

2018 Annual Report – Project 2a (Goodwood) Québec



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1 Permits and Authorization

1.1 Project 2a

Project 2a was subject to the impact assessment process; a project authorization was delivered in 2013 and modified in 2017.

In Spring 2017, Tata Steel Minerals Canada (TSMC) obtained an authorization certificate for a period of 1 year, with the condition that no effluent was to be produced from the project. In February 2018, a request for a certificate was submitted for long-term operations in the Goodwood pit. Approval was granted in April 2018.

1.2 Sterile Extraction from Flemming 7 Pit

For safety reasons, a volume amount of the Flemming 7 pit (located in Labrador) waste pile is stored in Quebec. TSMC has a certificate of authorization (no. 92031100000) for this activity and there is no change since the previous year.

2 Operation

2.1 Sterile Extraction from Flemming 7 Pit

Since 2015, operations at the Flemming 7 pit have ceased and the storage of waste pile material in the province of Quebec continues.

2.2 Project 2a

TSMC has decided to delay the start of the Sunny project; however, the environmental monitoring activities are ongoing.

The construction phase of the Goodwood pit as well as the water management infrastructures started in May 2017; operation activities started in July 2017.

There is no ore storage in the province of Quebec. All of the ore is transported by haul truck to the DSO3 site (Newfoundland and Labrador) for crushing, screening and shipment. The ore is then moved by rail until the port of Sept-Iles for maritime transshipment.

From May to December 2017, TSMC constructed the water management infrastructure, including 'clean-water' and contact water ditches as well as a sedimentation pond. In Spring 2018, a failure of the sedimentation pond highlighted several problems with the ditch network for this project. TSMC was never the less permitted to continue its operations with the condition that all of the contact waters be diverted to an old pit, Kivik 1, which is located in Newfoundland and Labrador. The details of the pond failure as well as TSMC's corrective measures are provided in section 3.1.

In 2017, TSMC contracted Blumetric to design and commission a water treatment unit for the effluent at Goodwood. The commissioning of the water treatment unit was planned for 2018 but was delayed until summer 2019 for numerous reasons. In particular, because this unit is a large-scale installation, it was not safe or practical to proceed with all of the required steps while the Goodwood basin was in a precarious state. In addition, weather conditions considerably limited the time period for which construction could be conducted. Given the remote nature of the site, it was decided to delay the commissioning of the Goodwood water treatment unit until the work could be conducted safely.

2.3 Blasting Summary

Table 1 presents the blasts conducted in Quebec in 2018. Blast reports as presented by Instantel are presented in Appendix II. Data are collected using a microphone (UM12242 V 10-87 Micromate ISEE).

Table 1. Summary of blasting done in Québec in 2018

Report Event	Date	Time	Pressure dB (L)	Vibration peak (mm/s)
GW-753-05	2018-05-21	17 h 31	122,30	0,8
GW-753-06	2018-05-26	18 h 52	135,97	0,8
GW-753-FS	2018-05-29	NA	NA	NA
GW-733-05B	2018-05-30	12 h 13	124,12	1,9
GW-733-08	2018-06-02	11 h 50	135,05	0,8
GW-733-07	2018-06-05	19 h 09	123,84	2,6
GW-733-06	2018-06-09	13 h 19	138,06	2,1
GW-753-07	2018-06-14	18 h 29	140,54	1,4
GW-753-08	2018-06-25	20 h 02	137,40	1,0
GW-743-11	2018-07-01	18 h 22	134,29	3,2
GW-753-09/10	2018-07-12	NA	NA	NA
GW-743-12	2018-07-18	18 h 09	141,67	3,0
GW-723-01A	2018-07-20	17 h 11	140,74	2,6
GW-723-01B	2018-07-26	18 h 09	127,85	5,9
GW-743-13	2018-08-16	12 h 22	140,95	2,4
GW-733-05B	2018-08-18	12 h 13	124,11	1,9
GW-723-02	2018-08-27	18 h 25	137,21	2,5
GW-743-14	2018-09-03	12 h 54	129,50	3,1
GW-743-17	2018-09-07	11 h 52	141,60	2,2
GW-723-03	2018-09-10	12 h 03	127,90	1,2

3 Incidents

3.1 2018 Incidents

3.1.1 Goodwood Basin Failure

In December 2017, construction of the Goodwood basin was completed. In June 2018, following the snow melt, damages were observed which prevented the basin from functioning as required. An exfiltration was observed downstream of the basin dyke. These problems were immediately reported to the environmental authorities and an inspector from the MELCC was dispatched.

Water monitoring was conducted both during and following the event. From June 6-26th, samples were taken from the station SP-OUT in order to monitor the environmental impact of the spill. Table 2 presents the sampling dates, Table 3 the parameters followed, Appendix III presents the incident report and Appendix II presents the laboratory analysis certificates.

Two samples were also taken in the natural environment on July 18 and 24th (station EE) in order to verify the final environmental impact.

Table 2. Water quality monitoring calendar following Goodwood basin failure

Analyses		June 2018	July 2018
Conventional, metals and metalloids		7, 14, 22, 28	9, 11, 15, 18, 19, 22, 24, 26
Toxicology		6, 21, 28	11, 18, 24
Hydrocarbon		7	9, 15, 18, 19, 22, 24, 26

Table 3. Water quality monitoring parameters following Goodwood basin failure

Analysis	Parameters
Conventional	Alkalinity, BOD ₅ , Cl, COD, Conductivity, DOC, TOC, DO, F, Cr-VI+, NO ₂ , NO ₃ , NH ₃ , pH, Phenols-4AAP, reactive SiO ₂ , SO ₄ , S ²⁻ , TKN, CN, Dissolved Solids, TSS
Metals and metalloids	Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, Cr(VI), Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, K, Se, Ag, Na, Sr, Tl, Ti, CaCO ₃ , P, U, V, Zn
Toxicology	<i>D. magna</i> , <i>O. mykiss</i>
Hydrocarbon	C ₁₀ -C ₅₀

Given the scope of the works that would be required to complete the repair works for the basin, a contingency plan was implemented. This 'winterization plan' consisted of the construction of three additional ditches around the basin and one temporary dyke. The plan is presented in Appendix III.

A permanent solution to the problems associated with the Goodwood basin is in the process of being developed and construction will occur in 2019.

3.1.2 2018 Monitoring Results

Table 4 presents the samples and criteria exceedances for aquatic life of the MELCC. There was no exceedance observed for any other parameter that was analyzed.

Table 4. Criteria exceedance for aquatic life following the 2018 spill

Date	pH	NO ₃ (mg/L)	MES (mg/L)	C ₁₀ -C ₅₀ (µg/L)	Al (µg/L)	Cd (µg/L)	Fe (µg/L)	Pb (µg/L)	Zn (µg/L)	<i>D. magna</i>	<i>O. mykiss</i>
2018/06/06	NA	NA	NA	NA	NA	NA	NA	NA	NA	Non tox	Non tox
2018/06/07	6,4	NA	19	<100	NA	NA	3400	0,75	7,2	NA	NA
2018/06/14	6,7	NA	<2,0	NA	NA	NA	5600	0,75	7,1	NA	NA
2018/06/21	6,4	NA	<2,0	NA	NA	NA	NA	<0,50	7,1	Non tox	Non tox
2018/06/28	6,5	NA	7,2	NA	NA	NA	4400	0,61	8,6	80,4%	Non tox
2018/07/09	6,4	2,3	<2,0	590	450	0,80	980	1,20	65	NA	NA
2018/07/11	6,1	NA	2,2	NA	NA	NA	960	<0,50	<7,0	70,7%	Non tox
2018/07/15	6,1	3,6	<2,0	<100	56	<0,20	120	<0,50	<7,0	NA	NA
2018/07/18	6,4	4,2	5,2	<100	18	<0,20	100	<0,50	<7,0	17,8%	Non tox
2018/07/19	6,3	4,5	<2,0	<100	<10	<0,20	<60	<0,50	14	NA	NA

Date	pH	NO ₃ (mg/L)	MES (mg/L)	C ₁₀ -C ₅₀ (µg/L)	AI (µg/L)	Cd (µg/L)	Fe (µg/L)	Pb (µg/L)	Zn (µg/L)	D. magna	O. mykiss
2018/07/22	6,6	5,2	5,3	<100	<10	<0,20	63	<0,50	<7,0	NA	NA
2018/07/24	5,8	5,5	<2,0	140	NA	<0,20	170	<0,50	8,7	70,7%	Non tox
2018/07/26	6,0	3,3	<2,0	<100	580	<0,20	2100	0,7	9,2	NA	NA

Green. No excess; Orange. Excess over CALG (chronic aquatic life guideline); Red. Excess over AALG (acute aquatic life guideline) or acute toxicity
NA. Parameter not analyzed

3.1.3 Preventive Measures for Spring 2019

In order to prevent a water spill from the basin, the following measures will be implemented in the Spring of 2019:

- Snow management before snow belt, including clearing snow from the ditches in order to allow for proper water circulation;
- Pumping system between the Goodwood basin and the Kivivik 1 pit;
- Water level management in the temporary section of the basin;
- Pumping system at the location of the exfiltration downstream of the basin, in case of spill.

Plans of the preventive measures is presented in Appendix III.

3.1.4 Monitoring in spring 2019

Visual monitoring will be conducted in order to ensure that no exfiltration occurs during snow melt.

3.2 Follow-up of 2017 Incident

3.2.1 Red Water Flow

In July 2017, following a rain storm, a consultant working on site noticed a red water flow towards Fra Lake. Immediate measures were taken and environmental monitoring of the lake was conducted. It is important to note that Fra Lake is not a fish habitat.

This situation was resolved by implementing a small temporary sedimentation pond and sediment fences. The construction of the dyke eliminated this problem by closing the channel in which the stream flowed.

3.2.2 Waste Rock Pile

In August of 2017, field monitoring activities allowed to note that there was a discrepancy between the construction plans and the reality in the field; the profile of the waste rock pile was different than planned; the clean water ditch location is no longer possible and there is a risk of red water runoff into a new watershed.

3.3 Community Complaint

In 2019, the report will contain a feedback and complaint process plan.

4 Surface Water Quality Monitoring

TSMC monitors surface water quality since 2015. The location of the water quality monitoring stations is presented in figure 1 of appendix I. Two stations are monitored: EE-GW, which corresponds to the station that is located at the outlet of Fra Lake; ER-GW, the reference station, which is located at the outlet of Migration Lake.

The monitoring plan includes sampling at the 2 stations 4 times annually for the following parameters:

- **Conventional:** alkalinity; DOC, TOC, conductivity, chloride, BOD₅, DOC, hardness, TSS, pH
- **Ions and nutrients:** ammonium nitrate, TKN, cyanide, fluoride, nitrates, nitrites, reactive silica, hydrogen sulfur, sulfates
- **Hydrocarbons:** C₁₀-C₅₀
- **Metals and metalloids:** Ca, Cr(VI), Hg, K, Mg, Ra₂₂₆, Na, T

And once annually for the following parameters:

- **Trace metals:** Al, Sb, Ag, As, Ba, Bo, Cd, Cr, Co, Cu, Sn, Fe, Mn, Mo, Ni, PT, Pb, Se, Th, U, V, Zn

4.1 Initial State

Analysis certificates for 2016-2017 are presented in appendix II. A table comparing data from 2015 to 2018, and showing all exceedances, is also presented in appendix II.

4.2 2017 Sampling

Results of the 2017 sampling campaign were presented in the 2017 annual report. The analysis certificates were not appended, and so they are now in Appendix II.

Table 5. Water sampling dates in 2017

Station	June	July	August	September
Conventional, ions, nutrients and metals				
EE-GW	29	31	NA	4*
ER-GW	8	10	23	27*
Hydrocarbon				
EE-GW	29	31	NA	4*
ER-GW	8	10	23	27*

* Annual sampling of trace metals
NA. Planned sampling but not done

4.3 2018 Sampling

Late presence of ice prohibited sampling of the natural environment (EE and ER) before July 9th 2018. Sampling dates are presented in Table 6.

Two types of sampling were conducted in the natural environment (EE and ER): annual sampling of trace metals and a monthly sampling during the ice-free period of conventional parameters, ions, nutrients, hydrocarbons, metals and metalloids

Table 6. Water sampling dates in 2018

Station	June	July	August	September	October
Conventional, ions, nutrients and metals					
EE-GW	NA	9,	13	18	1*
ER-GW	NA	9	13	NA	1*
Hydrocarbon					
EE-GW	NA	9	13	18	1
ER-GW	NA	9	13	NA	1

* Annual sampling of trace metals
NA. Planned sampling but not done

4.3.1 2018 Water Quality Results

Table 7 presents samples that had exceedances for aquatic life of the MELCC. There was no exceedance for all other parameters that were analyzed.

Table 7. Criteria exceedance for aquatic life – 2018 annual monitoring

Date	pH	AI (µg/L)	Pb (µg/L)
EE-GW			
2018/07/09	5.65	120	<0.50
2018/08/13	6.2	50	0.58
2018/09/18	5.85	35	<0.50
2018/10/01	NA	14	<0.010
ER-GW			
2018/07/09	5.41	21	<0.50
2018/08/13	5.4	<10	<0.50
2018/10/01	5.48	11	0.016

Green. No excess; **Orange.** Excess over CALG (chronic aquatic life guideline); **Red.** Excess over AALG (acute aquatic life guideline) or acute toxicity

NA. Parameter not analyzed

4.4 Surface Water Quality Monitoring Update

There is no update planned for this program.

5 Sediment Quality Monitoring

5.1 Sediment Quality

Sediment monitoring will be conducted once annually at the same stations as for water quality, and for the following parameters:

- Metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)
- Phosphorous

- Petroleum hydrocarbons C10-C50
- Total organic carbon
- sulfur

A visual description of the samples (cohesion, color, smell) and a grain size analysis (laboratory) is planned.

5.1.1 Initial State

Sediments at Fra Lake were characterized in July 2019. The analyzed parameters are summarized in Table 8 and the certificates of analysis are presented in Appendix II.

There is no other sediment sampling at Fra Lake. The lake's perimeter is primarily composed of pebbles and boulders. There is no noticeable accumulation of sediments at the location where the lake meets the torrential channel.

TSMC did not have the required equipment to sample the sediments at the center of the lake. In addition, since there is no path leading to the lake, it is impossible to access with a vehicle and to take any embarkation.

Table 8. Sediment characterization - initial state

Conventionnels	Métaux		
Azote ammoniacal (N-NH ₃)	Ag	Cu	Sb
Conductivity	Al	Fe	Si
Nitrite et nitrate	As	Hg	Sn
pH	B	K	Sr
Total phosphorous	Ba	Mg	Te
Chlorides (Cl ⁻)	Be	Mn	Ti
Sulfates (SO ₄)	Bi	Mo	Tl
Sulphur	Ca	Na	U
Grain size	Cd	Ni	V
	Co	Pb	Zn
	Cr		

5.1.2 2017 Sampling

Sediment sampling was not conducted in 2017.

5.1.3 2018 Sampling

Sediment sampling was not conducted in 2018.

5.2 Benthic Community

The sediment monitoring program also includes annual sampling for benthic communities monitoring. The sampling stations are in permanent streams, as close as possible to the sediment sampling stations. Sampling is to be done in August. The descriptors are:

- Total invertebrates' density
- Richness (Number of taxa)

- Simpson diversity index
- Evenness (Pielou's index)
- Density of each taxon
- Relative taxa abundance
- Absence/presence of taxa
- Bray-Curtis coefficient

TSMC has experienced difficulties in developing a benthic sampling/monitoring program at the Goodwood site due in part to the fact that there are no permanent streams in the vicinity. To date, there has been no benthic sampling at the Goodwood site. The outlet of the Fra lake is an intermittent stream along the majority of its path. Eventually it reaches another water course, which then flows into a wetland. Monitoring of benthic communities will therefore be conducted upstream of this junction, which could offer little representativeness of the conditions at the Fra lake stream.

5.2.1 Initial State

There was no sampling of benthic communities to document the baseline conditions. In 2009, a benthic inventory was conducted in Fra Lake, but it should not be considered as representative of the baseline conditions.

5.2.2 2017 Sampling

Benthic sampling was not conducted in 2017.

5.2.3 2018 Sampling

Benthic sampling was not conducted in 2018.

5.3 Sediment Quality Monitoring Program Update

TSMC is currently in discussions with the MELCC to establish a program that is in line with the CA and with the site's realities. The eventual program will be implemented starting in 2019. Figure 2 of appendix I presents the location of the proposed sampling stations.

5.3.1 Sediment Sampling

Given logistical constraints which prohibit transportation onto Fra and Migration Lakes, winter sampling is very difficult. As such, sampling will be conducted in mid-March, and this could be considered as representative of the 2018 conditions. Sampling will take place at two locations: at the center of Fra Lake and on the south-east shore of the Migration Lake. When the results are obtained, an update to the annual report, including a comparative analysis of the sediments, will be sent to the MELCC.

5.3.2 Benthic Community Monitoring

With respect to the monitoring of benthic communities, a field campaign will take place in August 2019. Benthic sampling will take place upstream of the junction with the discharge from Fra Lake as a reference site and downstream as the exposed site. Sampling at the discharge point of Migration Lake will also be done and will be compared to the exposed site. A completed description of each sampling station will also be provided.

6 Mining Effluents Monitoring

From May to December 2017, TSMC completed construction of the water management infrastructure; this includes clean water derivation ditches, runoff collection ditches and an accumulation pond. For the purpose of quality control, TSMC mandated WSP to conduct construction surveillance. In June 2018, the accumulation pond showed signs of structural failure. The pond will be operational in 2019, see section 3.1.1.

In 2017, TSMC mandated BluMetric to design and build the Goodwood effluent treatment plant. Due to safety concerns, construction of the plant was postponed, and it will be operational in 2019.

6.1 Metal and Diamond Mining Effluent Regulations Monitoring

Since the treatment plant will only be operational in 2019, there was no effluent monitoring done in 2018. The planned monitoring program is nonetheless described in the following sections.

6.1.1 Effluent Components

Table 9 shows sampling frequency and the parameters used for effluent monitoring. The monitoring program will be implemented as soon as the plant is operational.

Table 9. Effluent Monitoring Parameters

Continuous	Weekly	Monthly	Quarterly
Conductivity, pH and flowrate	TSS, Arsenic, copper, iron, nickel, lead and zinc	Acute Toxicity (<i>O. mykiss</i> and <i>D. Magna</i>)	Alkalinity, hardness, aluminum, barium, cadmium, chrome, manganese, mercury, molybdenum, selenium, NH ₃ , NO ₃ , dissolved solids, hydrogen sulfide

6.1.1.1 Acute Lethality Test

Two monthly trials on six effluent concentrations are planned: 0%, 6,25%, 12,5%, 25%, 50% et 100%.

- *Daphnia magna*, based on the SPE 1/RM/14 method
- *Oncorhynchus mykiss*, based on the SPE 1/RM/13 method

If the mining effluent results indicate a toxic lethality, a physico-analysis sample will be taken immediately. The toxic lethality tests will continue to be conducted twice monthly. If three consecutive samples are not lethally toxic, the monthly sampling frequency will resume (Section 15 of MDMMER).

6.1.2 Environmental Effect Monitoring

The Goodwood project will be subjected to environmental effects monitoring studies (EEM) once the effluent volume output reaches 50 m³/day. There was no effluent output in 2018.

Once the process is implemented, monitoring will comply with the requirements outlined in Schedule 5 of the MDMER. Results will be communicated in the annual report. The following sections presents studies to be conducted.

6.1.2.1 Effluent Monitoring

Effluent characterization will be conducted four times annually, with a minimum of one month interval between sampling dates. The parameters that will be measured are:

- **Conventional:** hardness, alkalinity, conductivity and temperature

- **Metals:** Al, Cd, Fe, Mo, Se, NH₄, NO₃ et Hg

6.1.2.2 Sublethal Toxicity Test

Sublethal toxicity trials will be conducted on a species of fish, invertebrate, plant and algae, when the effluent is discharged into freshwater, which is the case for project 2a. These trials will be conducted twice per year during the first three years that the project is subject to EEM, and then once annually if the effluent is non-toxic during 6 consecutive trials. The trials will be:

- **Fish:** test of Larval Growth and survival using *Pimephales promelas* (Rapport SPE 1/RM/22) or at the initial stages of the biological cycle of *Oncorhynchus mykiss* (Rapport SPE 1/RM/28).
- **Invertebrate:** test of reproduction and survival on the cladocera *Ceriodaphnia dubia* (Rapport SPE 1/RM/21)
- **Plant:** test for measuring the inhibition of growth using the freshwater macrophyte *Lemna minor* (Rapport SPE 1/RM/37)
- **Algae:** test for measuring the inhibition of growth of the algae *Selenastrum capricornutum* (Rapport SPE 1/RM/25)

6.1.3 Biological Monitoring

Pursuant to article 9, part 2 of the EEM (Appendix 5 of the MDMMER), a study on the fish population will be conducted if the effluent concentration in the exposed zone is superior to 1% at less than 250m upstream of the final discharge point. It has been therefore required to measure effluent concentration 250m upstream of the final discharge point since 2013.

In addition, a study on fish tissue will be conducted if a mercury concentration equal or more than 0.10 µg/L is noted during the characterization.

6.2 Directive 019 Monitoring

Monitoring of the final effluent is required under the Directive 019 sur l'industrie minière (MDDEP, 2012), and the requirements are described in section 2.1.1.1.1 of Directive 019, by virtue of article 22 of the Loi sur la qualité de l'environnement (LQE), and according to the objectifs environnementaux de rejet (OER) which were calculated by the MELCC specifically for the project 2a. Once the project is subject to the EEM process, TSMC will be subject to two types of monitoring, one regular and one annual.

Regular monitoring of the mining effluent includes the taking of an instantaneous sample and the analysis of certain parameters according to the frequencies indicated in Table 10. These frequencies must be maintained until the final cessation of mining activities.

Table 10. Directive 019 Monitoring

Continuous	3 / week	Weekly	Monthly	Annually
pH, flow rate	Suspended matter	As, Cu, Fe, Ni, Pb, Zn	Acute toxicity (<i>O. mykiss</i> and <i>D. magna</i>)	Alcalinity, Cl ⁻ , conductivity, BOD ₅ , COD, flow rate, hardness, F ⁻ , C ₁₀ -C ₅₀ , dissolved solids, total solids, phenolic substances, SO ₄ ²⁻ , turbidity, NH ₃ , TKN, NO ₂ , NO ₃ , TP, Al, Cd, Ca, Cr, Co, Mg, Mn, Hg, Mo, K, Si, Na, S ²⁻ , S ₂ O ₃ ²⁻

Annual monitoring the analysis and value, once annually, during the summer season, of several parameters (Table 4-3). Sampling and monitoring methods should be conducted on the same day and are completed in addition to the regular weekly monitoring for that week.

In order to evaluate the global toxicity of the mining effluents according to directive 019, this monitoring also includes lethal toxicity tests, which are developed by the MDDEFP, including:

- lethal toxicity in the crustacean *Daphnia magna*. Method MA 500 – D.mag. 1.0. 4th Revision;
- acute lethality in *Onchorynchus mykiss*, method SPE1/RM/13, 2nd edition.

6.3 Environmental Objectives of Rejection (EOR) Monitoring

Monitoring of the contaminants which were determined under the OER is required for each mining effluent in order to ensure that they are respected. This monitoring plan will be conducted in the same frequency as that planned under Directive 019 sur l'industrie minière (MDDEP, 2012).

The MELCC provided TSMC with OER for project 2a. This document outlines the concentrations and loads towards which the final effluents at Goodwood must trend.

Additional requested parameters (barium, selenium, and hydrogen sulfide) will be analyzed under the annual monitoring plan, which is once per summer. In addition, dissolved solids will be analyzed four times annually, rather than once as recommended by the Directive 019 sur l'industrie minière.

6.4 Summary of Effluent Monitoring

Table 11 presents the overall monitoring that will be conducted in relation to the mining effluent at Goodwood. The monitoring will commence once the flow of 50 m³/day is measured, that is once the water treatment unit is operational.

Table 11. Summary of Effluent Monitoring

Continuous	3 / week	Weekly	Monthly	Quarterly	Annually
pH, conductivity, flow rate	Suspended matter	As, Cu, Fe, Ni, Pb, Zn	Acute toxicity (<i>O. mykiss</i> and <i>D. magna</i>)	Alkalinity, total hardness, Al, Cd, Fe, Hg, Mo, NH ₃ , NO ₃ , dissolved oxygen, temperature	Cl ⁻ , BOD ₅ , COD, hardness, F ⁻ , C ₁₀ -C ₅₀ , dissolved solids, total solids, phenolic substances, SO ₄ ²⁻ , turbidity, NH ₃ , TKN, NO ₂ , NO ₃ , TP, Al, Cd, Ca, Cr, Co, Mg, Mn, Hg, Mo, K, Si, Na, S ²⁻ , S ₂ O ₃ ²⁻

7 Groundwater Monitoring

Drilling work was done in Fall 2016 to determine the presence of groundwater downstream of the infrastructure at the lowest topographical point. The two wells, Gdw-P01 and GDW-P02, drilled at 65m and 80m respectively, did not detect any groundwater. The location of these wells is shown on Figure2 in Appendix I.

7.1 Water Table Monitoring

Well water levels must be taken twice annually: in Spring and in Summer. Table 10 presents the results from 2016 and 2018.

Table 12. Water Table monitoring

Well	2016		2017		2018	
	Fall	Spring	Summer	Spring	Summer	
GDW-P01	No water	NA	NA	No water	NA	

GDW-P02	No water	NA	NA	No water	NA
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NA. Monitoring planned but not realized.

7.2 Groundwater Sampling

Water level monitoring in both wells must be conducted twice per year, in spring and summer. Should water be detected in the wells, a sample will be taken and analyzed for the following parameters:

- C10-C50
- pH, ORP
- Dissolved oxygen
- Conductivity
- Nitrites/nitrates
- Total Phosphorus
- Sulfides
- Total cyanides
- Dissolved metals (Al, Ag, Ba, B, As, Cd, Ca, Cr, Co, Cu, Fe, Mg, Mn, Hg, Mo, Ni, Pb, Sb, Se, K, Na, Zn)
- Carbonates/bicarbonates
- Chlorides
- Sulfates
- Fluorides
- Total dissolved solids

Since no water was detected in both wells in 2016, no monitoring have been conducted in 2017 and 2018.

7.3 Groundwater Monitoring Program Update

No updates are planned. The wells will be monitored in 2019 to verify the presence of a water table and, if required, sampling will be conducted.

8 Air Quality Monitoring

Since 2015, TSMC implemented air quality monitoring for the DSO project. Monitoring was completely operational for the first time in 2018. Certificates of Analysis for 2017 and 2018 are included in Appendix II. Location of the monitoring stations is shown on Figure 3 in Appendix I.

In 2017, we started the development of a system of data management which allowed us to conduct monthly comparative results for each station. Since 2018, this system is being adjusted.

8.1 2017 Sampling

Monthly air quality monitoring is conducted from April to September for most parameters. However, winter monitoring of nitrogen dioxide is in place with monitoring in January and November (Table 13).

Table 13. Air Quality Sampling Dates – Goodwood 2017

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO₂												
AQS2	NA	-	NA	-	NA	4	4	6	9	-	NA	-
AQS4	NA	-	NA	-	NA	4	4	6	9	-	NA	-
Dust and Metals												
AQS1	-	-	-	NA	NA	NA	4	NA	19	20	-	-
AQS2	-	-	-	NA	NA	NA	4	6	9	20	-	-
AQS3	-	-	-	NA	NA	NA	4	6	9	20	-	-
AQS4	-	-	-	NA	NA	NA	4	6	9	-	-	-
AQS5	-	-	-	NA	NA	NA	NA	NA	NA	-	-	-
PM2.5												
AQS1	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
AQS2	-	-	-	-	NA	25	NA	20	2	-	-	-
AQS3	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
AQS4	-	-	-	-	NA	NA	NA	25	9	-	-	-
AQS5	-	-	-	-	NA	NA	NA	23	NA	-	-	-
TPM and Metals												
AQS1	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
AQS2	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
AQS3	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
AQS4	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
AQS5	-	-	-	-	NA	NA	NA	NA	NA	-	-	-

NA. Sampling planned but not conducted

8.1.1 NO₂

Although NO₂ monitoring was conducted in 2017, no results were presented in the 2017 annual report.

In 2017, monitoring of NO₂ concentration occurred between June and September at stations AQS2 and AQS4. Sampling was conducted with a passive collector developed by Maxxam, which consists of an NO₂ – capturing device inside a protective container placed at a height of 1-3 m.

No exceedances of provincial government (QC and NL) regulations were recorded in 2017.

8.1.2 Dust and Metals

Although dust monitoring is conducted since 2016, no results were presented in the 2017 annual report. Dustfall monitoring occurred between July and October using dust jars with a 176.7 cm² opening. In general, the jars remain open for 30 days before their contents are analyzed.

Winter and Spring sampling was not conducted as the equipment is not adapted for temperatures below zero.

8.1.3 Particles PM2.5

Measurements were taken in August and September 2017. Low PM2.5 concentrations recorded at the sampling stations suggest that there is no contamination in the ambient air at the sampling sites.

8.1.4 Total Particles (TPM) and Metals

There was no sampling of TPM in 2017. The sampling equipment was defective which rendered the sampling of these parameters impossible.

8.2 2018 Sampling

Sampling dates for this monitoring program are presented in Table 14. Air quality monitoring started on July 1st 2018 and continued until the end of September. No sampling was possible in May and June due to the late onset of spring and November sampling could not be done since snow made access impossible.

Table 14. Air Quality Monitoring Sampling Date – Goodwood 2018

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO₂												
AQS2	NA	-	NA	-	NA	NA	1	5	8	-	NA	-
AQS4	NA	-	NA	-	NA	NA	1	5	8	-	NA	-
Dust and Metals												
AQS1	-	-	-	NA	NA	NA	NA	11	8, 29	-	-	-
AQS2	-	-	-	NA	NA	NA	NA	5	8, 29	-	-	-
AQS3	-	-	-	NA	NA	NA	NA	5	8, 29	-	-	-
AQS4	-	-	-	NA	NA	NA	NA	5	8, 29	-	-	-
AQS5	-	-	-	NA	NA	NA	NA	NA	NA	-	-	-
PM2.5												
AQS1	-	-	-	-	NA	NA	12	24	NA	-	-	-
AQS2	-	-	-	-	NA	25	7, 21	5, 18	5	-	-	-
AQS3	-	-	-	-	NA	NA	11	25	NA	-	-	-
AQS4	-	-	-	-	NA	NA	8, 28	7, 20	7	-	-	-
AQS5	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
TPM and Metals												
AQS1	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
AQS2	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
AQS3	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
AQS4	-	-	-	-	NA	NA	NA	NA	NA	-	-	-
AQS5	-	-	-	-	NA	NA	NA	NA	NA	-	-	-

NA. Sampling planned but not conducted

8.2.1 NO₂

NO₂ concentration monitoring in 2018 occurred from June to September at stations AQS2 and AQS4. Sampling was done using passive samplers developed by Maxxam, consisting of a cassette specifically designed for NO₂ capture, placed in a protective housing maintained at a height of 1-3 m.

No exceedance of provincial standards (QC and NL) were detected in 2018.

8.2.2 Dust

Dustfall monitoring continued in summer 2018. Three sampling events were done from July to September (Table 4) using jars with a 176,7 cm² opening. Usually, the jars are left open for a 30-day period before being closure and analysis of the contents.

Spring and winter sampling were not conducted because this system is not adapted to freezing weather.

There is no standard in Quebec for this criterion. However, a threshold of 7 g/m² per 30-day period from the NL standard was exceeded during the sampling period covering July 1st to August 5th at station AQS2 with an average dust mass of 18,1 g/m² on a thirty day period. See analytical certificate #B835159 in Appendix II.

8.2.3 Particles PM2.5 and TPM

PM2.5 and TPM monitoring instruments have suffered technical issues since the first time they were deployed in 2017. They are now operational. From three to five sampling events were conducted between July and September according to the stations (Table 14).

The low PM2.5 concentrations detected at the sampling stations suggest the absence of ambient air contamination at the sampling sites.

8.3 Air Quality Bio-Assessment

TSMC developed a program for air quality monitoring utilizing lichens. This method allows to measure atmospheric deposition with precision. The triennial program started with the first annual sampling done in 2016. Results and conclusions from this program are presented in Evinrude's report in Appendix IV.

8.4 Meteorological Station

Since December 2017, a weather station is being calibrated at site; this station will be operational in summer 2019. Delays are due to the complexity of installing and powering such a station in a remote area without access to electricity. TSMC is currently discussing with the MELCC to adapt weather monitoring to the reality of our site.

8.5 Air Quality Monitoring Update

There is no update planned for this program.

9 Waste Rock Monitoring

The waste rock monitoring program provides for sampling twice a month and analysis of the following parameters:

- Sulfur percentage
- MABA static test

- TCLP lixiviation test
- Metals (Ag, As, Ba, Cd, Co, Cr, Cu, Fe, Sn, Mn, Hg, Mo, Ni, Pb, Se, Zn)
- Parameters outlined in Directive 019 (B, U, Total fluorides, Nitrites and Nitrates)

9.1 2017 Monitoring

2017 data are not available.

9.2 2018 Monitoring

Given that there is no real waste pile to date, the mean values based on mineral waste are as such:

- Fe 45%
- SiO₂ 29%
- Al₂O₃ 1.5%
- CaO + MgO 0.5%
- MnO 0.2%

9.3 Waste Rock Monitoring Program Update

The monitoring program for the waste piles will be updated to ensure that the conditions of the certificate are met.

10 Caribou Monitoring

Data received from the Ungava program allow us to monitor caribou locations (*Rangifer tarandus*).

In 2018, the closest caribou to the mine was 95 km away and among all of the locations, 0.03% were at less than 100 km. On average, caribou were 300 ± 75 km from the Goodwood site.

10.1 Caribou Ungava Project Contribution

Since 2014, TSMC is a partner in the *Caribou Ungava* program and participates to this program for an amount of 100,000\$ annually

The research program follows populations and is committed to inform TSMC about caribou locations should they come within TSMC's buffer zone.

It aims to quantify factors determining population dynamics and use of the migratory caribou land in a context of climate and anthropic changes.

The Caribou Ungava program's objectives are to determine effects of anthropic activities on land use and survival of caribous, analyze caribou-predator interactions, analysis of the caribou population dynamic in order to ensure the continuation of socio-economic, cultural and subsistence hunting activities. Finally, the impact of climate change and demographic modifications on the caribou habitat is also studied.

10.2 CARMA Project Contribution

Since 2013, TSMC is a partner of the *CircumArctic Rangifer Monitoring and Assessment* (CARMA) network. This network includes scientists, administrators and communities concerned with the survival of arctic caribou herds.

TSMC participates to this program for an amount of 100 000 \$ annually; if required, TSMC will make accommodation at their camp available and share in the cost of fuel for helicopter surveys.

11 Avifauna Survey

In the environmental impact study, TSMC committed to conducting a quinquennial monitoring of avifauna. This plan aims to determine whether the mining activities have an effect on nesting populations.

11.1 Initial State

Surveys were conducted by Groupe Hémisphères in 2008-2009.

The white-crowned sparrow is the only nesting species that was detected in this bare environment. It was also the most commonly found species in all biotopes, which indicates its status as a dominant species in the region.

11.2 2017 Monitoring

Point counts were placed close to infrastructures and in undisturbed environment. 2017 results were compared to baseline data. There are no statistically significant differences between the two time periods.

The report is available in appendix V.

11.3 Avifauna Monitoring Program Update

There is no update planned for this program.

12 Wildlife Habitats Monitoring

In the environmental impact study, TSMC committed to monitoring of wildlife habitat. This monitoring aims to verify if the expected loss to habitat corresponds to that on the ground.

This evaluation will be done when construction is further along, in 2020. At that time, the site's construction activities will be nearly complete.

13 Closure Plan and Rehabilitation

13.1 Strategic Rehabilitation Plan

This strategic plan defines the foundations required for restoration of mining sites operated by TSMC for the duration of its mining activities, as well as for the closure of the project. The progressive restoration program is implemented to reduce exposition of bare ground, reduce dust generation, restore functional ecosystems and preserve quality of the pit and wastepile water. The plan is presented in Appendix VI.

This strategic plan supports TSMC's Environment and Permitting team in assessing restoration priorities, assembling required teams, defining the most appropriate restoration approaches and methods, and defining a realistic progressive restoration schedule.

It also describes restoration works already undertaken by TSMC in collaboration with Laval and McGill universities, T2 Environnement and Viridis Terra Innovations, as well as Earth Alive Clean Technologies inc.

In 2017, this collaboration allowed TSMC to adapt the rehabilitation and closure plan to Nordic conditions. The 2018 progression report from T2 Environnement and Viridis Terra Innovations is presented in Appendix VI.

TSMC is committed to restore their sites in close collaboration with local communities who will be consulted prior to producing the closure plan. TSMC will not ask to be released from its obligations until local communities are satisfied by the restoration efforts.

The strategic plan will be presented to local communities in early 2018 (the document is already available on the file sharing server used by TSMC and the local communities) and submitted to government authorities.

13.2 Research Project – Restoration of Habitats Affected by Mining Industry

13.2.1 Project Title

Isolation, identification and selection of plant root symbionts to improve habitat restoration in Quebec alpine and arctic tundra affected by mining development.

13.2.2 Description

The project started in 2016 with collaboration between TSMC, T2 Environnement et Viridis Terra Innovations, and is scheduled to end in May 2019.

The scientific objectives pursued in the project are:

- Decrypt the root and rhizosphere metagenome of key species in nordic mine sites.
- Isolate and identify morphologically and molecularly the ectomycorrhiza, ericoid and endophytic fungi associated with key cultural species of the forested tundra (*Picea mariana*, *Betula glandulosa* et *Vaccinium uliginosum*); and
- Select the best ectomycorrhiza fungi, ericoid and endophytic isolates *in vitro* and *in vivo* for their resistance to stress generated by mining waste with morphometric, physiological and biochemical parameters.

The fundamental objectives of the research will allow to generate new scientific knowledge for developing new phytotechnologies specific to arctic and subarctic areas. The applied objectives will allow development of relevant, transferable and economically viable know-how to approach present and future complex environmental issues afflicting the mining development in arctic areas.

13.2.3 Results

13.2.3.1 Deciphering root and rhizospheric metagenome of key species in northern mining sites

Native plants of the Schefferville iron mine have been harvested in disturbed and undisturbed alpine and tundra areas in August 2016 and 2017. Bulk soil microbe communities, rhizosphere and roots were analyzed with high throughput amplicon sequencing of the total DNA extract from representative plant species growing at site.

Following this, statistical data analysis specifically targeting micro-organisms associated with plants growing at the sites was conducted. Rhizosphere and endophytic bacterial communities of plants growing on disturbed and undisturbed areas were found to be significantly different.

Among the dominating bacterial and fungal taxa, it was observed that some are only present in roots and rhizospheres of plants growing on disturbed sites. These include species involved in iron oxide reduction, metals sequestration and resistance to heavy metals such as *Geobacter*, *Polaromonas* and *Cyanobacteria*.

These microorganisms can allow plants to have better tolerance and prosper in challenging environments and could eventually be used as an inoculum to increase efficiency in restoration of the mine site

13.2.3.2 Isolate and identify morphologically and molecularly isolate and identify fungi associated with key cultural species of forest tundra

Over 400 fungal isolates have been successfully identified, and sequencing was submitted to the Genbank databank (<http://www.ncbi.nlm.nih.gov>). Preliminary statistical analysis allowed to demonstrate a contrasted pattern of cultivable root symbionts isolated in natural and disturbed areas. It was also noted that plants don't recruit the same microorganisms according to the state of their environment.

13.2.3.3 Select the best fungus and endophyte isolates for resistance to stress from mining discharges

Candidate fungi have been selected *in vitro* for their growth and production of metabolites in presence of residues from the mine, as well as different concentrations of hematite (Fe_2O_3). Selected isolates will be used for inoculum production. Another experience on the performance of *Betula glandulosa* and *Alnus crispa* planted on overburden amended with biochar and sphagnum peat moss has been completed recently.

Significant differences have been found between *A. crispa* et *B. glandulosa* for each determined variable, respectively for root, foliar, caudine and total biomasses. However, the biochar and peat moss factors did not have any significant effects on biomass production of both species.

Additionally, results showed that *A. crispa* grew better than *B. glandulosa* in overburden. In another experience, it was demonstrated that performance (survival, shoot emergence rate, number of shoots, biomass production) of *Salix planifolia* cuttings planted vertically or horizontally on two types of substrate (overburden and waste rock) was better in overburden than in waste rock at the end of the experience (7 weeks). These results suggest that asexual propagation of *S. planifolia* shows potential for revegetation of overburden in iron mines.

13.2.4 Coordination, communication and dissemination of results and information generated by the project to stakeholders

A communication plan for dissemination of results and information is in place (5 meetings per year on average) to promote concertation and partnership between researchers and potential users.

Records of these meetings are available in the project's Dropbox, managed by research professional Marie-Eve Beaulieu at Laval University. At least 5 peer reviewed scientific publications are planned with the results of this project.

Some of the results have already been presented at international conferences:

- ICOM9 à Prague, 30 Juillet 30-4 août, 2017. Title: Isolation and morpho-molecular identification of root plant symbionts of Quebec's arctic and alpine tundra; and
- 7th European Bioremediation Conference (EBC-VII) and 11th International Society for Environmental Biotechnology conference (ISEB 2018), Chania, 25 june 2018 to 28 june 2018. Title: Isolation and morpho-molecular identification of root symbionts for the ecological restoration of Schefferville iron ore mining site in northern Quebec, Canada

Apart from annual reports, results from the present research will also be relayed through conferences and information sessions among which a workshop planned in the week of April 8th 2019 in Montreal at TSMC's head office.

14 Communities

Please refer to Appendix VII for the complete document. The appendices referred to in the following sections are presented in the document.

14.1 Citizens' Information Program

TSMC's 2018 information program included the following actions:

- Periodic communication of updates on mining activities and measures taken to protect the environment, by way of:
- Communiqués broadcast on local Naskapi and Innu community radio stations providing an update on mining activities, which took place solely at Goodwood, and on concentrator construction finalization efforts. (Appendix 1)
- Bi-weekly notices were also distributed in writing to the offices of the Naskapi Nation of Kawawachikamach (NNK), Nation Innu Matimekush-Lac John (NIMLJ), and the Town of Schefferville, and broadcast on local Naskapi and Innu community radio stations, advising the population of mining and blasting activities at Goodwood, along with TSMC contact information. (Appendix 2)
- Various interactions and communications were held between Quebec Aboriginal Groups and Tata Steel as detailed by Tata Steel Minerals Canada Consultation Log. (Appendix 3)
- Quarterly Meetings were held in February 2018, and in June 2018 with extensive and detailed presentation on the State of the Project, including its Environmental Component. (Appendix 4)
- IBA Implementation Meeting and Traditional Activities Meetings with Land Users in the Goodwood Area were held with Innu of Sept-Iles and Maloitenam. (Appendix 5)
- As per the Consultation Log, IBA Implementation Meetings were held with Matimekush-Lac John Representatives, including their Environmental Consultant, and also including Visits of the Goodwood Area during the Red Water Incident. (Appendix 6)
- As per the Consultation Log, IBA Implementation Meetings with the Naskapi Nation Representatives were held to discuss various issues including environmental matters. (Appendix 7)
- In March 2018, a meeting with Federal Agencies, including Environment Canada was held with the Naskapi Nation, the Matimekush-Lac John Representatives at the Tata Steel Minerals Canada Mine Site to discuss various environmental matters. (Appendix 8)
- As indicated in the TSMC Communication Plan (Appendix 9), land users have access to a 24-hour toll free emergency number at the TSMC mine site (1-844-828-2503). This phone number will be included in notices to the population and was already shared to many households through all Aboriginal Workers from Schefferville.
- Innuville and Nunatsiaq News: no notices were issued via these newspapers in 2018. For 2019, TSMC will favor direct interaction with stakeholders and Community Radio Broadcasts for mining activities at Goodwood.
- Several weekly meetings were held on a weekly or bi-monthly basis depending on availabilities of local Aboriginal Groups on environmental matters. Templates of minutes of meetings are attached (Appendix 10) and shared with local Aboriginal Groups. In the course of the year, to adapt and facilitate participation, exchanges with local Aboriginal Groups, the Company agreed to change the format of the weekly meetings to emailed weekly updates with a possibly for Aboriginal Environmental Representatives to share the Community Concerns. (Appendix 11)

TSMC participated in the following public events:

- Community meetings held in Matimekush in June (Appendix 12) and July 2018. Following issues raised: red water events, dust & air quality, vehicle cleanliness (Appendix 13), employment opportunities, salaries and taxation, haul truck training, IBA payments and confidentiality, community projects for youths, Howse Project timeline, need for Liaison Officer.
 - TSMC has since put in place the following: program for controlling red water infiltration; new car wash to the TSMC Iron Ore site; support to NIMLJ in their Schefferville car wash;

continued efforts to prioritize hiring of members of NIMLJ, NNK and Innu Takuaikan Uashat mak Mani-utenam; support to development and financing of heavy equipment/haul truck training program; support to community projects via IBA payments; an employment Liaison Officer was hired.

- TSMC Recruitment Day held in May, 2018;
- Career Fair in Uashat, November 2018. (Appendix 14)

Citizens continuously have the opportunity to communicate directly with TSMC through its representatives in Environment and Community Affairs by telephone, email, and social media applications, and through the intermediary of representatives of the Community Health, Safety and Environment Committee (the Committee), and anytime by visiting the TSMC Iron Ore Site.

Since 2017, there is an Environmental Liaison in Matimekush, while in Kawawachikamach, there is a new Environmental Liaison since 2018. There is also an Employment Liaison based in Matimekush since 2018.

Community environment representatives play a key role in receiving feedback and complaints pertaining to the Project, from community members which are transmitted to TSMC. The representatives have an important role to play in keeping apprised of mining activities and matters relating to the environment and disseminating to community members.

TSMC's Communication Strategy is attached.

14.2 Evaluation program of the perceptions of the Project by land users

The users of the land involved in Project 2a are primarily the citizens of Matimekush-Lac John and Kawawachikamach, who reside in proximity to the Project.

Following further clarification from the Administrator, an evaluation of perceptions of Project 2a will be carried out by a third party responsible for data collection from users of the land. A survey will be conducted among local groups (hunters and fishers, Council members) in order to determine the efficiency of the means of communication identified under the heading « Condition 19 ». Community environment representatives will participate in the process through the identification of citizens to survey and in the development of survey content.

In order to capture the attribute spectrum of possible responses, the survey will be a combination of quantitative and qualitative questioning. A copy of the questionnaire will be submitted to the Administrator for information purposes. The survey will be conducted in person by a researcher/research assistant.

The information gathered will be consolidated, analyzed and presented in a report that will be submitted to TSMC and the Administrator.

In order to accommodate for the alignment of the new TSMC Environment Department, and to be in a better position to ascertain the results of the monitoring activities, the evaluation program will be conducted in late 2019/early 2020.

In the view of respecting this Condition, Tata Steel Minerals take notes of the recommendation found in the Administrator's Report, especially on the item identified as QC-15 as far as it concerns the framework of interview guidelines. The report will also contain a Feedback and Complaint Process Plan.

14.3 Community Health, Safety and Environment Committee

A Community Health, Safety and Environment Committee was established in 2013 and meets in Schefferville three to four times per year. It is comprised of environmental representatives from the NNK, NIMLJ, ITUM, Innu Nation, Nunatukavut Community Council, and TSMC.

An Environmental and Social Monitoring Committee was established in 2015, comprised of KRG, Makivik and TSMC representatives. The Committee met once in 2018; two meetings are planned for 2019. Meeting minutes for 2018 are attached (Appendix 15). There are always challenges in setting-up meetings because of difficulty in reaching a consensus on a date and on a venue for such meetings including the challenge of having all Indigenous Groups concerned around the same table while taking into account their political sensitivities and realities.

14.3.1 Project 2A Closure and Rehabilitation Plan

This document was provided to members of the Environmental and Social Monitoring Committee when it was completed in 2016. No comments were received.

The document will be redistributed to the current Committee members for comment, and will be discussed at its meeting to be held in March, 2019.

15 2018 Operations and Conclusion

With respect to the Goodwood pit, TSMC will start 2019 with a Spring plan to capture all of the meltwater from the Spring thaw and redirect it to an existing pit. Following this, operations at Goodwood are expected to start in June 2019. At the same time, preparations are ongoing for the commissioning of the water treatment unit as well as the repairs to the Goodwood basin.

16 References

TSMC [Tata Steel Minerals Canada Ltd.]. (2018) *Rapport annuel 2017 – Projet 2a (Goodwood) – Québec.*
Rapport annuel présenté au ministère de l'Environnement et de la Lutte contre les changements
climatiques, direction générale de l'évaluation environnementale et stratégique.

TSMC [Tata Steel Minerals Canada Ltd.]. (2018) *Plan de suivi de la qualité de l'air du Projet DSO.* Tata
Steel Minerals Canada Ltd, 22 p. et 3 Appendixes.

APPENDICES

Appendix I. Figures

Figure 1. Water Quality Monitoring Stations

Figure 2. Proposed Sediment Monitoring Program

Figure 3. Air Quality Monitoring Stations

Appendix II. Analysis Certificates

A. Blasting Report

B. Water Quality

C. Drilling Report

D. Sediment Quality

E. Air Quality

Appendix III. Goodwood Basin

A. Incident Report

B. 2019 Wintering Plan

Appendix IV. Air Quality Bioevaluation Report

Appendix V. Avifauna Monitoring Report

Appendix VI. Rehabilitation and Closure Plan

A. Rehabilitation Strategic Plan

B. 2018 Progress Report

Appendix VII. Community 2018 Annual Report