence of avifauna post-construction on the DSO project, an avifauna survey was conducted in 2017 between the Howells River valley and a lacustrine area to the east, approximatively 40 km north of Schefferville, Qc. The study area straddles the Québec/Labrador border and the 55th parallel of latitude. Results from this campaign were compared to surveys from 2008-2009 in the same area to measure the potential effects of the mining projects on migratory birds and on bird species at risk.

Total richness of the study area includes 64 species of birds in 2017: Six raptor species, 20 species of aquatic birds and 38 species of terrestrial birds. In comparison, 52 species were found in 2008-2009: four species of raptors, 13 species of aquatic birds and 35 species of terrestrial birds. The Rusty Blackbird, a species at risk, was detected in eight wetlands and seven point-counts in 2017 while it was only found at two sites in 2008-2009. Additional species at risk found in 2017 but not in 2008-2009 are: The Bald Eagle (two sites), the Bank Swallow (three locations) and a non-breeding first year male Barrow's Goldeneye at Star Lake.

Based on statistical analysis there is no difference in richness and distribution of species for the different natural biotopes within a 50 m radius and throughout the study area. Results show greater richness and diversity in 2017 than assessed in 2008-2009. The greater effort in 2017 does not explain alone these changes as the Shannon-Weaver index. It is noteworthy that different field experts have different abilities in species identifications, and so, although the results are comparable between surveys, differences due to sampling techniques are not unexpected. Overall results of richness show a greater species diversity in all biotopes in 2017 and in groups of birds. Even by taking into consideration the different factors explaining the increase of diversity in 2017, it appears that the avian communities, including species at risk, remained healthy regionally since the implementation of the DSO Project.

5 QUALITY ASSURANCE

Groupe Hémisphères possesses an internal quality control program which is derived from ISO 9001 standards. This is based on a review and approval of all concepts and document production by a senior professional. The program considers the management, the control of documentation, the personnel's continuous training, as well as the quality assurance of the deliverables. The system also includes a tight control of the field work and the prevention and safety measures specific to the project.

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APPENDIX

Appendix I

Figures

6110000 610000 6105000 615000

605000 615000

Ruisseau Leroy

Lac Goodwood

River Goodwood

QM121

Q85 Q86 Q87 Q88

Q92 Q91

Goodwood

Q40 Q41

Goodwood Complex

Q43

Kivivic 5

Kiv5b

Kiv5a QM52 Kiv5c

Q33 Q32

Kivivic_1c

QM48

Kiv1a Kiv1b

QM53

Joan Brook

Joan Lake

QM49

Q106 Q105 Q98 Q104 Q107 Q97 Q96 Q93 Q95 Q94

QC/QC NLT.-N.-L

Ruisseau Rocky

Rocky Pond

Sun1d Sun1c Sun1b Sun1a

Q100 Q101 Sun1e Q102 Sunny 1 QM54 Lac Foggy Q99 Q103

Ruisseau Foggy

Kivivic 3,4

Kivivic 4 (west dump)

Q30 Q31 QM50 QM55

QC/QC NLT.-N.-L

QM75 QM74

Ruisseau La Potardière

QM51 QM72 QM73

Kivivic Brook

Q28 Q29

Nash Lake

Q83 Q84

QC/QC NLT.-N.-L

Migration Lake

QC/QC NLT.-N.-L

LEGEND

Data Validation

Avifauna survey stations
- Point counts
- Wetlands surveys

Ecoregion Boundary

Avifauna habitat
- Shrubland
- Tundra
- Wetland

Infrastructure and Mining Components
- Road to DSO Area 4
- Elross Lake Area Iron Ore Mine (ELAIOM) Plant Infrastructure footprint
- Permanent Watercourse
- Intermittent Watercourse
- Storm Runoff
- Artesian Spring
- Water Body

Basemap
- Contour Line (50 ft)
- Existing Road
- Wetland

*Hydronyms are oriented along the direction of water flow

FILE, PROJECT, DATE, AUTHOR:
GH-0900 , PR185-30-17, 2017-12-04, jcamy

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Meters

UTM 19N NAD 83

SCALE: 1:35 000

SOURCES:
Basemap
Government of Canada, NTDB, 1:50,000, 1979
Government of NL and government of Quebec, Boundary used for claims
SLE, AMEC and GHI (October 2012). LabMag and Kémag Iron Ore Projects 2012 Mine Site Aquatic Program Field Report.
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TATA

QUINQUENNIAL AVIFAUNA SURVEY DSO PROJECT

Avifauna Point Counts And Wetland Surveys

GroupeHemispheres
5731, rue Saint-Louis, Bureau 201, Lévis (QC) Canada, G6V 4E2
1453, rue Beaubien est, Bureau 301, Montréal (QC) Canada, H2G 3C6

Figure 1

615000 6095000 620000 6090000

610000 6095000 620000 6085000

Q110 Q111 Q109 Q108 Q113 Q112 Q27 Q26 Q117 Q116 QM56 Q25 Q24 QM131 H153 H152 H147 H149 HM171 H145 HM169 H151 H144 HM167 HM170 H150 HM164 H148 HM168 HM166 H136 H143 H135 H138 H146 H137 H131 H130 H123 H110 H118 H141 H142 H128 H129 H122 H115 HM165 H134 Q17 H133 H121 H119 H132 H125 H126 H158 H159 H157

Lac Allspur Lac Deacon Lac Denyse Morley Lake Dizzle Lake Goodream Lake Greenbush Lake Toms Pond Island Pond Triangle Lake Curlingstone Lake Sunset Creek Burnetia Creek Ione Lake Burnetia Lake Rosemary Lake Two Ponds Kivivic Brook Greenbush Brook Howells River

QC/QC NL/T.-N.-L GDR1 GDR2 GDR3 Goodream Creek

LEGEND

Data Validation

Avifauna survey stations
- Point counts
- Wetlands surveys
- Local Study Area
- Ecoregion Boundary

Avifauna habitat
- Open Wetland
- Coniferous forest
- Shrubland
- Tundra

Infrastructure and Mining Components
- Road to DSO Area 4
- Proposed Howse Pit
- Proposed Topsoil/ Overburden Stockpile
- Proposed In-Pit Dump/ Waste Dump
- Existing and Proposed Sedimentation Pond
- Proposed Mine Haul Road

Basemap
- Permanent Watercourse
- Intermittent Watercourse
- Storm Runoff
- Water Body
- Contour Line (50 ft)
- Existing Road
- Wetland

*Hydronyms are oriented along the direction of water flow

FILE, PROJECT, DATE, AUTHOR:
GH-0900 , PR185-30-17, 2017-12-04, jcamy

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SOURCES:
Basemap
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Figure 2

625000 6085000 630000 6080000

620000 6085000 630000 6075000

Q5 Creek1 Q15 QM57 Q4 Q3 QM60 QM59 Lac Star QM58 QM61 Q14 Q13 Q119 Q118 Q18 Q19 QM79 QM78 Lac Big Star QM62 Q6 Q46 Q22 Lac Inukshuk QM80 Q23 QC/QC NL/T.-N.-L Q9 Q47 Q8 H120 H124 Lac de l' Hématite QC/QC NL/T.-N.-L Timmins 6 Timmins2 Timmins 1 DSO Plant Complex Workers Camp QM76 Q16 Kata Creek Spruce Lake Red Lake Ain Lake H109 Q20 H114 H113 HM161 H106 QM81 H107 Q21 H104 H102 H111 Pinette Lake H100 H108 H105 H103 H101 HM162 Waste Disposal Site O'Neily Lake Kata Creek Stork Creek Q132

LEGEND

Data Validation

Avifauna survey stations
- Point counts
- Wetlands surveys
- Local Study Area
- Ecoregion Boundary

Avifauna habitat
- Open Wetland
- Coniferous forest
- Shrubland
- Tundra

Infrastructure and Mining Components
- Road to DSO Area 4
- Existing Railroad
- Elross Lake Area Iron Ore Mine (ELAIOM) Plant Infrastructure footprint
- Existing Pit
- Existing Dump
- Proposed Site Infrastructure
- Proposed In-Pit Dump/ Waste Dump
- Existing and Proposed Sedimentation Pond
- Proposed Mine Haul Road

Basemap
- Permanent Watercourse
- Intermittent Watercourse
- Storm Runoff
- Disappearing Stream
- Water Body
- Contour Line (50 ft)
- Existing Road
- Main Access Road
- Wetland

*Hydronyms are oriented along the direction of water flow

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GH-0900 , PR185-30-17, 2017-12-04, jcamy

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UTM 19N NAD 83

SCALE: 1:35 000

SOURCES:
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Government of Canada, NTDB, 1:50,000, 1979
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SURVEY:
Groupe Hémisphères (2011) Terrestrial Ecosytems and Terrain : Iron Ore Project Direct Shipping.
Technical Report for New Millennium Capital Corp, 2008-2010.

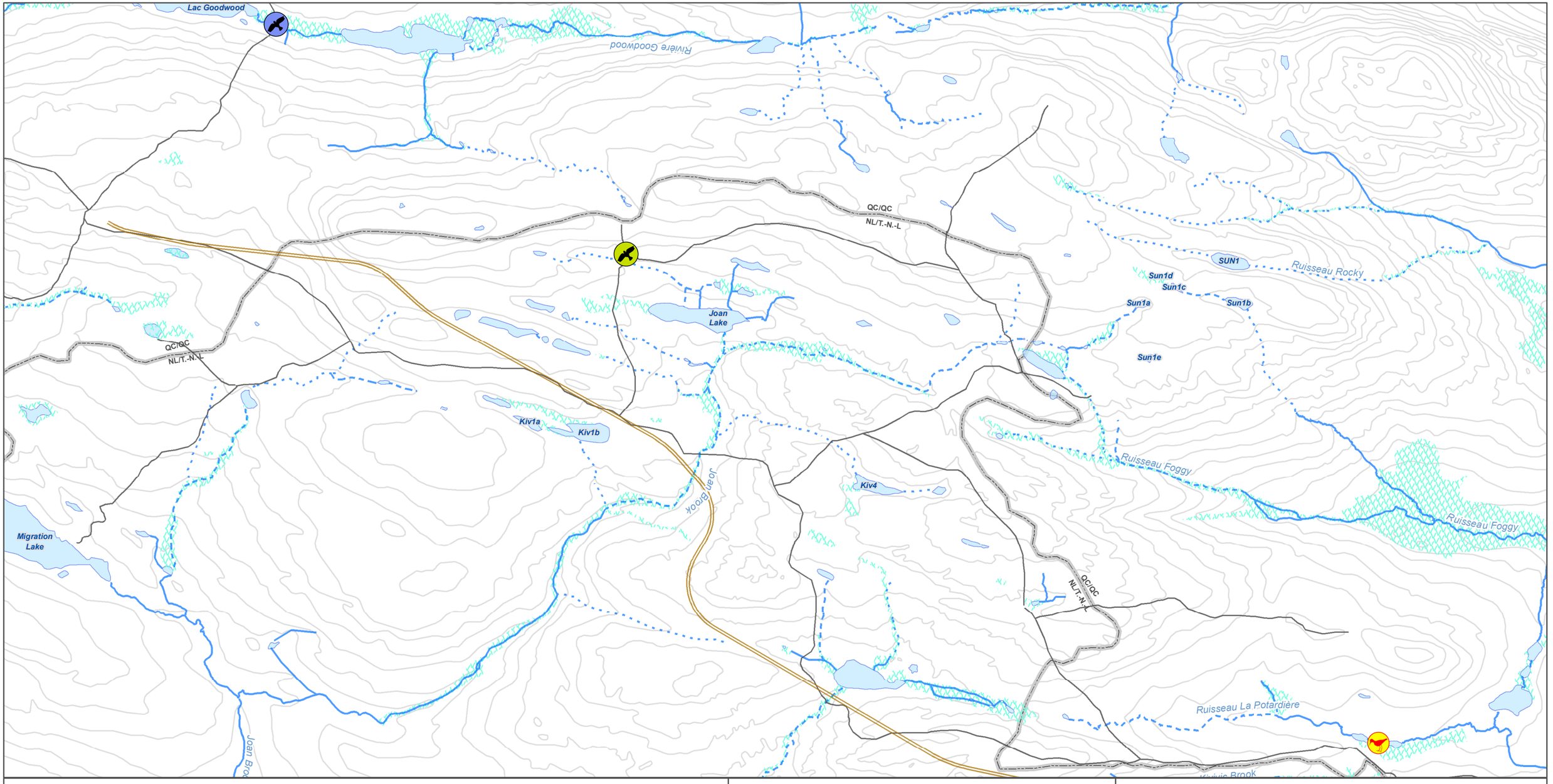
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Figure 3



Species at risk

- Bald Eagle
- Bank Swallow
- Rusty Blackbird

Hydrography

- Permanent Watercourse
- Intermittent Watercourse
- Storm Runoff
- Artesian Spring
- Water Body
- Wetland

Basemap

- Existing Road
- Road to DSO Area 4
- Contour Line (50 ft)
- Provincial Border

FILE, PROJECT, DATE, AUTHOR:
GH-0901 , PR185-30-17, 2017-12-04, jcamy

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Kilometers

UTM 19N NAD 83 SCALE: 1:30 000

SOURCES:
Basemap
Government of Canada, NTDB, 1:50,000, 1979 Government of NL and government of Quebec, Boundary used for claims
SNC Lavalin, Groupe Hémisphères, Hydrology update, 2013

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DSO PROJECT

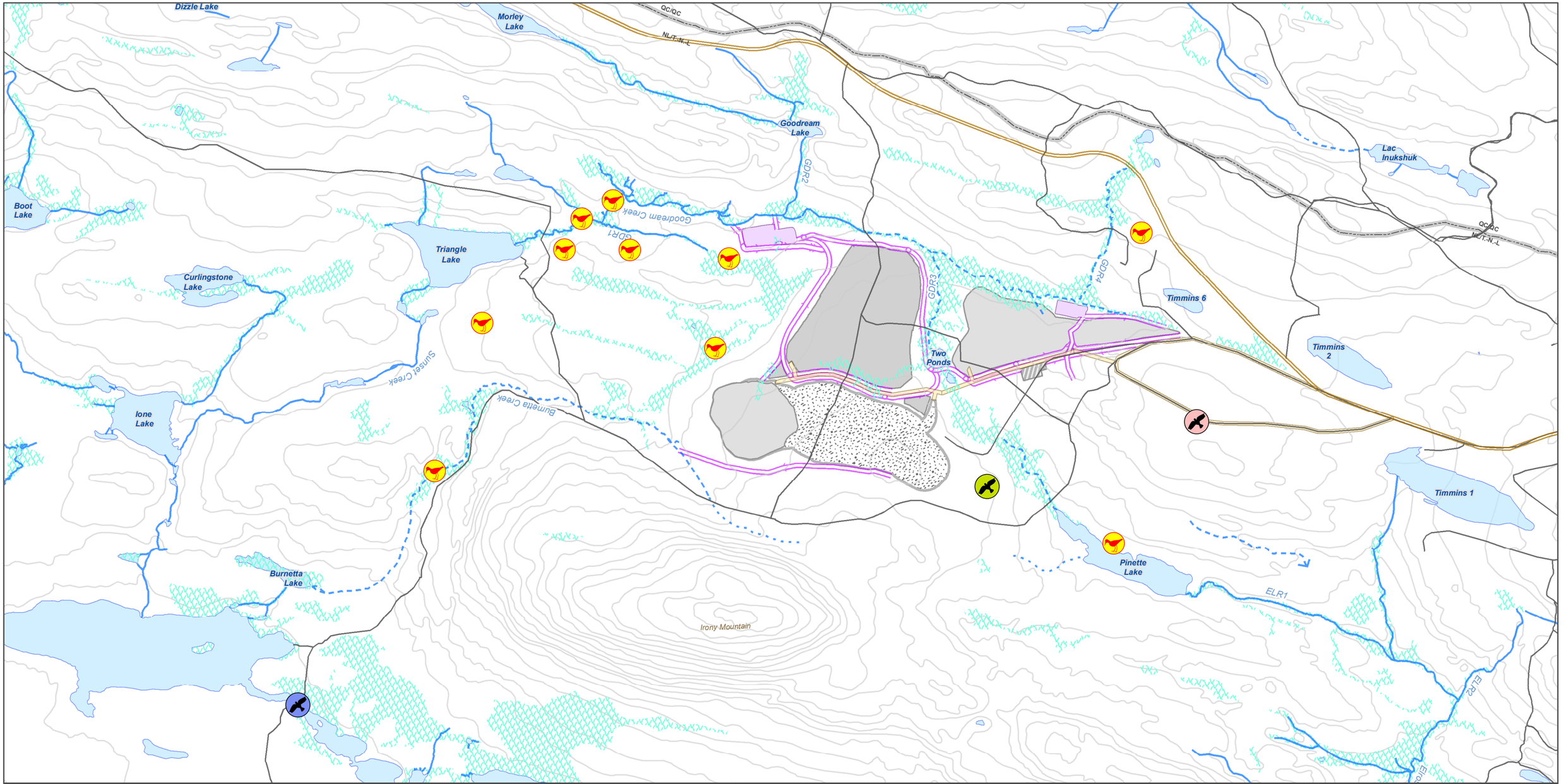
Location Of Species At Risk

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Bureau 201, Lévis (QC)
Canada, G6V 4E2

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Canada, H2G 3C6

Figure 4



Species at risk

- Bald Eagle
- Bank Swallow
- Bank Swallow breeding
- Rusty Blackbird

Howse Proposed Infrastructures

- Proposed Howse Pit
- Proposed Topsoil/Overburden Stockpile
- Proposed Waste Dump/In-Pit Dump
- Proposed Site Infrastructure
- Proposed Sedimentation Pond
- Proposed Ditch and Outlet

Hydrography

- Permanent Watercourse
- Intermittent Watercourse
- Storm Runoff
- Water Body
- Wetland

Basemap

- Existing Road
- Road to DSO Area 4
- Contour Line (50 ft)
- Provincial Border

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Kilometers

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SOURCES:
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Government of Canada, NTDB, 1:50,000, 1979 Government of NL and government of Quebec, Boundary used for claims
SNC Lavalin, Groupe Hémisphères, Hydrology update, 2013

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Location Of Species At Risk

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Figure 5

Fleming

Star Creek 1

Ruisseau Star

Ruisseau Star

Lac Star

Lac Big Star

Species at risk

- Bank Swallow
- Barrow's Goldeneye
- Rusty Blackbird

Hydrography

- Permanent Watercourse
- Intermittent Watercourse
- Water Body
- Wetland

Basemap

- Existing Road
- Road to DSO Area 4
- Contour Line (50 ft)

FILE, PROJECT, DATE, AUTHOR:
GH-0901 , PR185-30-17, 2017-12-04, jcamy

0 0,5
Kilometers

UTM 19N NAD 83 SCALE: 1:13 000

SOURCES:
Basemap
Government of Canada, NTDB, 1:50,000, 1979 Government of NL and government of Quebec, Boundary used for claims
SNC Lavalin, Groupe Hémisphères, Hydrology update, 2013

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QUINQUENNIAL AVIFAUNA SURVEY
DSO PROJECT

Location Of Species At Risk

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Figure 6