# Renard Mine
# ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM

## 2021 ANNUAL MONITORING REPORT

MAY 2022

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stornoway

# ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM

Renard Mine
2021 Annual Monitoring Report

Environment Department - Stornoway Diamonds (Canada) Inc.

May 2022

# Project Team

## Stornoway Diamonds (Canada) Inc.

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| Vital Boulé | Technical Director (Environment) |

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| Martin Boucher | Consultant-Expert for the Renard Project in Environment, Health and Safety, Sustainable Development |

# Summary

This report covers the results of the 2021 monitoring activities undertaken as part of the implementation of Renard mine's Environmental and Social Management System (ESMS).

The ESMS emerged from various environmental management tools SWY has developed over the years to promote early detection of environmental and social issues, ensure environmental regulatory compliance and promote continuous improvement.

Included among these tools are the Environmental Surveillance Program, the Environmental and Social Monitoring Program (ESMP) and other internal auditing tools. Although these tools were developed for the construction phase, SWY has continued to use the tools in the Renard mine operations phase.

As a communications tool, the Renard mine's annual environmental and social monitoring report is designed to communicate the results of the various environmental and social management activities to stakeholders, the public and government authorities. The report covers the results of the environmental monitoring activities in 2021.

***Environmental and Social Management System (ESMS)***

SWY's ESMS was put in place in 2015 to oversee construction activities at the mine, which were performed without any notice of non-compliance. The implementation of the ESMS on site resulted in an orderly, properly signposted and safe worksite.

Surveillance activities continued during mine operations in order to track the overall environmental performance of SWY's activities. The surveillance activities helped promote early detection of and respond rapidly to a system malfunction or a failure of a mitigation measure.

*TSM™ Certification*

Towards Sustainable Mining (TSM™) is a system developed by the Mining Association of Canada (MAC) to enable the mining industry to meet its commitments with respect to its environmental and social performance, credibility, transparency and responsibilities. Participation in TSM is mandatory for MAC's member companies, who are required to submit annual reports on the performance of their Canadian locations using protocols and indicators. For each indicator, mining facilities assign a letter grade from "C", the lowest, to "AAA", the highest, which reflects their performance, except in the case of crisis management protocol, which requires a yes or no response.

The goal of the TSM™ program is to help mining companies achieve Level A or higher, which indicates that the company is managing social and environmental risks effectively and using exemplary environmental management, safety and community engagement practices.

In 2021, SWY conducted its second self-assessment of the seven protocols in the TSM™ initiative. SWY achieved the top AAA level for two protocols and Level AA on five protocols. Self-assessments are externally verified every three years. The first external audit will take place in the spring of 2022 and will be conducted by a MAC accredited audit service provider.

*Eco-Permits*

The Eco permitting process is an internal procedure SWY put in place during the construction phase to ensure regulatory compliance of work in progress or of any change in working method. A total of 490 Eco-Permits have been submitted to the SWY Environment Department for assessment since 2015, 84 of which were submitted in 2019, 29 in 2020 and 38 in 2021.

*Solid Waste Management*

The solid waste management (SWM) philosophy put in place by SWY is based on the 3R-RD principle (reduce, reuse, recycle, reclaim, dispose). SWY adopted performance indicators to track SWM at the Renard mine site where solid waste (SW) is separated at source and collected in dedicated containers so that solid waste is reclaimed.

Since 2018, solid waste quantities have been expressed in percentage of tonnes (%t). This adjustment results in a more accurate weight of solid waste by type of material, not by container. This means SWY can track the change in recycling and landfilling rates more accurately in relation to performance indicators.

Since 2015, almost 49% of the tonnes of solid waste produced at the mine site was recycled or reclaimed. In 2021, about 56% of the tonnes of solid waste was recycled, as compared with 47% in 2020. SWY has continued to increase its rate of solid waste recycling since 2017, and still aims to achieve the solid waste recycling target of 70% set by Recyc-Québec.

The waste sent to the trench landfill site (TLS) in 2021, i.e. 44% of the solid waste, represents the lowest landfilling rate since the construction phase. The content consisted

of waste with a high organic matter content (kitchen waste and garbage bin materials, etc.) and ICI (institutional, commercial and industrial) waste.

The TLS is managed in compliance with applicable legislation. It includes covering the cells from May to October to minimize the dispersion of waste and prevent odours. An annual report on TLS operations is submitted to the MELCC.

*Residual Hazardous Waste Materials*

Residual hazardous materials (RHMs) produced at the Renard mine site are recovered, sorted and temporarily stored in the hazardous waste area before being transported off site to be treated, reclaimed or recycled by external specialized firms. Since 2015, about 1,352 mt of RHMs have been shipped off-site, including 243 mt in 2021. Used oil accounted for 56% of RHMs in 2021, which is comparable to 2019 (56%) and higher than 2020 (43%).

*Contaminated Soil Management*

In 2021, contaminated soil was all shipped to MELCC-authorized centres for storage and then decontamination at the RSI Environment treatment centre in St-Ambroise.

***Environmental Monitoring Program***

*Weather and Climate*

In 2021, temperatures measured at the site followed historical trends at the La Grande Riviere and Bonnard weather stations from 1981 to 2010. The trends for most of the months in 2021 reflect those observed in the southern part of the province. Thus, for most of the time, the mine site is subject to the same weather systems as southern Quebec.

The same is true for precipitation events observed at the site and elsewhere in the province. With a few exceptions, precipitation events at the mine site are similar to those observed province-wide.

The ice thickness measured on Lake Lagopède during winter is consistent from year to year. In 2021, this thickness was comparable to past years, although lower, which is explained by one of the mildest winters the province has experienced. Similarly, snow depth measurements at the site are lower than in 2020 and previous years, when the first snowfall arrived at the site later than in 2019 and the snow melted earlier in the spring.

In 2021, the overall wind direction and relative proportion of winds based on direction, are generally like 2020, with winds predominantly from the south and west.

*Air Quality and Atmospheric Emissions*

In 2021, no applicable ambient air quality standards for any of the monitoring parameters (total particulates, metals, $PM_{2.5}$, $SO_2$, $NO_2$, and dustfall) were exceeded at the Renard mine site property limits.

The Renard mine reported a total of 63,373 t ($CO_2$ eq.), including 41,941 t ($CO_2$ eq.) of greenhouse gas emissions (GHG) from stationary equipment in 2021. After being verified by an external audit, these emissions were reported in compliance with the Quebec Atmospheric Emissions Inventory (IQÉA), the Greenhouse Gas Reporting Program (GHGRP) and the federal Greenhouse Gas Emissions Reporting Program of Environment and Climate Change Canada (ECCC).

In 2021, the performance indicator, which reflects the amount of fixed GHG emissions per tonne of kimberlite processed, is 16.77 kg GHG/t. This is the lowest indicator since the start of mining operations thanks to the decrease in energy consumption by fixed equipment and, therefore, the mine's LNG consumption.

*Vibration and Noise Levels*

The 2021 monitoring of vibrations during blasting activities took place all year long, whereas it was interrupted by the temporary shutdown of the mine in 2020.

A new measurement point was set up in February 2020 near the accommodation complex. In 2021, the seismograph was not relocated. Most underground blasting operations were detected and no exceedance of applicable standards was observed. Since the blasts performed were all underground, air overpressures were not measured.

Noise levels were monitored multiple times near the accommodation complex in 2021. These surveys indicate that the crusher and plant do not represent a predominant source of noise among all the noise sources at the mine site.

At night, no complaints from Renard Camp residents were received, although noise levels were approximately +5 dBA higher than the nighttime limit value (50 dBA) of Directive 019 (including the +5 dBA penalty). Compared to the targets set by Stornoway of 40 dBA at night and 45 dBA during the day, the noise levels show a deviation of +10 dBA. However, this variation from the objective is of the same order of magnitude as values recorded since 2017.

In terms of mitigation measures, SWY always imposed restrictions on the use of vehicle horns in the vicinity of the accommodation complex.

*Hydrological Regime*

In 2021, SWY continued to monitor the hydrological regime, including lake levels at the mine site.

For the year 2021, the water levels of the lakes on the mine site remain comparable to those recorded in recent years. Water levels and flows measured since the start of mining activities (2015 to present) are comparable to those measured during the baseline condition (2010-2014) and no significant interannual trends were observed for water levels. No significant indication of the influence of mining activities on the hydrological regime of Lagopède Lake and its main tributaries was found.

As of 2019, the data supporting the discharge rating curves are used to calculate the flow at the A-A' threshold. For the year 2021, the calculated flow for the month of April is 0.42 $m^3/s$, which is like the flow recorded before (March 2013) and after (February 2016) the start of mining activities.

About water flow at the A-A' shoal in Lake Lagopede, 2019 monitoring during the winter and summer low flow periods indicates that restriction to natural water flow caused by ice upstream of A-A' shoal does not impede water flow between the north and south basins of Lake Lagopede.

These findings are deemed to apply to every low flow period in general in Lake Lagopede, including 2021 (lowest water level of 482.93 m), given that water levels in Lake Lagopede in 2019 were the lowest recorded since the 2010 winter low flow period at the Lake Lagopede station (lowest water level of 482.92 m).

In addition, monthly vertical profiles of temperature and conductivity conducted in 2021 validate, as in 2019 and 2020, the alternation of thermoclines (winter and summer) with seasonal mixing (spring and fall). Natural thermoclines illustrate the stratification of water layers by temperature while spring and fall turnover allows for mixing of the water column in the north basin of Lake Lagopede.

Water in the north basin flows to the south basin in Lake Lagopede without any horizontal barrier or vertical restriction.

Finally, in 2021, SWY was also able to continue the hydraulic renewal time study for Lake F3298. The HOBO probe was surveyed in July 2021 to harvest water level and current velocity data from Lake F3298, recorded since July 2020, and was surveyed again in October 2021.

SWY will take additional weekly readings of the water level in Lake F3298 and the flow at its outlet (V-shaped weir) in 2022 to generate sufficient data to establish the discharge rating curve for Lake F3298 and to estimate the hydraulic turnover time of Lake F3298.

*Drinking Water Quality*

In 2021, 34,822 $m^3$ of water was distributed by the Renard mine water treatment plant (DWTP), with a 100% availability rate. This represents 389 l/day/person, which is comparable to pre-pandemic levels.

All water quality test results obtained meet the standards of the Regulation respecting the quality of drinking water (RQP).

*Surface Water and Sediment Quality*

Surface water quality results from the 2021 sampling campaigns are comparable to those measured in the years 2015 through 2020, as well as the 2010 baseline conditions. No major change in surface water quality was observed since the start of mining operations. Overall, in 2021, the streams and lakes in the study area:

- Were well oxygenated and had an acidic to slightly acidic pH;
- Were mildly turbid with low total suspended solids (TSS) concentrations;
- Had low nutrient concentrations, similar to a natural state;
- Contained natural concentrations of some metals that exceeded surface water quality criteria, just as in the baseline conditions.

In 2021, in Lake Lagopede, the summer thermocline (warm water on the surface and cold water below) was between 6 and 15 m deep in July and August. The winter thermocline (cold water on the surface and warm water below) was less pronounced, but still significant below the ice cover.

A marked increase in water temperature and conductivity was recorded in summer from the bottom to the surface in Lake Lagopede. These observations confirmed that mine effluent concentrates below the thermocline in summer and winter. The effluent mixes uniformly during seasonal mixing of the water layers in the spring and fall. Monthly temperature and conductivity monitoring in 2021 are consistent with the behaviour of effluent as predicted in dispersion plume modelling.

The quality of sediment sampled in 2021 is comparable to baseline conditions (2010) and to the 2015 to 2020 monitoring results. Natural mercury and lead concentrations measured in the lakes and streams exceed sediment quality criteria, which is consistent with concentrations measured in 2021. These results concern both the reference area and the exposed area to the mine activities for the 2021 follow-up.

*Vegetation and Wetlands*

The Renard project's wetland compensation program supports a knowledge acquisition program that was needed on the region's peatlands and that was approved by the MELCC. Research teams from UQAM and UQAT conducted survey campaigns and inventories between 2016 and 2019.

Because the field portion of these research projects is now complete, there was no inventory campaign in 2021. No field activities are planned for 2022.

Analysis and writing work for UQAM began as early as fall 2020. Initial findings from the UQAM study indicate that peatlands are (positively or negatively) vulnerable to climate change. The study will be completed by 2022. The UQAT students are now identifying the samples collected and analyzing the environmental factors related to the development of peatlands.

A decision support tool will be proposed based on the results of the two research projects to target the most appropriate ecological services and locations for compensation. Development of the decision support tool will begin in the fall of 2021.

About revegetation (or agronomic) monitoring activities, a total of 32,000 m² have been revegetated at the mine site since 2017. The 2021 monitoring of the revegetation took place mid-June and allowed to note the success of the plantations and the slow regeneration of the vegetation observed on the various sites. The 2021 monitoring on the borrow pits located along Route 167 North showed an average survival rate of 100% for herbaceous plants and 89% for shrubs. Agronomic monitoring will continue in the summer of 2022 in the various areas that were reforested in 2019, as well as in the revegetated wetlands along Route 167 North.

*Fish and Benthic Communities*

The study plan for the first cycle of biological monitoring required for EEM (Environmental Effects Monitoring) for the Renard mine was submitted on February 15, 2019, and Environment Canada provided a set of recommendations in March 2019.

Stornoway has incorporated these recommendations into the study plan. These recommendations are intended to optimize the biological monitoring planned for the first cycle of EEM in order to assess the effects of the treated mine effluent discharged into Lagopède Lake on fish and fish habitat, and the potential for use of fisheries resources by Cree communities.

The biological monitoring sampling campaigns for the first cycle of EEM, which were scheduled for September 2020, took place in August 2021.

Stornoway began the sampling campaigns for the first cycle of EEM at the end of summer 2021 and filed the Cycle 1 EEM Interpretive Report on June 1, 2021. The results of the fish biological monitoring will be filed as an addendum in 2022.

*Habitat and Free Passage of Fish*

There were no monitoring operations scheduled for 2021. The fourth phase of monitoring of the effects of Renard mine on the free passage of fish and on fish habitat will be held in 2025. This monitoring will cover the Lake F3298 outlet, the tributary and outlet of Lake F3301, the Lake F2607 outlet and the Lake F3300 outlet. The results of the next follow-ups will allow the monitoring of the evolution of the fish populations in these lakes.

The R170 diversion stream was developed in 2015 to divert water from the Lake F3298 outlet to Lake F3295 and hence ensure the migration of fish in the diversion stream. The 2021 monitoring validated that the diverted section of R170 stream has a slight flow of water that varies significantly with the amount of precipitation.

Fish movement is therefore assured in this stream at the time of the downstream migration, especially during high-flow periods or after heavy precipitation. In summer low-flow periods, however, some sections of the stream are less suitable for fish to migrate downstream, but fish movement conditions remain like the baseline observed prior to the diversion.

*Fish Habitat Compensation*

In 2019, upon analysis of the report on brook trout habitat compensation monitoring, the DFO confirmed that the newly developed habitats were in fact being used by brook trout, that they were passable and that they enabled the free passage of fish in the four streams.

For developed brook trout spawning grounds in the Renard area, remedial work planned in 2019 to improve spawning area was initially postponed until summer 2020 due to receipt of comments from the MPO in December 2019. They were again postponed to the summer of 2021, due to the COVID-19 crisis and the temporary shutdown of the mine from March to October. The next monitoring will be conducted in 2023 to ensure the effectiveness of the corrective work requested by DFO and to validate the conditions for fish movement.

For the lake trout spawning area developed in Lake Lagopede, monitoring of the integrity of the developments, spawning area use by spawners, as well as water quality at the spawning area, was conducted in 2019. The next monitoring scheduled in the monitoring program is in 2023.

For the Mistissini walleye spawning ground, a follow-up of the integrity of the spawning ground and its use was carried out in 2021 during the walleye spawning period, at the end of May. In 2022, Stornoway has scheduled the corrective work described in the technical note written in July 2020 by an external consultant.

*Segments C and D on Route 167 Extension*

In 2021, there was no monitoring conducted on Segments C and D of the Route 167 extension, in compliance with the DFO's statements that as of May 2018, monitoring of developments on Route 167 North is complete. As a reminder, the developments completed by SWY, as part of the Route 167 compensation program, have met the objectives to the satisfaction of the DFO Fisheries Protection Program.

*Terrestrial Wildlife and Birds*

The large wildlife monitoring took place in 2021, as scheduled in the monitoring program.

The 2021 moose inventory still shows a low population density in the control area and no moose were observed in the airstrip and mine access road (Route 167) study areas. As was the case in 2011, 2015, 2017 and 2019, there were no caribou sightings during the 2021 survey in the mine, airstrip and control study areas. Unlike previous years, in March 2021, almost no wolf tracks were recorded during the inventory. Some black bears were sighted at the mine site in the spring and summer of 2021. Most of these animals were simply frightened off the site. Bears are consistently present at the TLS. Several measures were put in place to prevent bear intrusion at TLS (e.g. electrified fence and buried wire mesh). Implementation of the bear management plan continued in 2021, including implementation of HSS-3.6 on the camp.

In 2021, 71 wildlife sightings were documented along Route 167 North and on the mine site. Various species were observed: the otter, moose, red fox, wolf and beaver, and different birds. At the MFFP's request, all black bear sightings at the TLS and at the mine site have been recorded since June 2019 in a wildlife sighting log.

Waterfowl nesting boxes set up around Lake Lagopede and some small lakes nearby are in good condition and no signs of occupation were recorded in 2021. Monitoring will continue in 2022.

*Mine Water and Effluent Management*

Water that comes into contact with mine facilities is intercepted by a network of perimeter ditches and culverts that channel it toward pit R65 (retention basin) before it is treated at the mine wastewater treatment plant (MWWTP) and then discharged into Lake Lagopede.

In 2021, a total volume of 2,581,817 m³ of water was treated then discharged into Lake Lagopede via the final mine effluent outfall. Mine effluent quality complied with Directive 019 requirements. In addition, average concentrations measured in MWWTP effluent, except nitrite concentrations, complied with the MELCC's effluent discharge objectives (EDO).

A first follow-up report was produced and sent to MELCC so that the EDOs could be revised, as provided for in the environmental follow-up program. For the period 2017 to 2019, the concentrations of almost all the parameters measured at the intermediate effluent of the MWWTP (MIR2-A) are in compliance with the EDOs, except for nitrites, before dilution in the receiving environment.

The action plan to monitor sources of nitrogen compounds in the effluent was continued in 2021 in order to reduce the nitrogen compound concentrations at the effluent of the MWWTP through the optimization of blasting activities, increased worker awareness on the loading of explosives, as well as the establishment of an internal standard to initiate an investigation process during periods where higher concentrations are observed.

As part of its operations in 2021, the Renard mine extracted a total volume of 2.42 Mm³ of surface water, slightly less than the 2.66 Mm³ in 2020, from Lake Lagopede and various pumping stations and wells.

These withdrawals are connected with the dewatering of the underground and open pit mines (90.1%), the ore processing plant's fresh water requirements (7.7%), the production of drinking water (2.2%), the production of explosives and the airport sanitary facilities (less than 0.006%).

The Renard mine's wastewater usage in relation to the use of fresh water from Lake Lagopede in 2021 was an estimated 90%, as compared with 88% in 2020.

The mine wastewater re-use rate in 2021 was about 99.0% of the ore processing plant's total consumption in relation to water pumped from Lake Lagopede, which is a better rate than in 2020 (96%). These results confirm the effectiveness of the changes made and maintained at the ore processing plant.

*Domestic Wastewater*

In 2021, the domestic wastewater treatment plant (DWTP) discharged 32,099 m³ into Lake Lagopede, a similar amount to the previous years, excluding the 2020 shutdown due to COVID-19. Domestic effluent quality was at all times in compliance with:

- The standards set out in the Wastewater Systems Effluent Regulations;
- Environmental discharge objectives (EDO) set by the MELCC, in terms of both concentrations and load allocations.

*Water-Oil Separators*

In 2021, effluent from water-oil separators at the airport and the underground mine's fresh air raise (FAR) was always in compliance with the petroleum hydrocarbons (PHCs) disposal requirement of 15 mg/l. The same applies to the water in the garage's oil-water separator.

As in previous years, oil recovered from the separators in 2021 was transported offsite for recycling at authorized sites, in compliance with applicable regulations.

*Hydrogeological Regime and Groundwater Quality*

The quality of groundwater collected in 2021 in the three high-risk sectors at the mine site (sectors 1, 2 and 3) is like that measured in 2015 to 2018.

In 2021, in sector 1 (bedrock and unconsolidated deposits), almost all average ion and metal concentrations are within background levels. Initial leaching of reworked soil and other materials disposed of in the modified processed kimberlite containment (MPKC) facility along with water infiltrating into the ground from the MPKC could underlie the increased conductivity and ion concentration values, which were anticipated in the 2011 impact study. Special attention should be paid to this in the next round of monitoring in 2022.

In sectors 2, 3 (bedrock and unconsolidated deposits), and 5, no major issues seem to have impacted groundwater quality. Some of the elevated metal levels found in 2021 were already above the criteria for the 2010 baseline condition.

The quality of groundwater samples collected in sector 4, the trench landfill site (TLS), has remained stable since 2015. Results from 2021 indicate average concentrations below limit values set out in the Regulation respecting the Landfilling and Incineration of Residual Materials, or natural background levels typical of the sector. No polycyclic aromatic hydrocarbons (PAHs) were detected. No quality issues with respect to bacterial contamination and no colony forming units for fecal coliforms were detected at the TLS.

*Containment Area Surveillance*

The objective of monitoring containment areas is to control the integrity, hence the stability, of the geotechnical structures, verify the application of the materials deposition plan, track changes in the structures over time and identify any maintenance work required to ensure the structures remain in good working order. For this, various weekly, quarterly and annual inspections along with one-off inspections are carried out by an external auditor on the modified processed kimberlite containment facility.

In 2021, the underground mine operated on a daily basis from January 1 to December 31. The open pit is still closed as of April 2019. Changes made to the modified processed kimberlite containment (MPKC) facility helped ensure the structural stability of the facility, hence demonstrating throughout 2021 the effectiveness of the new design concept for deposition of PK.

No changes were made in 2021 to containment berm inspections. Visual inspections were carried out on a daily basis by supervisors and the Technical Services department, as well as by surveyors during the ongoing construction of the No. 3 permeable containment berm.

In 2021, an audit was conducted by the MPKC designer from May 25 to 27, which validated the proper management and monitoring performed by Stornoway for its containment area. Various recommendations have been issued and recorded in the action plan that follows each audit, allowing for progressive improvement of operational and monitoring aspects.

Quality control of the construction of the berms confirmed compliance with the designer's specifications. The few issues observed were mainly due to isolated cases of higher water levels in deposited materials. Several mitigation measures were implemented to reduce the water content of the materials at the source and hence facilitate water management at the site. The non-conformities have been corrected.

*Environmental Incident Management*

In 2021, the Environment Department reported 108 environmental incidents, which is lower than the numbers reported in previous years: 2019 (126), 2018 (144), 2017 (153), 2016 (114) and 2015 (163). Out of the reported environmental incidents, 95 were spills, 56% of which involved less than 20 litres, and only 19% that were greater than 100 litres, which is slightly higher than what was reported in 2017. Mechanical failures were the cause of 74% of the spills, the remaining is caused by human error or other reasons.

***Social Monitoring Program***

The Social Monitoring Program was established in order to meet the conditions set out in the Global CA, as well as the commitments made by Stornoway as part of the 2011 Environmental and Social Impact Assessment (ESIA) and commitments made by signatories of the Mecheshoo Agreement (Stornoway, Cree Nation of Mistissini and the Grand Council of the Crees) and the Partnership Agreement (Chibougamau and Chapais).

This report presents the results for 2021, along with observations of the evolution of the following:

- Recruitment and job types and numbers;
- The integration of workers from Cree and Chibougamau-Chapais communities;
- The retention of workers from Cree and Chibougamau-Chapais communities;
- The use of traplines;
- Regional economic spin-offs.

*Recruitment and Job Types and Numbers*

As of December 31, 2021,123 of the 467 operations employees at the Renard mine were from Chibougamau, Chapais, Mistissini and other Eeyou Istchee James Bay communities. That means that 26.3% of the workforce came directly from the region.

In 2021, 1,334 hours were devoted to the professional development of Cree employees in various functions at the surface, in the processing plant and in the underground mine, and 2,106.5 hours to development of employees from the Chibougamau and Chapais communities. As a result of this training, 383 certificates and 347 attestations of qualifications or professional training were awarded to Cree personnel and 790 certifications were awarded to personnel from the Chibougamau-Chapais communities.

Enabling our employees to diversify their skills is an important way for Stornoway to contribute to employee retention and foster a sense of belonging.

The professional development system we currently have in place offers employees an opportunity to acquire new skills and put them into practise in different functions.

*Agreements*

With the signature of the Mecheshoo Agreement, three committees were formed: the Jobs and Training and Environment committees, under the umbrella of the Renard committee, and the Renard Liaison committee. The purpose of these committees is to oversee the implementation of agreements regarding social and environmental impact, the economic spin-offs associated with jobs and business development, environmental protection and biodiversity, all in keeping with our vision of sustainable development.

In 2021, each of the committees held regular meetings and many different activities, meetings and events were held virtually in order to ensure ongoing communication with host communities despite the pandemic.

*Integration of Cree Workers*

Experience with other projects in the James Bay territory (e.g., the Troïlus mine [Inmet], the Eastmain-1-A and Sarcelle power plants and the Rupert diversion [Hydro-Québec]) drew attention to the challenges associated with integrating Indigenous workers in the working environment. Indigenous workers face multiple challenges with regards to language, supervision, work schedules and cultural differences, which can lead to difficulties adapting.

It is essential that workers be successfully integrated into the work environment, as it has a significant impact on their health.

To accomplish this, the Mecheshoo Agreement sets out a number of integration and retention measures for the mine's Cree employees. The goal is to ensure long-term retention of Cree employees and development of the Cree workforce, in addition to ensuring Cree employees have the same opportunities for advancement as other workers. In addition to various measures regarding working conditions, the recommended measures take into consideration cultural specificities and the importance of maintaining family ties.

The work schedule for most Renard mine employees is generally two weeks on followed by two weeks off. For Cree workers in particular, the feedback we have received about this schedule has generally been very positive, as it gives them a chance to engage in traditional activities with their families for an extended period of time during their days off.

A few Cree employees did resign in 2021, however, due to the pandemic. Some Cree employees with young families were afraid to leave their family bubble for two weeks at a time, leading them to apply for and obtain jobs in their communities. The same was true for a few non-Cree employees. The turnover rate among Cree employees decreased from 1.49% in 2020 to 1.63% in 2021. We can therefore say that our efforts since 2019 have contributed significantly to employee retention. These improvement efforts, which include regular communication with communities of interest, continued development and training, and opportunities to learn various trades, go a long way in developing a strong sense of belonging among our staff. Charlie Petawabano, our Integration and Diversity Coordinator, has also contributed to these positive results. With 13 years of experience as a police officer in Mistissini and seven years' experience in the mining industry, Mr. Petawabano now works in collaboration with the development and training teams, as well as human resources at Renard Mine. He is responsible for overseeing tandems, learning logs, development activities and special projects related to diversity, and ensures that inclusion strategies fulfill the company's responsibilities. He also provides advice, guidance and support to management in order to develop a better understanding of Cree culture. We believe that the Cree Cultural Awareness Program has also helped raise awareness among our employees and contributed to better integration of our Cree team members.

In addition to his regular work, Mr. Petawabano takes part in the various meetings held by the committees involved in implementing the Mecheshoo Agreement. He assists tallymen with environmental monitoring and assists the human resources department with regard to labour relations.

The presence of the Integration and Diversity Coordinator and the Director of Organizational Development and Host Community Relations promotes the recruitment, development and retention of local workers, and the establishment of honest, sustainable relationships with authorities from the three communities, which can help prevent different problems that may arise.

*Continuous Training/Development System*

Stornoway has established structures that promote the development of a culture of integration and diversity through continuous training (in-house coaching). This leads to the following outcomes:

- Provides experienced employees with an opportunity to teach newer staff members;
- Brings employees from different cultures and age groups into contact with one another (multiculturalism and multigenerationalism);
- Offers aspiring young employees opportunities for advancement;
- Offers experienced workers and aspiring young employees an unparallelled sense of pride. in working closely together as a group;
- Solidifies common values;
- Credits hours worked on each piece of equipment and/or in each function for the eventual acquisition of a "Recognition of Prior Learning" from the Ministry of Education or even the Quebec Construction Commission.

Applied on a daily basis, this strategy helps:

- Integrate cultural communities into the mining environment (remote mining camps);
- Train employees on specific mining skills, for example, the operation of oversized and auxiliary equipment and different ore processing machines, drilling and blasting, underground mining, and leadership development in a growth context;
- Develop greater flexibility among instructors, trainers and their student-employees;
- Apply innovative teaching methods adapted to our environment, which help develop knowledge,

as well as work-related and behavioural skills: a sense of observation, teamwork, a desire for learning and entrepreneurship, how to take responsibility, etc.;

- Pass down mining expertise.

*Land Use by M-11 Tallymen*

Due to the pandemic, in 2021, most activities involving tallymen took place virtually.

Through regular meetings and phone calls, Stornoway was able to keep tallymen on the M-11 site updated on the COVID-19 situation and progress on various projects and operations at the mine, as well as to field any questions or concerns they might have.

In addition, thanks to the Mecheshoo Agreement, the Mecheshoo Cultural and Social Fund has been active since January 1st, 2017. It is funded entirely by Stornoway. The Mistissini community uses it for a variety of activities, as long as they meet certain conditions.

*Regional and local economical impact*

In terms of regional impact, as of December 31st, 2021, the 106 Stornoway employees from our communities of interest (including 40 Cree employees) had helped generate annual benefits in excess of $9.2 million worth of salaries for members of the Mistissini, Chapais and Chibougamau communities.

With regards to economic impact, in 2021, more than $123.4 million were invested in purchasing goods and services from suppliers throughout Quebec, $21.6 million (17.5%) of which was invested directly in the host region (Cree territory and James Bay).

Stornoway is especially proud of the level of collaboration from the regional stakeholders and committees who are constantly working to find ways to optimize the benefits generated by the Renard mine. The Renard mine continues to have a significant impact on the daily lives of stakeholders in James Bay and the local Cree community, and is proud to contribute to the economic growth of the region.

In accordance with the Mecheshoo Agreement, the Mistissini/Renard Business Development Fund was established on January 1st, 2017. Every year, Stornoway and Mistissini contribute equal amounts to the fund, which is intended to support the start-up and development of Mistissini Cree businesses.

In 2021, a total of $859,532 (maximum of $100,000 from each partner) was awarded to six projects submitted to the Mistassini Cree Band Council.

*Communications*

Stornoway is fully aware that communication is the key to developing and maintaining high-quality relationships with employees and partners. As such, a number of different methods have been deployed on an internal level, such as the sharing of quarterly results by the Vice-President of Mining Operations, the Labour Relations Committee, team meetings, vignettes, informal meetings, presentations and more.

In terms of external communications, in addition to committee meetings, Stornoway has introduced a monthly report that provides statistics on jobs and training within the company. Our partners appreciate this type of contact, because it opens the door for discussions on how to continuously improve our results.

*Local Community Relations*

Stornoway's 2021 communication plan was developed and carried out with the goal of consolidating support and maintaining clear channels of communication with local stakeholders (monitoring committees, tallymen, employees, politicians, companies, etc.) as well as proving ourselves worthy of their continued respect. The main elements of our communication strategy were:

- Quarterly meetings of all monitoring committees as established by the Mecheshoo Agreement with the Crees, as well as the Declaration of Partners with the communities of Chibougamau and Chapais
- Regular meetings and consultation with tallymen;
- Information sessions with Renard mine employees and agreement partners;
- Recruitment sessions and communication of employment opportunities to local and regional populations as well as Renard Mine employees.
- Implementation of employee skills development programs in the underground mine, the pit and mine equipment maintenance departments;
- Presentation of the Cree Cultural Awareness Program to key administrator.

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## Appendices

# Acronyms and Abbreviations

| *Abbreviation* | *Meaning* |
|---|---|
| **CA** | Certificate of authorization |
| **HADD** | Harmful alteration, disruption or destruction |
| **EBS** | Environmental baseline study |
| **ESIA** | Environmental and Social Impact Assessment |
| **ENVS** | Environmental and social |
| **FMTM** | Formation Modulaire du Travailleur Minier (modular training program for mine workers) |
| **TLS** | Trench landfill site |
| **WCP** | Wetlands Compensation Plan |
| **ESMP** | Environmental and Social Monitoring Program |
| **RADF** | Regulation regarding the sustainable development of forests in the domain of the State |
| **CSR** | Comprehensive Study Report |
| **WSEF** | Wastewater Systems Effluent Regulations |
| **ESMS** | Environmental and Social Management System |
| **SWY** | Stornoway Diamond Corporation |
| **UQAT** | University of Quebec in Abitibi-Témiscamingue |
| **UQAM** | University of Quebec in Montreal |
| **TSM** | Towards Sustainable Mining |

***Organizations***

| | |
|---|---|
| **CEAA** | Canadian Environmental Assessment Agency |
| **MAC** | Mining Association of Canada |
| **CCME** | Canadian Council of Ministers of the Environment |
| **CEAEQ** | Centre d'expertise en analyse environnementale du Québec |
| **NSERC** | Natural Sciences and Engineering Research Council |
| **ECCC** | Environment and Climate Change Canada |
| **NPRI** | National Pollutant Release Inventory |
| **IQÉA** | Inventaire Québécois des Emissions Atmosphériques |
| **MAMROT** | Ministry of Municipal Affairs and Land Occupancy |
| **MDDELCC** | Ministry of Sustainable Development, the Environment and the Fight against Climate Change |
| **MDDEFP** | Ministry of Sustainable Development, the Environment, Wildlife and Parks |
| **MDDEP** | Ministry of Sustainable Development, Environment and Parks |
| **MELCC** | Ministry of the Environment and the Fight against Climate Change |
| **MFFP** | Ministry of Forests, Wildlife and Parks |
| **DFO** | Fisheries and Oceans Canada |
| **CWS** | Canadian Wildlife Service |
| **MDMER** | Metal and Diamond Mining Effluent Regulations |

# 1 Objective

The primary objective of the annual monitoring report is to communicate the results of the various environmental and social management activities at the Renard mine to government authorities and the public. More specifically, the report is focused on the results of the implementation of environmental and social management tools that SWY put in place during the project development phase.

The annual report reflects our commitment to be transparent and disclose the results of implementation of the Environmental and Social Management System (ESMS), as set out in the ISO 14001 standard.

This management framework promotes the early detection of and control over the environmental impact of mine operations, thereby reconciling the operational needs of the mine with the applicable regulatory framework and industry best practises.

This report presents the results of the 2021 monitoring activities that were performed in line with the implementation of the Environmental and Social Management System at the Renard mine. It provides a summary of the various environmental management tools SWY has put in place over the years to promote early detection of environmental and social issues, ensure environmental regulatory compliance and promote continuous improvement.

These tools include the Construction Environmental Surveillance Program, the Environmental and Social Monitoring Program (physical and biological components), and other internal auditing tools.

The 2021 monitoring report was examined and validated by Norda Stelo (see Appendix 1) in order to confirm that the activities mentioned in the report actually took place and that results were consistent with what was documented in the report.

This audit also offered an opportunity to ensure that the prevention, risk management, mitigation and compensation measures as set out in the Environmental and Social Impact Assessment and discussed with stakeholders and government authorities had been implemented correctly.

# 2 Environmental and Social Management System (ESMS)

## 2.1 Sustainable Development Policy

In 2011, when the Renard mine was still in its design phase, SWY developed a Sustainable Development Policy, which was later updated in April 2021 after a change in management.

The environmental component of the Sustainable Development Policy can be summarized as follows:

**Follow environmental best practises in all activities;**

**Protect the environment and biodiversity in line with features specific to the host site;**

**Encourage gradual restoration of work sites, leaving them in a condition comparable to that in which they were initially found;**

**Collaborate with stakeholders to develop our knowledge of the host environment.**

## 2.2 ESMS

In 2015, in keeping with SWY's sustainable development policy, the company introduced an environmental and social management system (ESMS), along with procedures covering all the different activities that take place at the mine site. The implementation of the ESMS resulted in a safe, orderly work site with clear signage.

**With the ESMS in place, no notices of environmental non-compliance or infractions were issued during construction, nor have any been issued since the mine entered its production phase.**

Since the ESMS was first implemented in 2015, it has been adapted for the mine's operations, allowing the evolution of the environmental impacts predicted in the impact study to be monitored and controlled in compliance with the applicable regulatory framework and best practises.

This monitoring is one part of a larger process to ensure the continuous improvement of environmental management practises.

The ESMS also covers the future closure and restoration of the site. In line with the company's sustainable development policy, SWY hopes that the ESMS will help the company:

- Improve its environmental performance;
- Meet compliance obligations;
- Achieve its environmental objectives.

SWY has also acquired a environmental management software (IsoVision©) that facilitates the implementation of the ESMS by ensuring compliance with the ISO 14001 standard, the applicable regulatory framework, and environmental objectives set by SWY. The IsoVision© software includes several distinct modules for different types of monitoring (environmental incidents, documentation, field samples, audits, inspections and so forth).

## 2.3 TSM$^{TM}$ Program

In keeping with its goal of being at the forefront of environmental management, SWY drew inspiration from the ISO 14001:2015 certification when establishing its environmental management system in 2014, as well as choosing to take part in the Mining Association of Canada's Toward Sustainable Mining*TM* (TSM$^{TM}$) initiative starting in 2018.

The TSMTM program is a set of tools and indicators that are deployed as part of an environmental management system, all designed to ensure that mining risks are managed responsibly while also encouraging continuous and sustainable improvement.

Ever since choosing to take part in the TSMTM initiative in 2019, SWY has remained firmly committed to honouring the requirements set out by the MAC (i.e., credibility, accountability, transparency and performance) in the context of its activities at the Renard mine.

## 2.3.1 Protocols

The MAC's self-assessment tools fall into three major categories: communities and people, environmental stewardship and energy efficiency. The MAC has come up with eight different performance protocols to help companies develop and evaluate their systems and processes in each of these categories, and thereby report back to Canadians on their environmental and social performance and ways in which they can improve.

Each protocol includes three to five performance indicators, for a total of 29 indicators across the eight protocols (figure 2.1). Every year, companies conduct self-assessments, which are reviewed externally every three years. During their self-assessment, they assign themselves a letter grade ranging from C to AAA. Level C is the lowest grade and AAA the highest. The MAC letter grades are outlined in Table 2.1.

The *Risk Management* protocol is the only one that requires a yes or no answer. The self-assessments are reviewed by a third party once every three years in order to verify the performance ratings reported for the eight protocols.

**Table 2.1 Definition of TSM's performance rating system**

| Grade | Description |
|---|---|
| AAA | Excellence and leadership. |
| AA | Systems/processes are integrated into management decisions and business functions. |
| A | Systems/processes are developed and implemented. |
| B | Actions are not consistent or documented; systems/processes are in the process of being developed. |
| C | No systems in place; activities tend to be reactive rather than proactive; certain procedures may exist, but they are not yet integrated into policies or management systems. |

#### 2.3.1.1 External audit of the TSM$^{TM}$

In 2021, after confirmation from the Mining Association of Quebec (AMQ), SWY decided to have their performance on the seven protocols that apply to the Renard mine evaluated by an external auditor for the entire TSMTM initiative. This is scheduled for the first quarter of 2022, three years after the company's first self-assessment (2019) as validated by the AMQ.

## 2.3.2 Overview of TSM Performance

In 2021, SWY conducted a self-assessment for all seven protocols that apply to the mine under the TSMTM program. SWY maintained its AAA rating for the *Biodiversity* protocol, and achieved the same rating for the first time for the *Indigenous and Community Relationships* protocol. The AA ratings for the other five protocols were maintained and provided with additional support, as SWY was able to resume the implementation of various initiatives, in particular for the *Energy and GHG Management* protocol. The external audit scheduled for early 2022 will allow us to confirm these ratings.

In December 2021, SWY submitted the results of their 2021 self-assessment for all seven TSMTM protocols that apply to the Renard mine (Figure 2.2) on the Mining Association of Canada website

A summary of the activities carried out under this program is presented by protocol in the following sections. Figure 2.

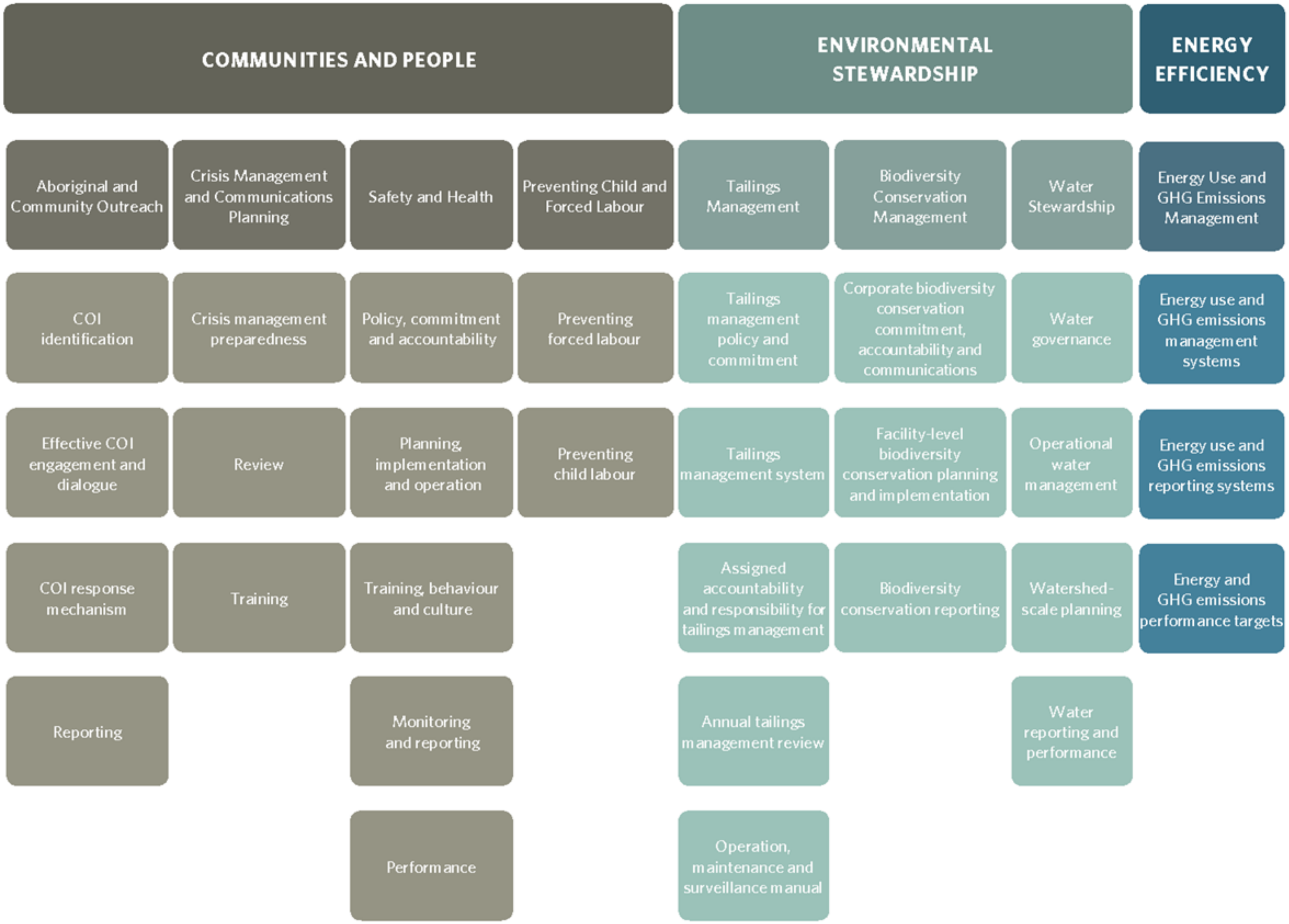



**Figure 2.1 Protocols and performance indicators under the TSM$^{TM}$ program**

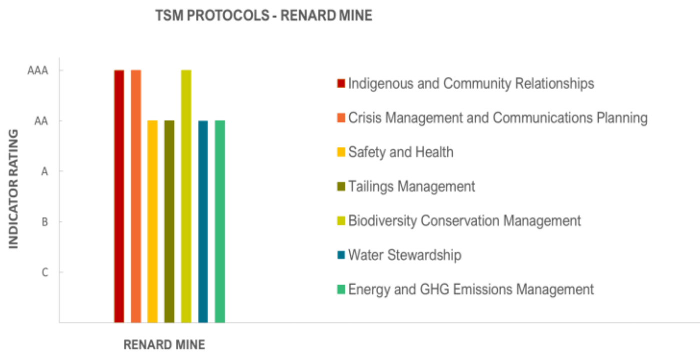



**Figure 2.2 Results for TSM™ Protocols**

#### 2.3.2.1 Indigenous and community relationships

This protocol defines the MAC's general expectations of how its members manage Indigenous and community relations in support of the TSM initiative.

In 2021, SWY strengthened its efforts to maintain high-quality relationships with stakeholders. SWY conducted its self-assessment using the 2019 version of the protocol for the first time, in accordance with the directives set out in the AMC calendar (AMC, 2022). This self-assessment resulted in the highest possible rating (AAA) for all four indicators in the protocol (Figure 2.3).

In 2022, SWY will have its compliance with the 2019 version of this protocol from the AMC (AMC, 2022) verified by an external audit.

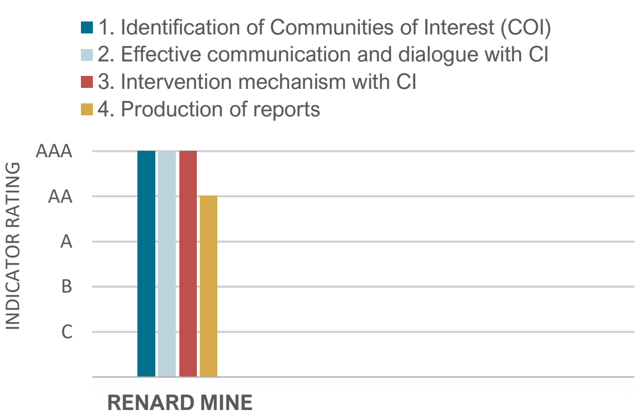



**Figure 2.3 Results of the 2021 self-assessment for the *Indigenous and Community Relationships* protocol**

##### *2.3.2.1.1 Communities of interest*

The 2011 Environmental and Social Impact Assessment (EIES) clearly identified the communities of interest (CIs) as well as the individual characteristics and needs of each community.

In July 2012, Stornoway signed a "Partnership Agreement" with the Chapais and Chibougamau host communities, which provided a framework for the ongoing identification of communities of interest affected by the Renard project.

In 2021, thanks to this agreement, SWY was able to continue addressing issues common interest such as communications, employment, economic diversification and initiatives to attract newcomers to the region.

In 2020, the Renard Liaison Committee welcomed the James Bay Regional Government (ARBJ) as a new member in order to promote the development of communities in the James Bay region (Radisson, Villebois, Chapais-Chibougamau, Lebel-sur-Quévillon, Matagami).

The addition of the ARBJ to the Renard Liaison Committee means that this community of interest will be given priority for procurement contracts, thus fostering economic development (for example through the awarding of contracts) at the local and regional level.

##### *2.3.2.1.2 Communication and effective dialogue with communities of interest*

Communication and dialogue with the groups of interest are based on a sound communications plan. Committees have been formed to monitor established agreements with stakeholders affected by the Renard mine.

The communications the CIs most appreciate are open-house meetings, the sustainable development and environmental and social monitoring reports, and the many meetings held with the various monitoring committees.

By holding regular meetings throughout the year, Stornoway has been able to improve upon their relationships with communities of interest and thereby ensure constructive, inclusive communications.

The success of the many business, training and communications partnerships that have been established, as well as the various community activities that have been held, is a testament to the effective, constructive networking that has been accomplished throughout the implementation of the Renard project.

##### *2.3.2.1.3 Communication and effective dialogue with Indigenous communities*

Communities of interest are essential partners for Stornoway.

Through various communication activities and committee meetings with CIs, SWY has established an effective, ongoing dialogue resulting in a number of constructive discussions.

Relationships with communities of interest have led to the establishment of multiple forums for discussion, including:

- The Partners Committee;
- The Renard committee, which includes both the Environment Committee and the Jobs and Training Committee;
- Annual public meetings;
- Round tables and consultations;
- Joint preparation of local and regional capacity studies and training plans;
- Community involvement.

##### *2.3.2.1.4 Management of repercussions and benefits for communities*

The meetings held by SWY to discuss and communicate issues with CIs provide stakeholders with valuable platforms for the exchange of information and discussion of concerns. This dynamic information-gathering process has a direct impact on Stornoway's decision-making process.

Stornoway also offers an informal method for submitting complaints on its website.

##### *2.3.2.1.5 Feedback system*

Maintaining a high level of transparency with communities of interest and the general public fosters discussion and constructive dialogue, as well as the achievement of common objectives.

SWY publishes several reports each year, such as the local economic impact report and the Environmental and Social Monitoring Report, which are both available to the public on the SWY website. All of these reports are public and can be consulted on the SWY website at any time. These publications are the result of in-depth consultations with experts and discussions regarding monitoring, committee and partnership activities.

In 2021, SWY published certain opinions from communities of interest, such as the opinion of the Environment Committee on the results obtained by Renard Mine (ex. Monitoring of large wildlife). Other publications also addressed communications and dialogues that took place in 2021: SWY remained in close, regular contact with experts, as well as holding regular discussions with communities of interest on the monitoring of activities, committees, and partnerships over the course of 2021. The results of these consultations can be found in the 2020 Environmental and Social Monitoring Report (Stornoway, 2021) and in Chapter 8 of this report.

#### 2.3.2.2 Biodiversity conservation management

In 2021, for the first time, SWY conducted a self-assessment of the 2020 version of the protocol as set out in the directives of the AMC calendar (AMC, 2022). SWY maintained its AAA rating for the three indicators associated with this protocol, and continued monitoring biodiversity as shown in Figure 2.4. The fish habitat compensation projects that were completed in 2019 (lake trout, walleye and brook trout spawning grounds), are also monitored, and were visited throughout 2021 (more details in Section 3.10).

The third phase in the large wildlife monitoring project took place in March 2021 (more details in section 3.12) and the wildlife observation log continued to be used. As the black bear management plan is also a way to monitor the species, it is used on an ongoing basis at the mine site, particularly at the trench landfill site (TLS).

In 2022, SWY will have the 2020 version of this protocol verified by an external audit in accordance with AMC directives (AMC, 2022).

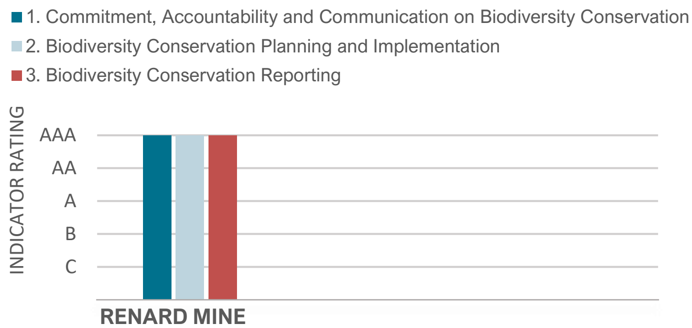



**Figure 2.4 Results of the 2021 self-assessment for the *Biodiversity Conservation Management* protocol**

#### *2.3.2.2.1 Commitments, accountability, and communication on biodiversity conservation*

In addition to the voluntary commitments outlined in the 2011 impact assessment (Roche, 2011a), SWY also introduced a sustainable development policy in 2011, which was later updated in 2021. All of Stornoway's commitments can be found on the company website.

The environmental management system (ESMS) that was put in place in 2014 is in line with SWY's sustainable development policy, which was updated in April 2021. This framework is designed to ensure that SWY's commitments result in concrete environmental management measures, and to define the roles and responsibilities of the different parties involved.

In 2021, SWY continued its commitment to protecting the environment and biodiversity in line with the specific characteristics of the host environment. SWY is also committed to collaborating with stakeholders to build on our knowledge of the work site, including Route 167 North. In 2021, SWY demonstrated its continued commitment to the conservation of biodiversity by maintaining the regulatory monitoring laid out in the Environmental and Social Monitoring Program (ESMP). SWY met with various stakeholders such as the Environment Committee as stipulated in the Mecheshoo Agreement. This agreement provides SWY with opportunities to take ownership of the environmental commitments made by Renard mine.

#### *2.3.2.2.2 Planning and implementation*

The implementation of the objectives laid out in the ESMS is guided by procedures specific to each component of the impact assessment, including biodiversity conservation. The primary tool SWY uses to manage these activities is its Environmental and Social Monitoring Program (ESMP). The ESMP, which was introduced in 2015, tracks changes in the natural environment throughout the year, anticipates issues and monitors the evolution of the impacts anticipated in the 2011 impact assessment (Roche, 2011a). It is also intended to encourage ongoing observation and protection of biodiversity.

Monitoring and surveillance work has been carried out on the Renard mine site throughout the year at various frequencies (weekly, monthly, quarterly, bi-annually and annually) ever since the baseline conditions for the Renard mine study area were established in 2010. Several animals have enormous importance in Cree culture when it comes to hunting, fishing and gathering activities. SWY therefore reports on all species (both fauna and flora) with a special status observed in the Renard mine study area.

In summary, biodiversity conservation activities are based on monitoring and the production of reports on:

- Vegetation and wetlands
- Terrestrial wildlife and birds;
- Fish and fish habitat;
- Fish habitat compensation measures;
- Large fauna inventories;
- Quality of the environment (air, water, habitats).

#### *2.3.2.2.3 Reporting*

SWY's commitment to environmental protection and surveillance has been subject to external audits and annual inspections by federal and provincial authorities, including Environment and Climate Change Canada (ECCC), Fisheries and Oceans Canada (DFO), the Ministry of Forests, Wildlife and Parks (MFFP), and the Ministry of the Environment and the Fight Against Climate Change (MELCC).

Since 2015, SWY has produced an annual environmental and social monitoring report presenting data on biodiversity collected by observation and monitoring throughout the year. This annual report covers monitoring results on the quality of the natural environment, and the measures implemented to preserve the area's significant natural heritage.

The results of this monitoring, in particular with regards to biodiversity, are also reported and communicated internally to the board of directors, the Environment Committee and other stakeholders on a quarterly basis.

#### 2.3.2.3 Water stewardship

The *Water Stewardship* protocol was added to the TSM™ program in early 2019. In keeping with its commitments, Stornoway conducted a self-assessment in 2021.

The self-assessment resulted in Level AAA ratings for indicators 1, 2 and 4, and a Level AA rating for indicator 3.
(Figure 2.5).

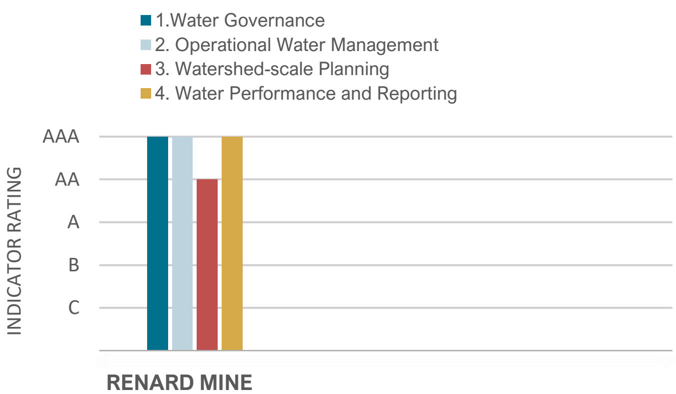



**Figure 2.5 Results of the 2021 self-assessment for the *Water Stewardship***

##### *2.3.2.3.1 Water governance*

Since 2010, the Renard mine has been collecting data on the usage, treatment, consumption and disposal of water (including mine wastewater, groundwater, domestic water, drinking water and water from the natural environment). In 2011, SWY made a public commitment in its Environmental and Social Impact Assessment (ESIA) (Roche, 2011a) to make a special effort to monitor and track water resources.

This commitment led to the implementation of the Environmental and Social Monitoring Program (ESMP) at the Renard mine in 2015. The ESMP is designed to detect and correct non-compliance with regulatory requirements and SWY's commitments in the area of water management.

In 2021, SWY continued to apply the basic principles of water management, which can be summarized as follows:

- Maintain excellence in water management and water quality at every level and throughout every step in the life cycle of the mine;
- Ensure ongoing monitoring of efforts to manage water required for mining operations, in keeping with the natural hydrology of watersheds;
- Remain accountable and transparent when it comes to the management of water intended for use by the public and stakeholders;
- Position SWY as a leader in water stewardship in the mining industry.

##### *2.3.2.3.2 Operations water management*

The Environmental and Social Management System (ESMS) introduced in 2015 includes a number of tools for monitoring the management of water used for various operations at the Renard mine. In 2021, SWY continued to follow the procedures laid out for water usage and treatment. Water sampling was undertaken in accordance with a strict operational calendar, as specified in the Global CA on December 4, 2012. In addition, the emergency response plans established in 2015 to deal with contaminant spills or regulatory non-compliance involving mine water, domestic water and drinking water were put into practise in 2021.

Finally, SWY continued compiling specific water quality parameters (ex. pH, water temperature, conductivity, metals) in the relevant logs. These parameters are used to determine water quality. After completing the operational water assessment for 2021, it was possible to establish a rate of water reuse for the mining site as a whole (see section 3.13 for more information).

New employees and visitors to the Renard mine are given a short presentation on environmental awareness, which covers topics such as the responsible consumption of drinking water.

#### *2.3.2.3.3 Watershed planning*

As part of its 2011 impact assessment, SWY performed a thorough analysis of the watersheds associated with the Renard mine. The impact assessment defined the boundaries of the subwatersheds and characterized their hydrological conditions and baseline physical-chemical characteristics.

By identifying and consulting the Renard mine's communities of interest when establishing a baseline in 2010, SWY ensured it would be able to identify any issues associated with water resources in the future.

SWY organized a number of discussion groups and open houses with the towns of Chibougamau and Mistissini in 2012 to learn about and document their concerns, practises, customs and beliefs as well as local traditional knowledge of water. SWY also presented its water management and treatment process to the authorities and stakeholders, specifically during public hearings that were held prior to the start-up of the Renard project.

The watersheds affected by Renard mining activities were identified and outlined in the impact study (2011). Roles and responsibilities with regards to watershed planning were also attributed in the same study. In addition, Stornoway involved communities of interest by conducting focus groups prior to the construction of the Renard mine. These groups provided a better understanding of how the relevant communities of interest use water resources. The 2011 impact assessment also made it possible to assess the cumulative effects of mining activities on water quality in affected watersheds.

Stornoway has continued to follow the monitoring procedures introduced as part of the ESMS in 2015. As such, in 2021, the watersheds identified in the impact study remained under surveillance. The hydrological regime of Lake Lagopede was monitored closely, and an operational water assessment was completed for the mining site as a whole in 2021.

The results of these analysis were submitted to the relevant authorities for 2021.

This leads to rigorous monitoring of Lake Lagopede's hydrological system, as well as an operational water balance for the mine. which includes representatives from communities of interest. In this way, SWY is able to promote an understanding of how the water used in mining operations is managed. SWY shares the operational water assessment reports produced each year with communities of interest by publishing the results on the website in the annual environmental monitoring report.

Finally, every year, SWY informs communities of interest about watershed-related activities at the Renard mine by way of its sustainable development and environmental monitoring reports.

#### *2.3.2.3.4 Water reporting and performance*

As part of the internal water management reporting process that was in place in 2021, the Environment team:

- Provided other departments with reports on the volume of water treated at the mine wastewater water treatment plant (MWWTP) each day;
- Shared the results of bi-monthly drinking water tests with employees by posting them on bulletin boards on the mine site;
- Informed the Surface Mining department when daily ammonium nitrogen concentrations in water from the underground mine exceeded the internal limit. Water treatment technicians team recorded any stoppages or anomalies observed during the water treatment process;
- Kept senior management informed through monthly meetings with the Board of Directors.

In 2021, SWY monitored water management data (water quality, plant operations, treatment) very closely on a weekly, monthly, quarterly and annual basis. This data was submitted to both senior environment officials (internal audit) and government authorities (external audit) for review.

In terms of internal auditing, water management personnel continued their usual activities. As in previous years, in 2021, water management personnel conducted a weekly review and calibration of the different instruments used to collect data on water quality (pH meters and conductivity and turbidity probes), thereby ensuring the reliability of said data. They also took daily and weekly samples of water treatment plant effluent and affluent, as well as conducting internal testing of certain chemical parameters required for operations.

Thus, in 2021, SWY made sure they had adequate procedures and sampling practises in place in order to make well-informed decisions, thus ensuring compliance with regulatory requirements such as Directive 019 and the RQEP and paving the way for continuous improvement in water management at the mine site.

#### 2.3.2.4 Energy use and GHG emissions management

Energy management is also subject to both internal and external audits. SWY has ensured these audits are integrated into operational planning at the mine site ever since mining activity began in 2016. In order to improve energy efficiency, in 2021, SWY resumed work on the comprehensive energy management program on which development began in late 2018.

In 2021, as in 2019 and 2020, SWY once again earned an AA rating for this protocol in their self-assessment (Figure 2.6), and continued to pursue the implementation of their action plan to reduce consumption of energy and fossil fuels, thus reducing greenhouse gas emissions.

##### *2.3.2.4.1 Energy use and GHG emissions management systems*

After identifying and analyzing several different energy sources for the Renard project in its impact study (Roche, 2011a), Stornoway selected liquefied natural gas (LNG) in 2014. LNG, which is considered as the most suitable energy source for the mine, is used in large part for mining site operations. The choice of this energy source will allow Stornoway to reduce the greenhouse gas (GHG) emissions resulting from mining activities by 45% as compared to diesel, which was the original plan. It also reduces the risk of environmental incidents, which is very important given the remote northern location of the mine.

Energy consumption and greenhouse gas emissions have been monitored and managed at the Renard mine ever since construction began, and have been integrated into operational planning since the beginning of the production phase in 2016. The managers of the power plant are constantly monitoring the consumption of different departments at the mine site.

Since 2016, standardized external reviews have also been conducted, and the data collected during these reviews has been archived. Since November 2019, the electrical engineer has been in control of turning on the on-demand ventilation system for the underground mine, leading to a reduction in electricity consumption.

In 2021, operational controls have been identified to target opportunities to reduce power consumption required for underground ventilation.

##### *2.3.2.4.2 Energy use and GHG emissions reporting systems*

In order to comply with the reporting requirements of the National Pollutant Release Inventory (NPRI) and the Quebec Atmospheric Emissions Inventory (IQÉA), SWY calculated the atmospheric emissions produced by mining operations at the Renard diamond mine in 2021. These emissions include both greenhouse gases and other pollutants likely to be released by mining operations.

The 2021 GHGs emissions report was audited by a third party and an external verification report has been filed with and accepted by the authorities. SWY filed a declaration with government authorities reporting a total amount of 63,374 t.m. ($CO_2$ eq) of GHGs emitted into the atmosphere from the Renard mine during the production phase (see section 3.2.3 for details).

#### 2.3.2.4.3 *Energy consumption and GHG emissions performance targets*

Overall, the most significant performance indicator for operations at the Renard mine is the total fixed emissions as declared and verified by a third party and expressed in kilograms of GHGs emitted per ton of kimberlite processed (standard unit).

For 2021, the performance indicator is 16.77 kg of GHGs emitted per ton of kimberlite processed, for a total of 2,458,846 t.m. of kimberlite processed in 2020. For similar activity and and mineral production, the amount of greenhouse gases emitted by stationary equipment on the mining site decreased by 13% from 2019 to 2021. This significant decrease is directly attributable to the temporary halt in mining activity from March to October 2020 due to the COVID-19 pandemic. For more details, see Section 3.2.3.2.

One of the main actions implemented in 2021 consisted of the analysis of energy consumption practises on the mining site. As planned, in the last quarter of 2021, SWY defined three new objectives for the maintenance or reduction of energy consumption for different sectors, providing additional justification for the third performance indicator in the protocol.

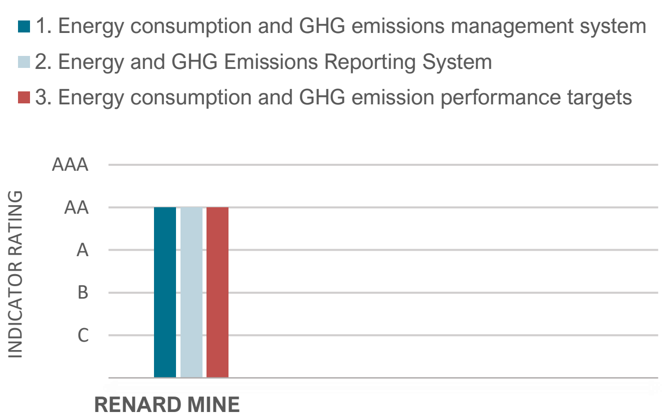



**Figure 2.6 Results of the 2021 self-assessment for the *Energy Use and GHG Emissions Management Protocol***

The energy consumption maintenance/reduction goals set in 2021 refer to electricity consumed by the underground mine and the housing complex. More objectives will be defined for the ore processing plant and the power plant in 2022.

By the end of 2022, SWY plans to implement an energy management system that will make it possible to establish an energy efficiency plan structured around quantifiable energy reduction goals.

### 2.3.2.5 Health and safety

In addition to demonstrating good performance in occupational health and safety, the Renard mine also achieved an AA rating for two indicators of the TSM protocol and an AAA rating for the other three as a result of the 2021 self-assessment. (Figure 2.7).

The departmental (sector and personal) action plans that were introduced in 2021 improved the quality and safety of the various working environments.


**Figure 2.7 Performance Indicators for the *Health and Safety* Protocol**

#### 2.3.2.5.1 *Commitment and accountability*

**SUSTAINABLE DEVELOPMENT POLICY**

This policy includes some Health and Safety elements, and is based on SWY's principles and values. It is reviewed by senior management each year.

**ANNUAL REVIEW OF THE HEALTH AND SAFETY MANAGEMENT STRATEGY**

Each year, SWY sets a number of health and safety and prevention goals. These are based on legal and regulatory health and safety requirements imposed upon all operations at the Renard mine site.

### HEALTH AND SAFETY OBJECTIVES

Our health and safety objectives are reviewed several times each year, and are communicated to both in-house employees and the different contractors and service providers with whom we collaborate. Stornoway employees show their commitment to health and safety by adopting healthy preventive practises and embracing the values represented by Stornoway's slogan: *"Courage to care!* ".

#### *2.3.2.5.2 Development and implementation*

**THE OCCUPATIONAL HYGIENE, HEALTH AND SAFETY (OHHS) SYSTEM** is based on the OHSAS 18001 standard as well as the principles set out in Stornoway's Sustainable Development Policy.

**THE SUSTAINABLE DEVELOPMENT POLICY** applies to both Stornoway employees and the various contractors and service providers involved in Renard mine operations.

**THE OPERATIONAL PROCEDURES ESTABLISHED** as part of the system are also based on the legal and regulatory requirements that apply to operations at the Renard mine.

**The Renard mine's health and safety system includes:**

- A definition of roles and responsibilities;
- Administrative and operational procedures;
- Risk management and emergency measures;
- An OHS prevention program;
- An occupational hygiene program;
- A verification, inspection and auditing schedule.

#### *2.3.2.5.3 Training, behaviour and Culture*

The assessment of training needs is an essential tool for identifying the different OHHS training programs that are available and determining which are mandatory.

By identifying the different kinds of OHS training required for successful operation of the Renard mine, SWY ensures a high level of vigilance and a safe work environment for all workers at the mine site. Prevention activities, job safety analysis, employee participation in risk assessments, and support from qualified trainers all contribute to the development of a corporate culture in which OHHS is a priority.

Wellness programs are another essential part of promoting OHHS within Stornoway. Employee participation is required and encouraged at every level within the organization.

Despite the numerous organizational changes that took place at SWY in 2021, the company continued to maintain its commitment to OHHS all while updating certain roles and responsibilities in the crisis management plan. In order to ensure that the managers involved in crisis management have a thorough understanding of their roles and responsibilities, SWY has updated the training materials for managers and vice presidents on duty. Following some changes to the management team in 2021, new managers were provided with training on potential emergency measures at the Renard mine.

#### *2.3.2.5.4 Surveillance and reporting*

Stornoway's OHHS system includes performance indicators, surveillance and review programs, and a regular assessment of performance results with senior management.

The OHHS system includes controls, monitoring and job safety analysis, as well as a number of other preventive activities for operations at the mining site. The implementation of these surveillance measures and the reporting of results to senior management lead to the creation of a safer working environment with a focus on continuous improvement. Finally, Stornoway shares the results of their internal monitoring and external audits with both in-house employees and contractors and other service providers the company collaborates with.

#### *2.3.2.5.5 Performance*

The results obtained from monitoring OHHS objectives are shared widely and analyzed by both management and employees to ensure they are incorporated into specific plans for improvement. Stornoway may be a relatively young company, but it is already a leader in the industry when it comes to occupational health and safety.

### 2.3.2.6 Crisis management and communications planning

SWY's head office and Renard mine site operations are in full compliance with the requirements set out in the three performance indicators associated with this protocol (Table 2.2). Figure 2.

In 2021, the mine rescue competition was cancelled once again due to the COVID-19 pandemic. The skills and perseverance of SWY's Mine Rescue Team earned them first place at the Provincial Mine Rescue Competition in both 2018 and 2019, in a testimony to SWY's expertise in mine rescue.

**Table 2.2 Evaluation of performance indicators for the crisis management protocol**

| WORKSITE | INDICATORS | | |
|---|---|---|---|
| | PREPARATION | REVIEW | TRAINING |
| RENARD MINE | ✓ | ✓ | ✓ |

#### *2.3.2.6.1 Crisis management preparation*

Stornoway reviews its crisis management plan (CMP) and emergency response plan (ERP) on an annual basis to ensure their continued relevance and effectiveness. This yearly review helps the company identify any credible threats or risks and hence develop or implement emergency response protocols accordingly.

Emergency response equipment and logistics are in place, and are tested on a regular basis. The different roles, responsibilities, and alert processes are clearly defined, and control and command centres are established, identified and known to all.

The CMP and the ERP are controlled documents that are distributed internally and to the relevant authorities each year. The ERP was reviewed on January 12, 2021, and the CMP was updated in November 2021.

#### *2.3.2.6.2 Evaluation of the CMP and EMP*

New employees are briefed on emergency measures on their first day of work, and new managers are also expected to familiarize themselves with the CMP and ERP as soon as they arrive. Management and employees are tested on alert procedures and mechanisms regularly in order to ensure that everyone is prepared to respond quickly if an emergency situation were to arise.

#### *2.3.2.6.3 Training and implementation of the crisis management plan*

Crisis simulations take place on a regular basis to ensure the organization is prepared to manage emergency response measures efficiently. These simulations include:

- Simulations in conference rooms without field deployment;
- Simulations including the control and command centre;
- Simulations including large-scale field deployment;
- Training sessions with real-life simulations in the field.

These measures enable Stornoway to remain operational and to position itself a leader in emergency response measures in the industry.

Since production resumed at the mine in October 2020, SWY has also had the opportunity to use the system that was established for communication between the Renard mine and the head office in Longueuil, in particular to keep people informed when the few positive cases of COVID-19 were diagnosed at the mine site.

### 2.3.2.7 Mine Tailings Management

Stornoway is committed to achieving the highest possible rating in the TSM initiative, which is AAA. After two years of implementing the *Mine Tailings Management* protocol, SWY has achieved an AA rating for all five TSM indicators through its comprehensive monitoring and management program for the modified processed kimberlite containment (MPKC) facility. Systems and processes are well integrated with management decisions and operational functions (Figure 2.8).

The results of the self-assessment for 2021 are presented in Figure 2.8. For 2021, after numerous audits, it has been confirmed that all operations meet the regulatory requirements. The Operation, Maintenance and Surveillance (OMS) Manual for the MPKC facility was also updated twice in 2021, once in January and once in December, and a special annual report dedicated entirely to this facility was released.

In order to achieve the AAA rating, SWY will be conducting an external audit in early 2022 to confirm that the measures in place at the Renard mine meet all the relevant requirements of the TSM protocol.

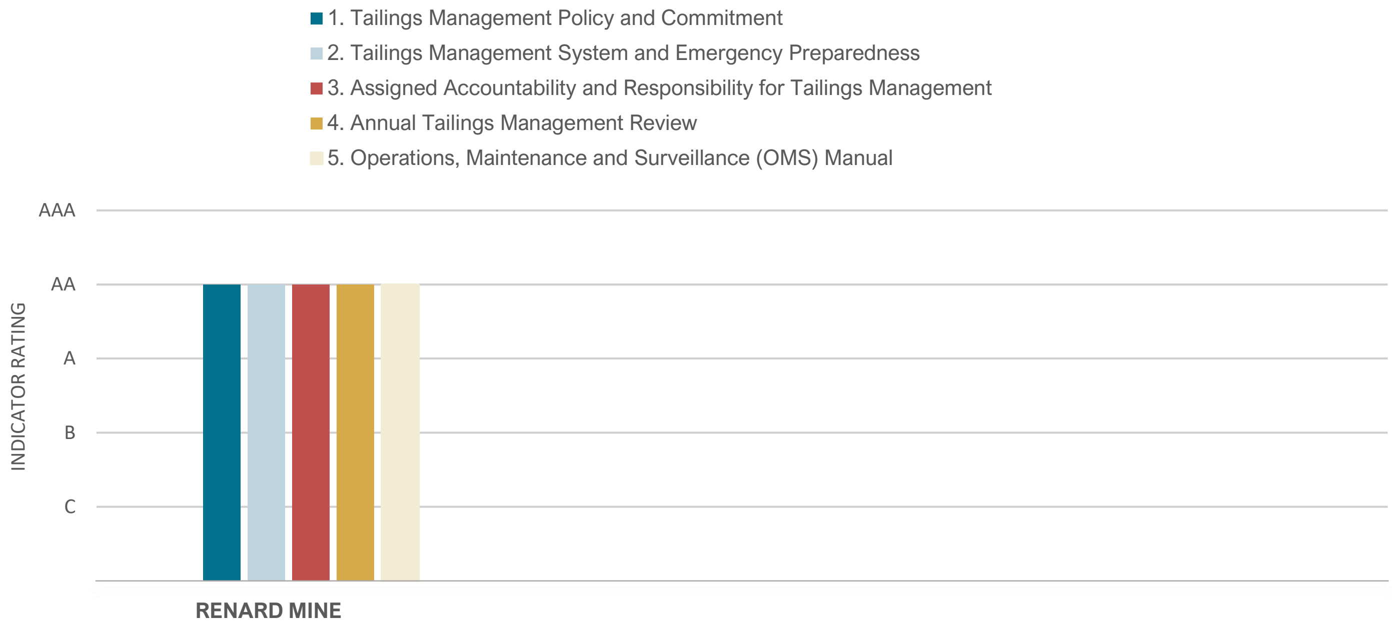



**Figure 2.8 Performance Indicators for the *Mine Tailings Management* Protocol**

#### *2.3.2.7.1 Tailing Management Policy and Commitments Statement*

Stornoway has a policy in place that includes a statement of its commitments with regards to tailings management at the modified processed kimberlite containment (MPKC) facility, in keeping with MAC's Tailings Guide. Specific funding and budget allowances also help ensure sound management, operation, monitoring and auditing of the tailings containment facility.

#### *2.3.2.7.2 Tailings management system and emergency preparation*

A tailings management system is in place covering every step in the life cycle of the tailings containment facility (from planning, design and construction, to operations, closure and post-closure). Two annual audits are carried out on the system by an external consultant. The system's procedures and manuals are also updated each year to reflect new industry directives.

SWY tested its Emergency Response Plan (ERP) and Emergency Preparedness Plan (EPP) during a simulation in October 2021.

#### *2.3.2.7.3 Operations, Maintenance and Surveillance (OMS) Manual*

SWY has an operations, maintenance and surveillance manual in place for the modified processed kimberlite containment (MPKC) facility, which is updated annually. In January 2021, the OMS manual was updated to reflect the latest information from the MAC. The updated version was published in December 2021. A number of different operational procedures were also developed and/or updated in 2021 in accordance with the OMS manual and the plans and specifications of the designer (Golder).

OMS activities comply with the best practises specified by the Mining Association of Canada (MAC) and include an inspection and verification schedule, operating procedures, detailed deposition plans, maintenance procedures, monitoring reports and emergency response plans. Management of the MPKC facility is also structured by a quality assurance and control plan and a surveillance plan.

#### *2.3.2.7.4 Division of responsibility and accountability for tailings management*

SWY has detailed operational procedures in place for the management of tailings at the MPKC facility. Roles and responsibilities with regards to budgetary control, implementation and accountability for the management of waste are clearly defined in procedure 2.4 of the ESMS, and in the OMS manual. In 2021, these responsibilities were verified by an annual external audit (more details in Section 3.15). Detailed audit reports are submitted to senior management, so as to ensure any gaps, corrective measures or changes are properly tracked.

#### *2.3.2.7.5 Annual review of tailings management*

Regular reviews of the tailings management system along with its performance are carried out weekly, quarterly and annually. More specifically, the weekly internal review takes the form of inspections and monitoring. The monthly review of the tailings management system is carried out as part of the monthly review of operations and surveillance activities.

In 2021, only one annual audit took place, in May 2021. This audit confirmed that the MPKC facility was being managed and monitored properly. Several recommendations were made and incorporated into the post-audit action plan, thereby contributing to the gradual improvement of operational and monitoring aspects of the MPKC facility.

SWY also has a system of external audits that take place every two years, which includes a review of the effectiveness of tailings management and a report to senior management. To ensure accountability, an action plan is developed in response to audits and inspections conducted by the designer. The design consultant produces a biannual audit report.

## 2.4 Environmental Surveillance Program

As part of the 2011 impact assessment (Roche, 2011a), mitigation measures were developed to prevent and mitigate the impact of the mine during the construction and production phases.

**These activities help to prevent and anticipate environmental issues, as well as to respond quickly in the event of a system failure or problem with a mitigation measure.**

They take place during the production phase in order to verify the overall environmental performance of SWY activities and the Environmental and Social Management System (ESMS).

### 2.4.1 The status of mining activities during the COVID-19 pandemic

After a temporary halt in mining activity at the start of the pandemic (from March to October 2020), the activities scheduled for the Renard mine in the Environmental and Social Monitoring Program (ESMP) were partially resumed in October 2020, then fully resumed in 2021, in accordance with the PSES calendar.

The Renard mine upheld governmental health directives for the mining industry with regards to transportation and social distancing at the mining site, and followed the rules as the situation evolved.

### 2.4.2 Eco-permitting Procedure

Internal SWY procedure to ensure compliance of any work undertaken by contractors or changes to a contractor's operating procedures.

Stornoway requires contractors to obtain an Eco-Permit before making any significant modifications. This document must be acquired before any changes can be made that may affect the environment, for example:

- Changes to aquatic environments (e.g., installation of bridges or culverts), ditch excavation, or any type of earthworks;
- Clearing, construction of any type of infrastructure, mining or road works;
- Installation of treatment systems (oil-water separators, drinking water and wastewater treatment facilities, etc.);
- Any other modification or construction of infrastructure, equipment or operation that releases liquid, solid or gaseous substances into the environment;
- Use of a new product.

#### *2.4.2.1.1 Evaluation and approval*

SWY's Environment Department assesses Eco-Permit applications to ensure that all the necessary authorizations have been obtained and that the project complies with applicable regulations.

Once the applicant has been issued an Eco-Permit, it means they have been approved to go ahead with the work. The process makes it possible to update the Environmental and Social Monitoring Program to reflect any changes that may occur.

Once an Eco-Permit has been approved and signed by the Environment Department, it is issued to the applicant in the form of a document that specifies the requirements set out in relevant authorizations, guidelines and best practises.

In order to cut down on environmental incidents and ensure better protection of the environment, SWY promotes prevention and application at the source, prevention and attenuation measures, and alternative work methods.

These measures, which are determined based on the work to be performed, are specified in the impact study (Roche, 2011a) and included as requirements on Eco-Permits.

This internal approval system, which goes above and beyond the legal requirements, enabled Stornoway to ensure that all work performed respected the relevant rules and governmental authorizations throughout the construction phase. It is now well established as part of operations and will remain active throughout the life of the mine. Figure 2.

#### *2.4.2.1.2 Inspections*

Compliance with the requirements specified in eco-permits is validated in planned daily inspections by environment technicians. Surveillance forms are included with each Eco-Permit to ensure systematic verification of compliance with mitigation measures. The status of Eco-Permit applications is updated regularly in the mine's Eco-Permit register.

#### *2.4.2.1.3 2021 Results*

Since 2015, a total of 490 Eco-Permit applications have been submitted to the Environment Department for internal assessment. Figure 2.9 illustrates the distribution of Eco-Permits issued between 2015 and 2021.

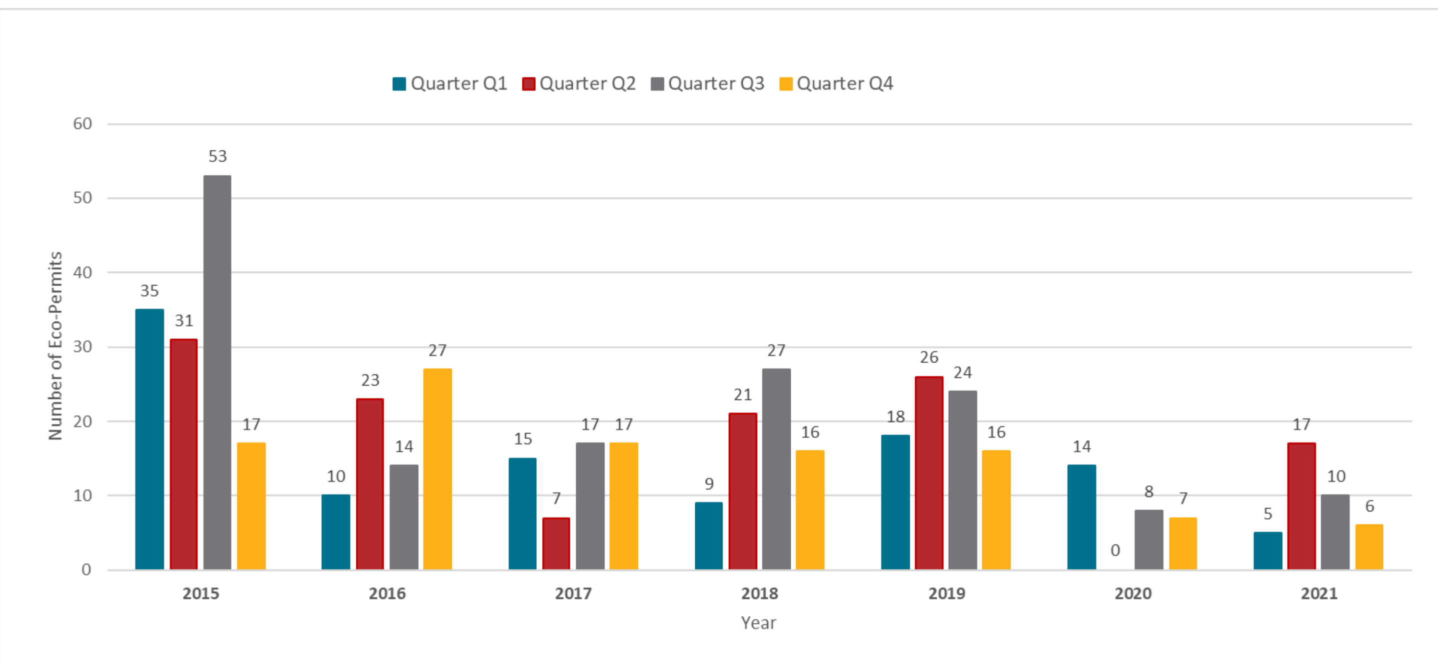



**Figure 2.9 Number of Eco-Permits issued each quarter in 2021**

Applications generally peak in the second (Q2) and third (Q3) quarters i.e., in summer, the best time to undertake outdoor maintenance work at the mining site.

Over the course of 2021, 38 Eco-Permit applications were submitted, for an increase of 18% from 2020 and a decrease of 54% from 2019.

The decrease in the number of applications since 2019 is primarily due to the decrease in surface mining activity and the migration of mining underground.

**REQUESTS FOR ECO-PERMITS IN 2021**

**Introduction of new products at the ore processing plant, in the garage and at the power plant**

**Creation of a new bypass path**

**Dismantling of the management office and camping RVs**

**Creation of a new temporary surface for the storage of sterile ore**

**Road maintenance and snow removal at the mine site**

## 2.5 Hazardous, Recyclable and Ultimate Materials and Contaminated Soil Management

### 2.5.1 Hazardous Materials Management

In order to ensure hazardous materials are managed properly at the Renard mine site, the procurement process for new products includes a rigorous check. Safety data sheets for newly selected products are analyzed and then submitted to the Health and Safety and Environment departments for approval.

**DID YOU KNOW?**

**The Renard mine has a system of electronic kiosks (Hazmat) that provide access to safety data sheets for the different hazardous materials used on site.**

**Employees can use them to look up and print safety data sheets at any time. They can even be used to print labels for products that are transferred to other containers.**

In 2021, we began installing the most recent version of these kiosks, which have improved accessibility and higher performance (Photo 2.1).

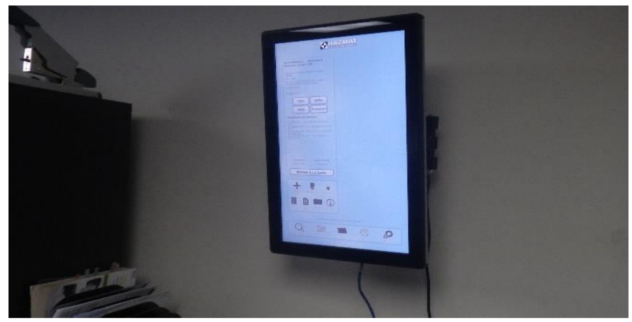


**Photo 2.1 New Hazmat kiosk installed in 2021**

Since July 2016, mine personnel have also been required to attend mandatory training sessions on the *Workplace Hazardous Materials Information System* (WHMIS, 2015). These training sessions continued in 2021, thus ensuring all employees have the knowledge and tools necessary to make safe use of hazardous materials on the job.

### 2.5.2 Residual, Recycled or Ultimate Waste Management

The Renard mine generates a variety of solid waste (SW), which is recycled, recovered or discarded. This waste is generated by construction activities, mining operations, and dismantling and site restoration work.

#### 2.5.2.1 Policy

SWY's approach to solid waste management (SWM) is based on the 3R-RD principle. The first goal is to ***reduce*** the amount of solid waste generated; the second is to ***reuse*** such materials; and the third is to maximize the ***recycling*** or ***reclaiming*** of residual materials. Finally, solid waste that cannot be reclaimed is ***disposed of*** in the trench landfill site (TLS).

Solid waste at the Renard mine site is separated at the source and collected in dedicated containers (Photo 2.2) so that anything that can be reused is recovered. The primary solid waste disposed of at the TLS is waste with a high organic matter content (kitchen waste, waste bin materials, etc.) and ICI (institutional, commercial and industrial) waste. Photo 2.


**Photo 2.2 Source separation of residual materials on the site (December 2021)**

All solid waste generated at the mine site (including the airstrip and the domestic wastewater treatment plant) is suitable for landfilling at the TLS, except for waste rock and mine tailings, recyclable materials, residual hazardous materials and biomedical waste.

**DID YOU KNOW?**

**The covers that were installed on household waste containers on the mine site in 2019 prevent the waste from attracting bears or foxes to the mine site, as well as keeping waste from being blown away by the wind.**

Since 2015, the management of solid waste at the TLS at the Renard mine has consisted of:

**TRANSPORTING both ferrous and non-ferrous metals, waste oil, and used tires off the mining site to be recycled or repurposed by specialized third-party companies.**

**STORING uncontaminated (untreated) wood at the TLS and chipping some of it as part of the program for the reclamation of organic materials for the progressive restoration of the site.**

**SORTING SW with a high percentage of organic material from the cafeteria at the source, then storing it temporarily in a refrigerated room before sending it to the TLS, less than 10 km from the Renard mine.**

**TRANSPORTING dehydrated sludge produced by the rotary press used in the domestic wastewater treatment process to the TLS for disposal.**

**DISPOSING OF all other ultimate SW that cannot be reclaimed (e.g., construction waste) in the TLS.**

#### *2.5.2.1.1 Valorization and recovery of wood at TLS*

The Rouyn-Noranda Industrial Residues Technological Centre (CTRI) conducted a study on the reclamation and recovery of waste bales. The results were released in March 2020 and can be found in the 2020 Environmental and Social Monitoring Report (Stornoway, 2021). SWY is still considering the best way to manage used wood.

#### *2.5.2.1.2 TLS fencing*

As usual, SWY repaired the fence around the TLS after the snow melted in spring 2021 (photo 2.3). Work continued on extending and burying the fence in summer 2021, in accordance with the recommendations from the black bear management plan published in 2019.

**Photo 2.3 Installation of the fence around the TLS (June 2021)**

#### 2.5.2.2 Solid waste management monitoring tools

To keep track of SW management at the Renard site, SWY uses a key performance indicator (KPI) expressed in tonnes of processed ore. This indicator has been recorded yearly since 2017.

SWY also tracks the amount of SW that is recycled and compares it to the government's 2015 recovery and reclamation target, which RECYC-QUÉBEC set at 70% of recyclable materials (by weight). The goal is to track SWM more accurately using a performance indicator and a target set by the government.

Also, since 2018, the amount of SW has been calculated using material-specific conversion factors (wood, metal, electric wire, tires, etc.) to determine the amount of SW that is recycled and landfilled. Amounts of SW are now expressed in percentage of tonnes (% of t) instead of cubic metres ($m^3$), which was the default measurement until 2017. This adjustment results in a more accurate weight of SW by type of material, rather than by container.

#### 2.5.2.3 Overview of solid waste management

Figure 2.10 shows a breakdown of SW generated (in %) in 2021 by category.

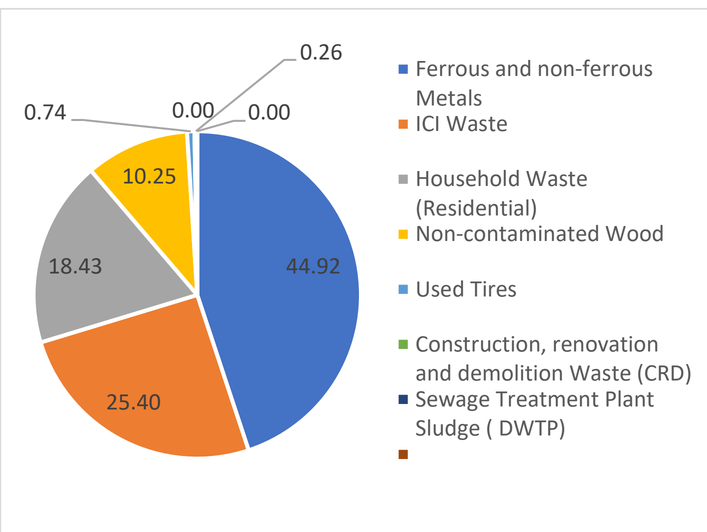



**Figure 2.10 Amount of ultimate solid waste generated by category at the Renard mine site in 2021**

Ferrous and non-ferrous metals represent nearly 45% of SW by weight, which is more than in 2020 (35%) or 2019 (40%). Household waste represents 18% of SW, which is less than in 2020 (28%) or 2019 (23%). This decrease is a direct result of the relative increase in the amount of metals, as well as the rate of occupation at the camp, which is less than in 2019. The amount of sludge produced by the domestic wastewater treatment plant (0.2%) went up from 2020 (0.02%) and returned to a level similar to that of 2019 (0.3%) The site did not produce any construction waste in 2021, as has been the case since 2019.

Table 2.3 shows the amount of solid waste (SW) that has been recycled and sent to the landfill since 2015, as well as the number of tonnes of ore that have been processed since the start of the production phase.

**Table 2.3 Solid waste (SW) sorting processes (in % of tonnes) since 2015**

| Year | Sorting Process (in tonnes) | | | |
|---|---|---|---|---|
| | Recycled SW | Recycled SW | Total SW | Processed ore (dry) |
| **2015** | 796 | 937 | 1733 | N/A |
| **2016** | 911 | 1028 | 1939 | N/A |
| **2017** | 519 | 751 | 1270 | 1,990,906 |
| **2018** | 1152 | 957 | 2109 | 2,328,300 |
| **2019** | 799 | 745 | 1544 | 2,556,459 |
| **2020** | 325 | 366 | 691 | 1,106,697 |
| **2021** | 679 | 536 | 1215 | 2,458,846 |
| **Total (%) depuis 2015** | ***49*** | ***51*** | ***100*** | ***99,334,51 1*** |

N/A : construction period

Since 2015, more than 49% of waste generated at the mine site has been recycled, and nearly 51% has been buried in the landfill. The return to full-time mining operations after a temporary halt in activity in 2020 (due to COVID-19) resulted in the generation of more waste than in 2020. Therefore, the numbers for 2021 are similar to those of 2019.

The amount of recyclable SW accounted for more than 56% of the total SW generated in 2021, which is the highest percentage at the mine so far (Figure 2.11). With the gradual resumption of mining activity in 2021, the total amount of SW recycled in 2021 returned to a similar level to that of 2019.

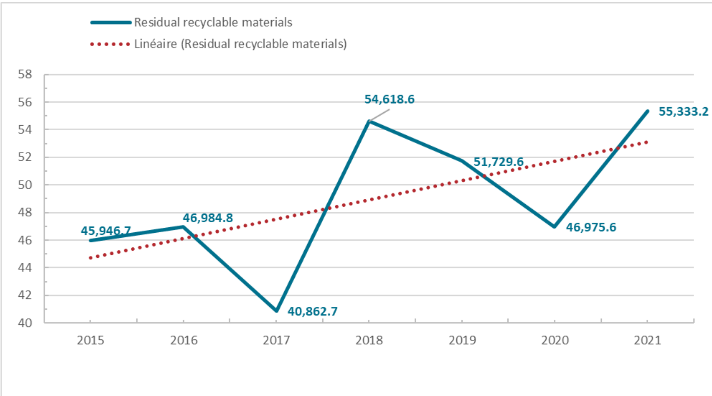



**Figure 2.11 Solid waste recycling rates since 2015**

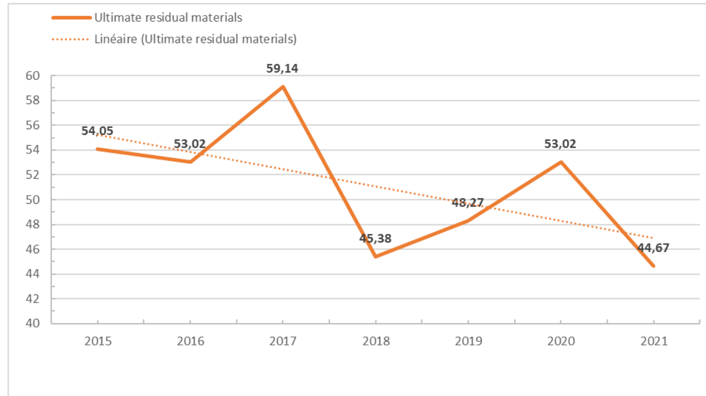



**Figure 2.12 Ultimate residual materials rates since 2015**

### 2.5.2.4 TLS management

Approximately 44.1% of SW generated in 2021 was sent to the landfill, which is the lowest it has been since the mine was built (Figure 2.12).

Figure 2.13 illustrates the amount of SW buried at the TLS each month in 2021, along with the evolution of the population at the Renard camp. Overall, the amount of SW sent to the landfill is closely tied to the fluctuating population at the Renard mine, with the highest rate of landfilled waste being recorded in February 2021.

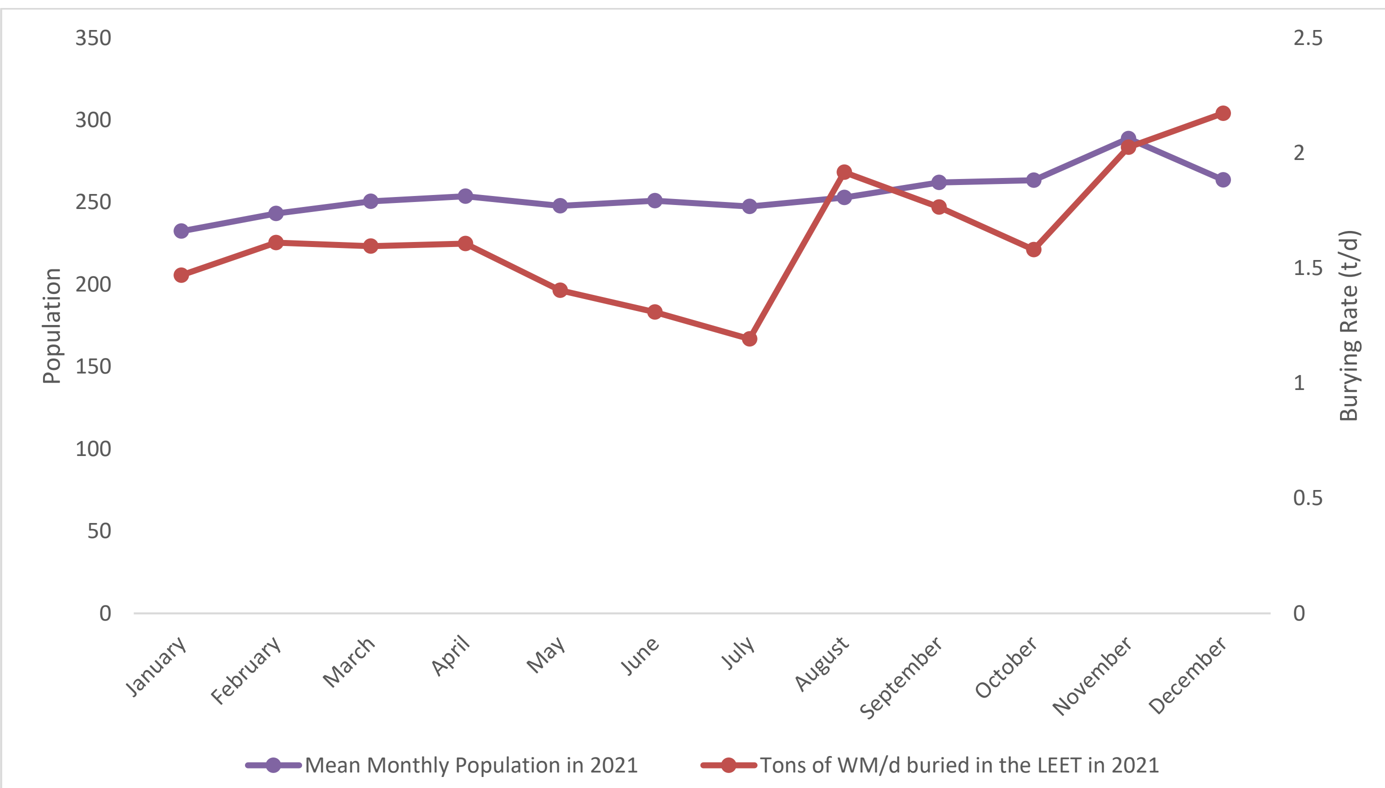



**Figure 2.13 Monthly solid waste landfilling rates at the TLS based on the Renard camp population in 2021**

#### *2.5.2.4.1 Control of TLS*

The TLS is managed in compliance with applicable legislation. TLS management procedures include covering the cells from May to October to minimize the dispersion of waste and prevent odours. A TLS operations report is submitted to the MELCC every March.

The landfill operator conducts a visual inspection of every load of solid waste that arrives at the landfill in order to confirm whether or not it is suitable for the landfill site. The only waste materials allowed into the landfill site are those produced by activities at the Renard mine. The landfill operator is the only one with access to the site, and the landfill gate is secured with a lock.

#### *2.5.2.4.2 TLS structure*

Trenches are dug as needed to prevent water from coming into contact with the waste. Every fall, a larger trench is excavated to meet the site's landfilling needs over the course of the winter, when excavation is more difficult. Overburden is stored at the site for use as surfacing materials (Photo 2.4).

**Photo 2.4 Aerial view of the TLS (September 6, 2021)**

Solid waste placed in the trenches is covered with a layer of soil at least once a week from May to October, as specified in the regulations. SW management is critical during this period of the year.

- Higher summer temperatures can lead to bad odours from the site,
- and the lack of snow cover exposes waste to being dispersed by the wind.

The site is cleaned regularly to prevent the dispersal of waste. When solid waste in the trenches has reached its final height (3 m) as specified in the certificate of authorization for the construction and operation of the TLS, a 60-cm layer of soil composed of impermeable material is placed on top of the trench and then graded to prevent water accumulation.

A final layer of topsoil (15 to 30 cm) is then placed on the impermeable material. The cells are covered as they are filled to allow for the progressive rehabilitation of the TLS.

#### *2.5.2.4.3 Operating cells*

Two cells were used in 2021. 675 $m^3$ of soil was used to partially cover these cells in summer 2021, including 340 $m^3$ of compost as final cover. As of December 31st, 2021, two cells were still open and in use.

The amount and nature of the waste materials buried at the TLS, the materials used to cover said waste materials, and the materials used for the final cover are recorded in a logbook and presented in the TLS annual report, which is submitted to the MELCC on March 15th each year.

### 2.5.2.5 Control of residual hazardous materials and the RHM storage area

The main residual hazardous materials (RHM) produced at the Renard mine site are:

- waste oil, used grease, and oil-contaminated solids (filters, aerosols, various containers, etc.);
- various solutions (fuel, anti-freeze, detergents, etc.) and hazardous acids;
- batteries;
- and biomedical waste.

This waste is recovered, sorted and stored in the hazardous waste area (RHM) temporarily before being taken off site to be treated, recovered or recycled by specialized firms (Photo 2.5). The types and quantities of materials stored are recorded in a log on site.

**Photo 2.5 Loading residual hazardous materials for processing (August 2021)**

#### *2.5.2.5.1 Quantities of RHMs*

Table 2.4 shows the amount of RHM that have been taken off the mining site since 2015, which is approximately 1,352 tonnes. Considering the return to normal mining activities in October 2020, the amount of RHM sent off site in 2021 (243.1 t) is similar to or higher than the amount sent off site in 2019 (223.6 t).

**Table 2.4 Quantities of residual hazardous materials shipped off site and tonnes of dry processed ore since 2015**

| Year | Process (tonnes) | |
|---|---|---|
| | RHM Shipped | Processed Ore (dry) |
| 2015 | 125.1 | N/A |
| 2016 | 150.3 | N/A |
| 2017 | 183.5 | 1,990,906 |
| 2018 | 237.1 | 2,328,300 |
| 2019 | 223.6 | 2,556,459 |
| 2020 | 189.1 | 1,106,697* |
| 2021 | 243.1 | 2,458,846 |
| Total depuis 2015 | **1,351.8** | 9,334,511 |

N/A : construction year
* : temporary halt in production from March to October (COVID-19)

#### *2.5.2.5.2 Distribution of RHM*

Figure 2.13 shows the amount of RHM shipped off site in 2021 broken down by category. The amounts of RHM generated in 2021 illustrate the return to full-time mining activity similar to that of 2019.

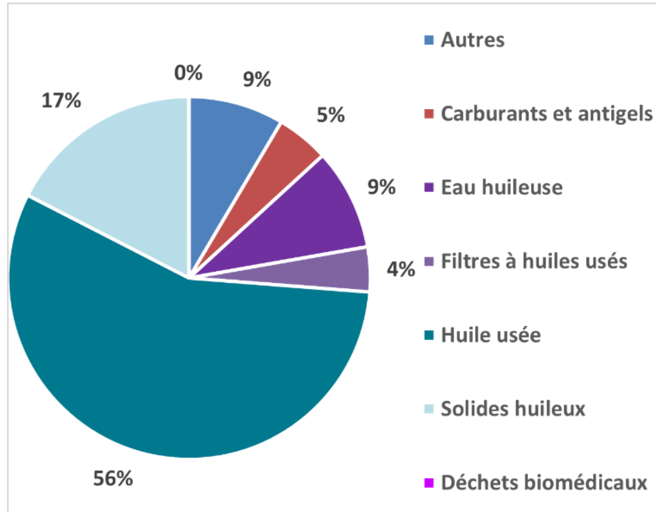



**Figure 2.14 Types of residual hazardous materials shipped off site in 2021**

One example is waste oils used for machine maintenance, which account for nearly 56% of the total RHM sent off site, which is identical to 2019 (56%) and more than 2020 (43%).

The same goes for the “Other” category, which includes waste grease, acids, contaminated containers, aerosols, batteries, and other substances, which amounted to 9% of the total RHMs shipped off site in 2021, which is identical to that of 2019 (9%) and less than that of 2020 (13%).

Biomedical waste (BMW) generated at the Renard mine site is recovered at the infirmary. This waste includes infectious non-anatomical waste (e.g., blood-soaked bandages), and sharp infectious non-anatomical waste (e.g., contaminated needles).

In 2021, a total of 91.5 kg of BMW was shipped off site for disposal, as compared with 84.5 kg in 2020 and 20.3 kg in 2019. The increase in the amount of biomedical waste since 2020 is a direct result of the materials needed to conduct COVID-19 testing, which began on the site in March 2020 (Figure 2.15).

The amount of BMW generated in 2021 is more than 2020, when mining activity was temporarily halted for a period of six months (COVID-19).

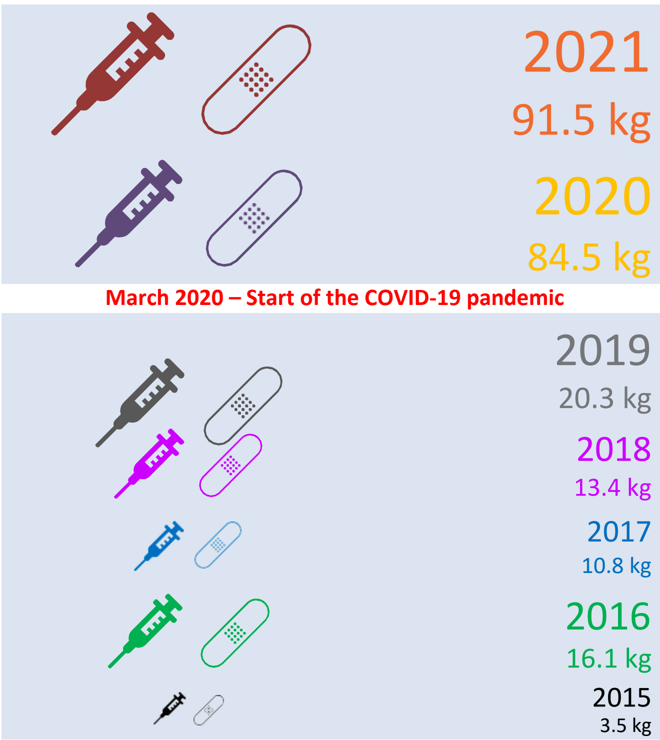



**Figure 2.15 Effect of the COVID-19 pandemic on the amount of biomedical waste generated at the Renard mine site since 2015**

## 2.5.3 Contaminated Soil Management

In 2021, no contaminated soil was added to the biopile treatment bed. SWY's goal is to ensure the Renard mine is free of contaminated soils.

That is why the contaminated soil processing cell is no longer used. Contaminated soil is transported to the RSI Environment processing centre in Saint-Ambroise. The on-site treatment area will be reopened if the mine has a large quantity of soil that needs to be decontaminated. In that case, it would be more cost effective to use the treatment bed than to ship a large number of containers of soil off site for treatment.

In 2021, contaminated soil was all shipped to MELCC-authorized treatment centers. A sample is taken before each load of contaminated soil is sent off site in order to determine their levels of contamination and ensure they will be accepted by the treatment centres they are being transported to (Photo 2.6). In 2021, a total of 356 tonnes of contaminated soil was shipped to the Saint-Ambroise treatment centre for incineration (Photo 2.7), as compared with 192 tons in 2020 and 426 tons in 2019.

**Photo 2.6 Sampling of contaminated soil (October 4, 2021)**

An average of 0.145 kg of contaminated soil was treated per tonne of processed kimberlite in 2021, as compared to 0.173 kg/t in 2020, for a decrease of 17%. As compared to the 2017 average of 0.367 kg/t, the treatment of contaminated soil in 2020 has decreased by 63% in four years.

This decrease is the result of SWY's decision to to reduce the amount of contaminated soil being sent out for treatment. Whenever a container reaches capacity, a sample is taken so that the mine has a representative sample of every load of contaminated soil sent off-site. The soil is sent to an external laboratory for contaminant analysis.

**Photo 2.7 Transport of contaminated soil (September 2021)**

# 3 Environmental Monitoring Program

The Environmental and Social Monitoring Program (ESMP) is required under Condition 4.1 of the Global Certificate of Authorization (CA) and the Comprehensive Study Report (CSR) published by the Canadian Environmental Assessment Agency (CEAA, 2013).

The Environmental and Social Monitoring Program is part of a larger environmental and social management framework based on the ISO 14001:2015 standard.

**PURPOSE OF THE ESMP**

**To measure, observe, and document any and all changes (whether naturally occurring or a result of the project) in the environment as compared to the baseline. To confirm the environmental assessment and evaluate the effectiveness of mitigation measures in place.**

In the event that an unexpected adverse impact on the environment is detected and adaptive management is deployed, these mitigation measures will be adjusted accordingly.

The Renard mine's ESMP enables SWY not only to detect environmental issues early on, but also to uphold their commitments to various governmental authorities and host communities.

## 3.1 Weather and Climate

**3.1 PURPOSE OF MONITORING**

**To measure meteorological conditions on the mine site.**
**To make it easier to interpret the data collected during environmental monitoring.**
**To distinguish between direct effects of the project and those caused by natural variations in meteorological conditions at the site.**

The specific objectives of monitoring are to:

- To provide the meteorological information necessary for mining operations as well as the design and operation of water management facilities, and ensure the mine site as a whole is managed properly;
- To track snow depth and ice thickness at the mine site;
- To assist with the interpretation of air and water quality monitoring data;
- To assist with the interpretation of hydrological monitoring data.

Support the interpretation of hydrological monitoring results. One is at the airport and the other is near Lake Lagopede (Photo 3.1). The water level stations are described in section 3.4.1

**Photo 3.1 Weather station near Lake Lagopede (December 2021)**

In order to uphold the commitments made by Stornoway in the ESIA (Roche, 2011a), as well as the Global CA and subsequent updates, these monitoring activities are carried out according to the following schedule:

- Weather and water level data is recorded continuously;
- Data recorded at weather stations is downloaded onto the network continuously.

Data collected at the airport is used primarily for aviation purposes. Data collected at the Lake Lagopede weather station is used for analytical purposes, as it is located closest to mining operations.

The Lake Lagopede weather station records a number of parameters every two minutes, enabling an in-depth analysis of weather conditions at the Renard mine site. These measurements include air temperature, relative humidity, atmospheric pressure, and wind speed and direction.

A precipitation gauge was installed near the weather tower to measure precipitation all year round.(Photo 3.2). A pyranometer was also installed in 2016 to calculate solar radiation near Lake Lagopede. This data is needed to determine evaporation rates from Lake Lagopede, which are in turn used to calculate the water balance at the mine site (see 3.4.4).

**DID YOU KNOW?**

**SWY collaborates with the MELCC by sharing all the raw weather data it collects each year, thus contributing to the database maintained by Quebec's climate monitoring program.**

**Photo 3.2 Precipitation gauge near the weather station (April 2021)**

### 3.1.1 Temperature

Figure 3.1 shows the variation in daily minimum and maximum temperatures observed in 2021.The average temperatures recorded at the Renard mine site in 2021 are comparable with historical averages for the La Grande River (1981-2010) and Bonnard (1981-2010) stations (Table 3.1).

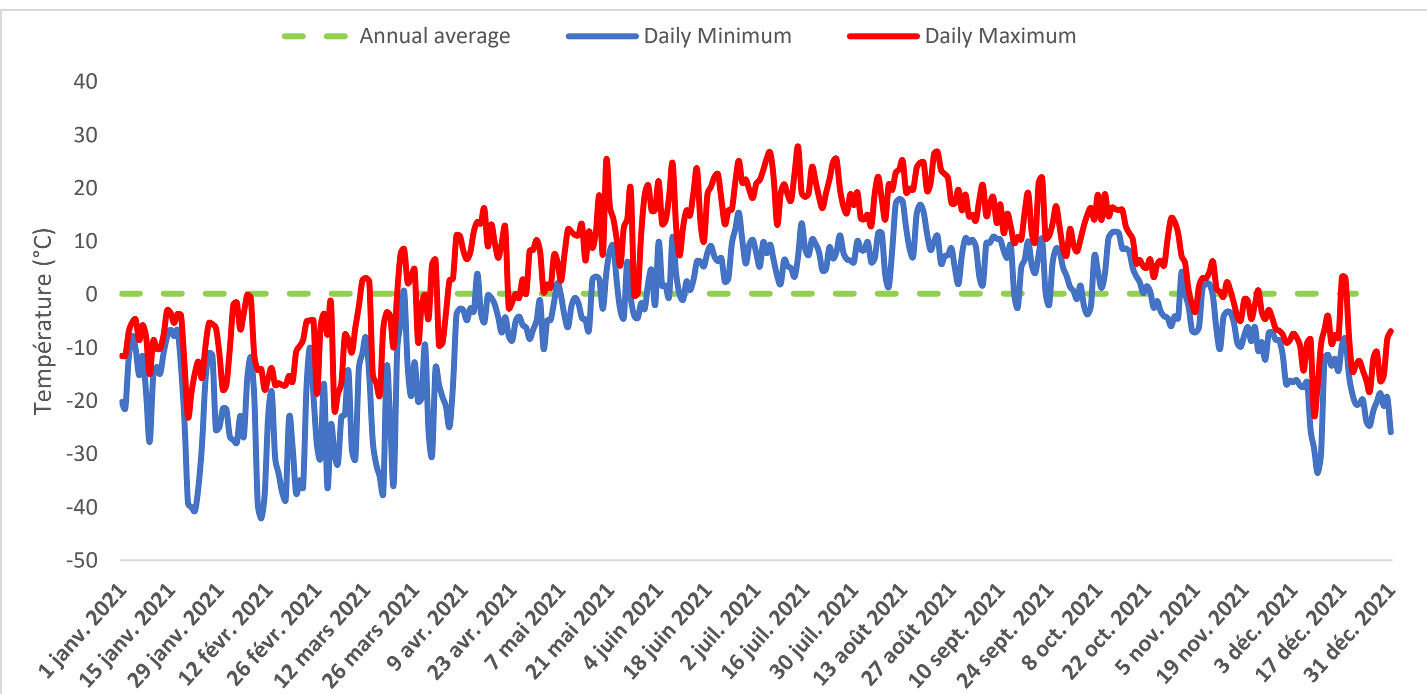



**Figure 3.1 Daily minimum and maximum temperatures in 2021**

**Table 3.1 Monthly temperatures at the mine site in 2020 and 2021**

| Month | Average temperature at the Renard mine weather station (°C) | | Average temperatures at nearby weather stations (°C) | |
|---|---|---|---|---|
| | In 2020 | In 2021 | La Grande Rivière (1981-2010) | Bonnard (1981-2010) |
| January | -18.89 | -14.01 | -23.2 | -20.9 |
| February | -17.81 | -17.97 | -21.6 | -18.0 |
| March | -14.47 | -12.05 | -14.5 | -11.4 |
| April | -5.03 | -0.24 | -5.0 | -1.9 |
| May | 2.52 | 4.62 | 4.3 | 5.8 |
| June | 10.89 | 11.87 | 10.8 | 12.0 |
| July | 17.36 | 14.54 | 14.2 | 14.5 |
| August | 14.12 | 15.08 | 13.1 | 13.5 |
| September | 7.79 | 10.25 | 8.1 | 8.6 |
| October | -0.47 | 6.52 | 1.7 | 1.9 |
| November | -5.60 | -3.20 | -6.1 | -6.7 |
| December | -12.97 | -10.31 | -16.0 | -16.0 |

The trends observed at the mine site in 2021 were in line with observations from the rest of the province. 2021 marked the second-warmest winter in Quebec in 100 years, along with a hot spring and summer (from April to September) and the hottest October in 101 years (MELCC, 2022). The temperatures in November and December were also fairly mild. They were slightly higher than the same period in 2020, and slightly higher than the temperatures measured at nearby weather stations.

### 3.1.2 Precipitation

Table 3.2 lists the monthly precipitation measured at the Renard site in 2021, as compared with the historical averages at the La Grande River station (1981-2010). Monthly precipitation data is also compared with the multi-year monthly averages for the Nitchequon station, located 97 km from the site, and the station closest to the site (Golder, 2011a and 2015). This station is the most representative of historical weather conditions observed at the Renard mine.

In 2021, the precipitation recorded at the Renard mine was generally comparable to historical data, with a few notable differences.

#### January and February 2021

In January and February 2021, the amount of precipitation measured at the mine site was much less than in 2020 and much less than the historical average for the same months (Table 3.2).

#### March and April 2021

Overall, there was significantly more precipitation than in recent years and as compared to historical data. A technical issue with the precipitation gauge produced incorrect data for April, hence the missing data.

#### May to July 2021

July was the only month during which precipitation at the site was comparable to historical data and less than that measured in 2017 through 2020. In the rest of the province, the summer was marked by a series of dry spells and heat waves (MELCC 2022).

#### September and October 2021

In September, the residual effects of Hurricane Ida reached Quebec, causing unusually heavy precipitation (MELCC, 2022), which is reflected in the precipitation recorded at the mine site in September. Finally, October at the Renard mine was relatively dry, whereas the southeastern part of the province had a more normal amount of rainfall (MELCC, 2022).

#### November and December 2021

In November and December, the mine site had an unusually high amount of precipitation as compared to previous years and historical data.

**Table 3.2 Monthly precipitation measured in 2021**

| Month | Monthly Precipitation (mm) Measured at La Grande River | Estimated Multi-Year Monthly Averages (mm) at Renard Mine | | Monthly Precipitation (mm) Measured at Renard Mine | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1981-2010) | (Golder, 2011a) | (Golder, 2015) | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| January | 31 | 38 | 36 | - | 49 | 45 | 15 | 14 | 10 |
| February | 22 | 32 | 28 | - | 59 | 29 | 71 | 16 | 11 |
| March | 29 | 39 | 36 | - | 12 | 11 | 37 | 25 | 51 |
| April | 33 | 39 | 34 | - | 44 | 24 | 39 | 37 | N/A |
| May | 39 | 58 | 55 | - | 59 | 57 | 63 | 69 | 74 |
| June | 65 | 89 | 84 | - | 91 | 81 | 110 | 65 | 128 |
| July | 78 | 107 | 105 | - | 126 | 198 | 101 | 133 | 79 |
| August | 91 | 111 | 107 | - | 98 | 65 | 101 | 117 | 128 |
| September | 111 | 100 | 98 | - | 59 | 129 | 106 | 159 | 168 |
| October | 87 | 81 | 79 | 113 | 120 | 72 | 60 | 67 | 40 |
| November | 68 | 61 | 58 | 43 | 64 | 40 | 34 | 84 | 81 |
| December | 43 | 61 | 35 | 32 | 40 | 36 | 36 | 50 | 45 |
| Annual Average | *58* | *68* | *63* | *63* | *68* | *66* | *64* | *70* | *74* |
| **Total** | **697** | **798** | **755** | **188** | **821** | **787** | **773** | **836** | **815*** |

N/A : data unavailable due to a technical problem

*: average for 11 months

### 3.1.3 Snow and Ice Cover

#### 3.1.3.1 Snow depth and ice thickness

Snow cover and ice thickness were measured at the mine site during the winter months (generally from November until May) at the mine site (photo 3.3). The depth of snow cover naturally affects the rise in water levels each spring. This measurement is used to calculate the water balance for the mine site for winter 2020-2021.

**Photo 3.3 Measuring ice thickness on Lake F3297 (December 12, 2020)**

Table 3.3 shows the maximum snow cover recorded on Lake Lagopede each winter since 2015, as well as the maximum ice thickness on the lakes since April 2015, which is to say the total measurement of both white and black ice (average of the AQR69, AQR70 and AQR71 stations, unless otherwise specified).

**Table 3.3 Snow depth and ice thickness (average of the AQR69, AQR70 and AQR71 stations) on Lake Lagopede**

| Winter | Date | Maximum Thickness (cm) | |
|---|---|---|---|
| | | Snow | Ice |
| 2014-2015 | 2015-04-20 | - | 84 (AQR 62) |
| 2015-2016 | 2016-03-16 | 37 | - |
| | 2016-04-02 | - | 79 |
| 2016-2017 | 2017-03-01 | 53 | - |
| | 2017-04-03 | - | 84 |
| 2017-2018 | 2018-03-08 | 29 | - |
| | 2018-04-07 | - | 94 |
| 2018-2019 | 2019-03-18 | 41 | - |
| | 2019-04-06<br>2019-04-10 | - | 84 |
| 2019-2020 | 2020-03-03 | 42 | - |
| | 2020-04-04 | - | 82 (Dock) |
| 2020-2021 | 2021-03-06 | 31 | - |
| | 2021-04-02 | - | 74 |

The results for 2021 show that the maximum ice thickness remains comparable to before the production phase (2015-2016), although it was lower than the last few years.

The snow cover and ice depth on Lake Lagopede during the 2020-2021 winter season are presented in Table 3.4. For 2021, Lake Lagopede thawed on May 13th, 2021, 17 days earlier than in 2020 (May 30th). This may have been a result of the unusually warm winter in 2021 (see section 3.1.1).

**Table 3.4 Snow depth and ice thickness on Lake Lagopede during winter 2021**

| Sampling Date | Snow and Ice Cover (in cm)* | | | |
|---|---|---|---|---|
| | Snow | White ice | Black ice | Total ice |
| 2021-01-02 | 27 | 5 | 32 | 37 |
| 2021-01-09 | 16 | 17 | 9 | 26 |
| 2021-01-16 | 19 | 14 | 17 | 31 |
| 2021-02-01 | 11 | 21 | 25 | 47 |
| 2021-02-06 | 15 | 10 | 22 | 32 |
| 2021-03-06 | 31 | 32 | 22 | 54 |
| 2021-04-02 | 1 | N/A | N/A | 74 |
| 2021-05-13 | The lake has stalled. | | | |

N/A : white and black ice combined

* : average of the AQR69, AQR70 and AQR71 stations

### 3.1.3.2 Snow accumulation

The total accumulation of snow on the ground is also measured near the MER1 weather station. A maximum snow accumulation of 96 cm was measured on the ground on March 14th, 2021 which is less than the maximum recorded on the same date in 2020 (120 cm). For winter 2021-2022, the first snow accumulation measurement took place on November 1st, 2021, one and a half months later than in 2020 (September 17th).

### 3.1.3.3 Snow density

Stornoway has been calculating snow density since winter 2018-2019. To do this, a snow core is taken and the corresponding snow depth (in cm) is noted. This is done weekly at the Lake Lagopede station throughout the snow cover period (photo 3.4).

The snow sample is weighed so that the weight and depth of the snow can be used to calculate the density of the snow at the site (in %).

The lower the snow density, the airier the snow is; the higher the density, the more compact and waterlogged the snow is.

**Photo 3.4 Measuring snow density (December 26, 2021)**

In 2021, the maximum snow density measurement was 38%, which is higher than the maximum in 2020 (34%), meaning that the snow was more compact (Table 3.5).

**Table 3.5 Maximum snow density on the Renard mine site from 2019 to 2021.**

| Date | Depth | Weight | Density |
|---|---|---|---|
| | cm | cm water equivalent | % |
| 2019-04-26 | 100 | 34 | 34.00 |
| 2020-04-12 | 80 | 27 | 33.75 |
| 2021-04-10 | 61 | 23 | 38.00 |

Measurements of snow density are combined with measurements of snow accumulation to calculate the quantity of water runoff during the spring thaw. This data is used in hydrological studies of the north basin of Lake Lagopede (see section 3.4 for more details).

### 3.1.3.4 Winds

The weather station near Lake Lagopede (MER1) is also used to help develop the wind rose for the mine site and to assist with the interpretation of air quality monitoring data (Photo 3.5).

The prevailing winds (from the south and southwest) in the area around the mine site are influenced primarily by the water masses of James Bay and, more locally, by the presence of a varied terrain that includes numerous lakes and rivers. With two main seasons, winter and summer, and very short transitions between the two, the prevailing climate at the mine site is a cool summer climate.

**Photo 3.5 MER1 weather station (April 2021)**

Figures 3.2 to 3.5 show quarterly wind roses for 2021. Table 3.6 provides wind-related information (speed, prevailing winds, and proportion of calm winds) as well as precipitation.

The winds measured at the weather station in 2021 came primarily from the south, as was the case in 2020 (Table 3.6). In spring of 2021, the winds were primarily from the north and west (Table 3.6). Section 3.2.2 describes the effect of wind on measurements from stations AIR1 to AIR6, which are used to monitor air quality.

**DID YOU KNOW?**

**The strongest winds are generally observed in April, June and September.**

This general trend continued in 2021 with the highest winds being observed in September. The maximum wind speed was 51.05 km/hour, which was measured from 6:22 to 6:24 pm on September 21st. Strong winds in September and October are, among other things, a sign of the beginning of lake trout spawning season (section 3.10.2). That is one of the reasons why it is important to monitor the weather around the Renard mine site closely.

**Table 3.6 Weather conditions during air quality monitoring campaigns in 2021**

| Season | Average Wind Speed (km/h) | Prevailing Winds | Calm winds (<6 km/h) | Average daily precipitation (mm/d) | Stations Downwind |
|---|---|---|---|---|---|
| **Winter** 2020-12-21 – 2021-03-20 | 10.04 | south and west | 32.40% | 0.89 | AIR3, AIR4, AIR5, AIR6 |
| **Spring** 2021-03-20 – 2021-06-21 | 15.15 | north and west | 25.72% | N/A | AIR3, AIR6 |
| **Summer** 2021-06-21 – 2021-09-22 2021 | 12.80 | sou th | 25.85% | 3.86 | AIR4, AIR5, AIR6 |
| **Fall** Sept. – 2021-12-21 | 11.22 | south and west | 24.63% | 2.48 | AIR3, AIR4, AIR5, AIR6 |

n.a.: not applicable, only one sampling over this period (COVID-19 pandemic)
N/A: not available due to a technical issue

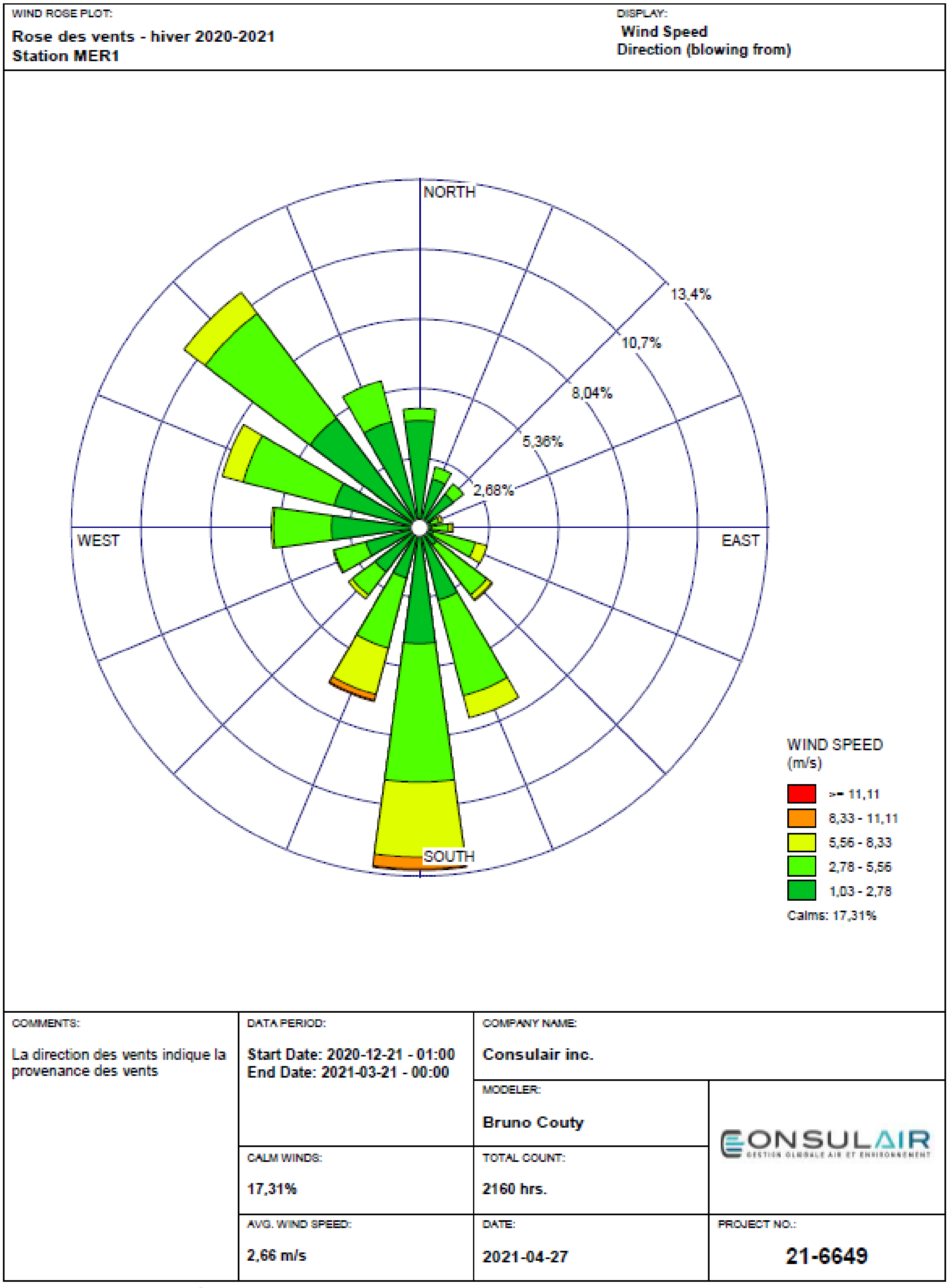
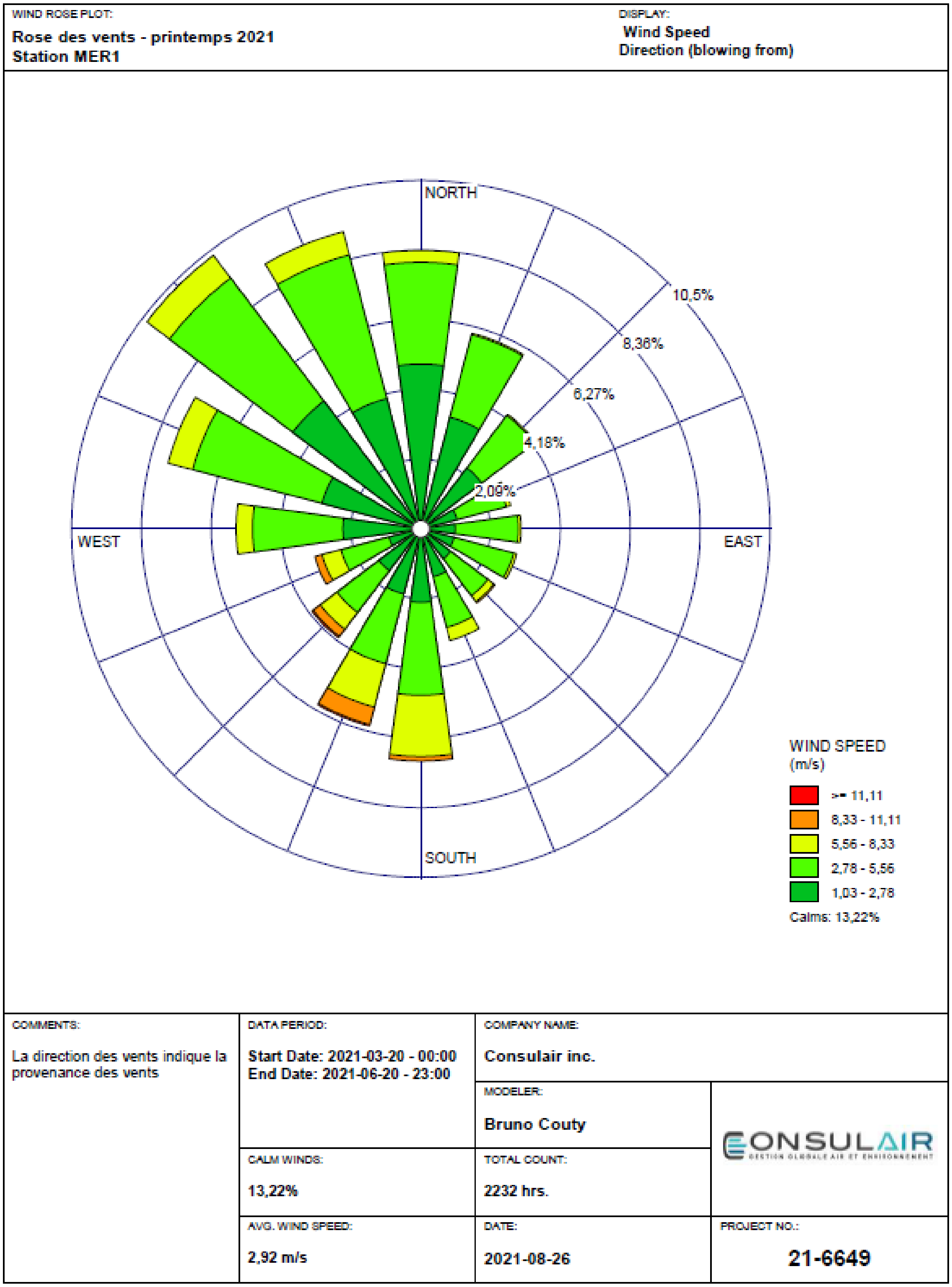



**Figure 3.2 Wind rose at the Renard mine for the 1st quarter of 2021.**




WRPLOT View - Lakes Environmental Software

**Figure 3.3 Wind rose at the Renard mine for the 2nd quarter of 2021.**

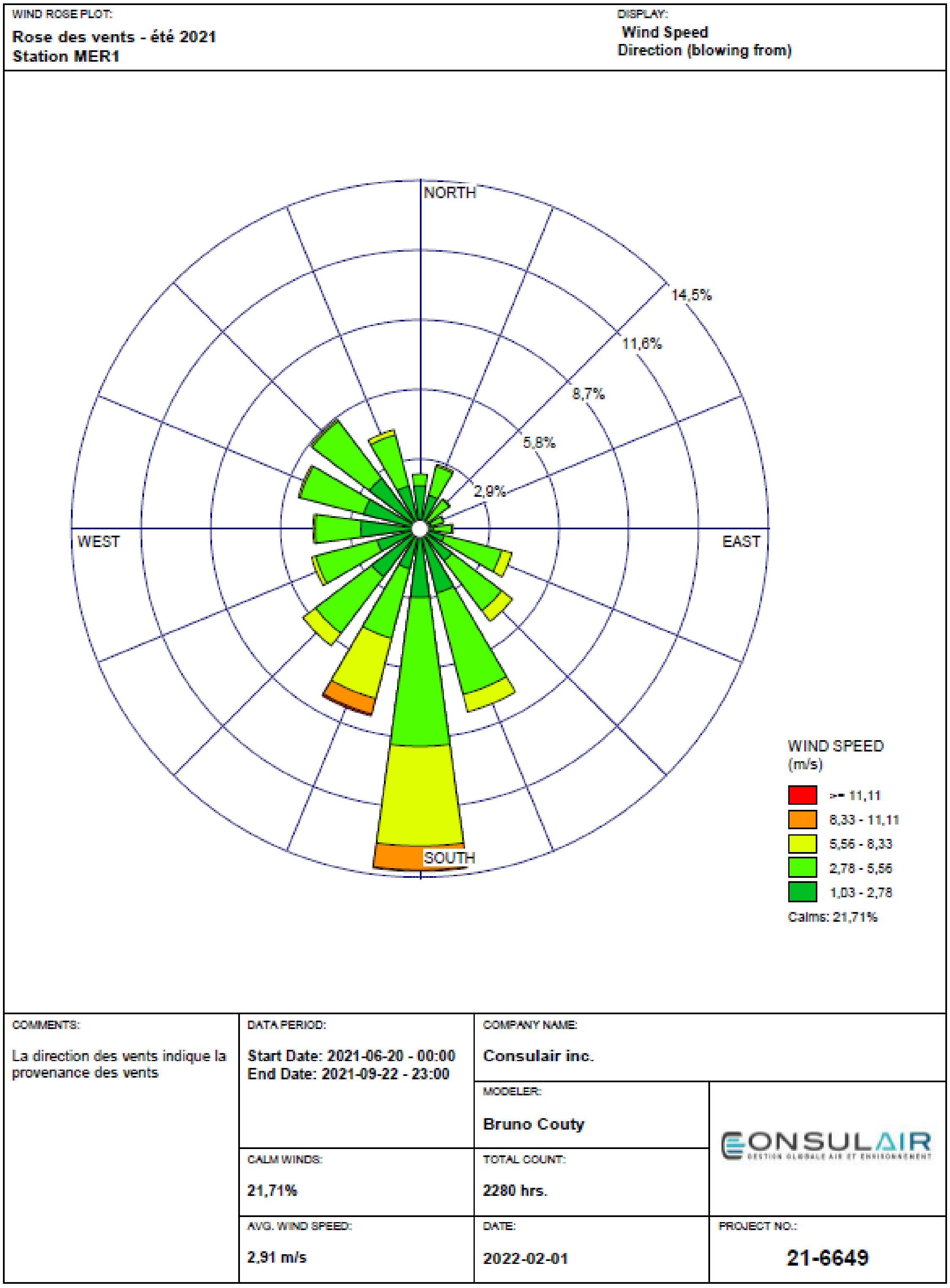



**Figure 3.4  Wind rose at the Renard mine for the 3rd quarter of 2021.**

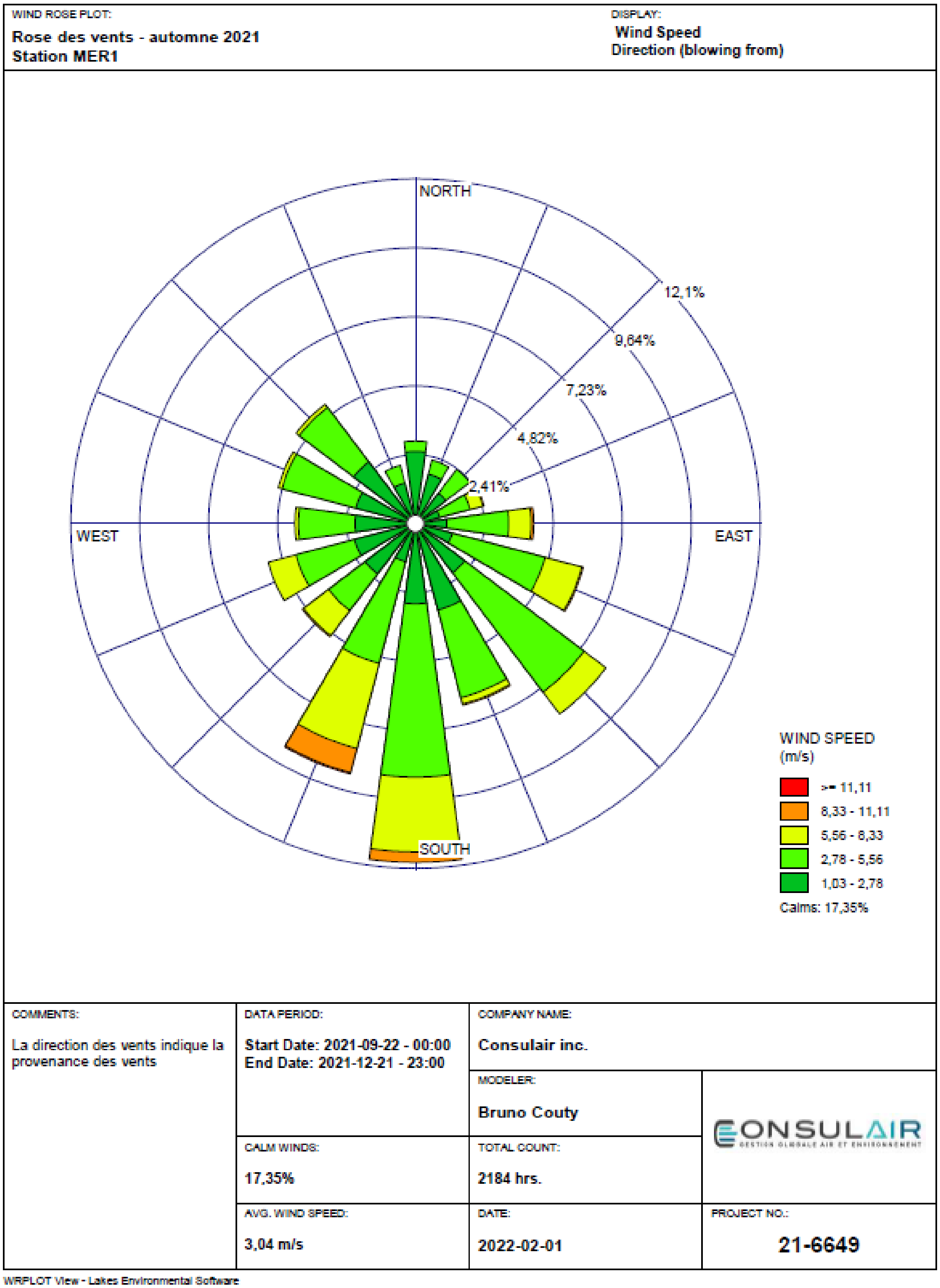



**Figure 3.5 Wind rose at the Renard mine for the 4th quarter of 2021.**

## 3.2 Air Quality and Atmospheric Emissions

### 3.2.1 Air scrubber management

In order to control air contaminant emissions at the source, during the construction of the ore processing plant, four dust collectors (PEP-3-4-5-6) were installed above the primary sources of point emissions, namely equipment used for crushing, grinding, and sorting ore. The dust collectors and scrubbers were implemented starting in July 2016.

A dust collector cleaning and maintenance program was established to ensure the equipment continued to operate smoothly. The dust collectors are maintained by personnel from the ore processing plant.

SWY has also had an air quality monitoring program in place since 2016 (section 3.2.2). This program is designed to demonstrate and confirm the effectiveness of the air scrubbing equipment installed at the mine site.

#### 3.2.1.1 Dust collector monitoring

SWY adjusted its plan for the monitoring and maintenance of dust collectors in 2019 to align with the frequency of inspections required by the MELCC (Table 3-1 of Annex 2) in order to qualify for the depollution attestation, which includes new atmospheric emissions requirements.

Operators from the ore processing plant inspect dust collectors (PEP-3, 4, 6) and cyclones weekly (instead of every two weeks as before) and note important information in a special log. The ore processing plant also conducts monthly inspections and maintains a log for the PEP-5 scrubber.

In addition, all dust collectors with a capacity of more than 17,000 m³, as well as the wet dust collector installed at the ore processing plant, are equipped with passive leak detectors. This continuous leak detection system is connected to the control system, in accordance with CAR requirements (Q-2, r. 4.1) for a continuously operating system for the detection of leaks and/or system failures.

Weekly inspections and monthly preventive maintenance checks are carried out on the cyclones installed at the ore processing plant.

The inspections conducted in 2020 resulted in no anomalies or special reports being filed, and no dust emissions were observed or recorded from the air scrubbing equipment.

#### 3.2.1.2 Diffuse emission monitoring

As part of the depollution attestation, regular inspections of the tailings ponds, waste rock piles and ore stockpiles were also carried out by the environment technician to check for diffuse emissions. The goal was to detect the presence of any visible particles more than two metres away from emission sites.

No dust emissions were observed at any of the sites visited during inspections in 2021. However, diffuse emissions can obviously be observed along the mining paths when machinery passes by during the dry season. As soon as summer begins, the dust suppressant is used as a mitigation measure as specified in the impact study (Roche, 2011a), in particular during dry spells in the summer season. The frequency of inspections is specified in Table III-1 and the points to be checked are listed in Table III-2 of Appendix II (PED-1,2,3,4,5,6,7,8,9,10) and (PT-1, 7).

### 3.2.2 Air Quality Monitoring

**The monitoring of ambient air quality and atmospheric emissions focuses on five main components:**

1 **Meteorological data (see section 3.1);**

2 **Hydrometeorological data (see section 3.4);**

3 **Measurement of contaminants in ambient air and dustfall rates;**

5 **Measurement of contaminants from point emission sources;**

**Evaluation of the amount of fuel and natural gas required for mine operations (see section 3.2.3).**

#### *3.2.2.1.1 Regulatory framework*

As laid out in the ESMS, the air quality is monitored in order to ensure the concentrations of contaminants measured in the ambient air are compliant with the standards laid out in the Clean Air Regulations (CAR, Q-2, r. 4.1). This monitoring also confirms that the source emissions standards indicated in the same regulations are being met. Air quality monitoring is performed in accordance with the quality assurance and control guidelines set out by the National Air Pollution Surveillance (NAPS) program.

#### *3.2.2.1.2 Recommendations for PM10 from Environment Canada*

In their June 2021 recommendations for air quality monitoring at the Renard mine, Environment Canada and Health Canada suggested measuring PM10 (≤ 10 µm). However, there is no Canadian standard for this measurement. The only standards available are the guidelines (50 µg/m$^3$ in a 24-hour period and 20 µg/m$^3$ in a one-year period) provided by the World Health Organization (WHO) as recommendations, rather than requirements. The City of Montreal is the only place in all of Quebec monitoring PM10.

### 3.2.2.2 Equipment

Monitoring ambient air quality also aims to ensure that the equipment used at the mine site has the necessary features and performance levels to measure atmospheric emissions with enough precision to confirm that the requirements laid out in the Clean Air Regulation (CAR) and the air quality targets as defined in the ESMP (Stornoway, 2019) are being met.

The monitoring equipment used include:

- Gauges, used to measure monthly dustfall rates;
- Passive $SO_2$ and $NO_2$ samplers, used to check whether emissions of these two contaminants comply with the annual average concentration standards set out in the CAR;
- A high volume (Hi-Vol) air sampler (TE-6070.2.5V) that draws in air and traps fine particles (particles with a diameter of ≤ 2.5 µm, otherwise known as PM2.5) on a filter.
- A high volume (Hi-Vol) air sampler (TE-5170V) that draws in air and traps total suspended particles (TSP) on a filter;

Hi-Vol devices measure not only the total suspended particulates (TSP), but also all other particles with a diameter of less than 25-50µm, which includes PM10s (≤ 10 µm in diameter).

**Photo 3.6 Installation of the sampling filter and calibration of the motor (August 23, 2021)**

### 3.2.2.3 Sampling stations

Air quality monitoring is carried out at six ambient air monitoring stations installed within and on the perimeter of the mine site (Photos 3.7 to 3.12), including a control station and five stations influenced by mining activity (Map 3.1). AIR1 and AIR3, on the property limits, are the only stations subject to CAR standards.

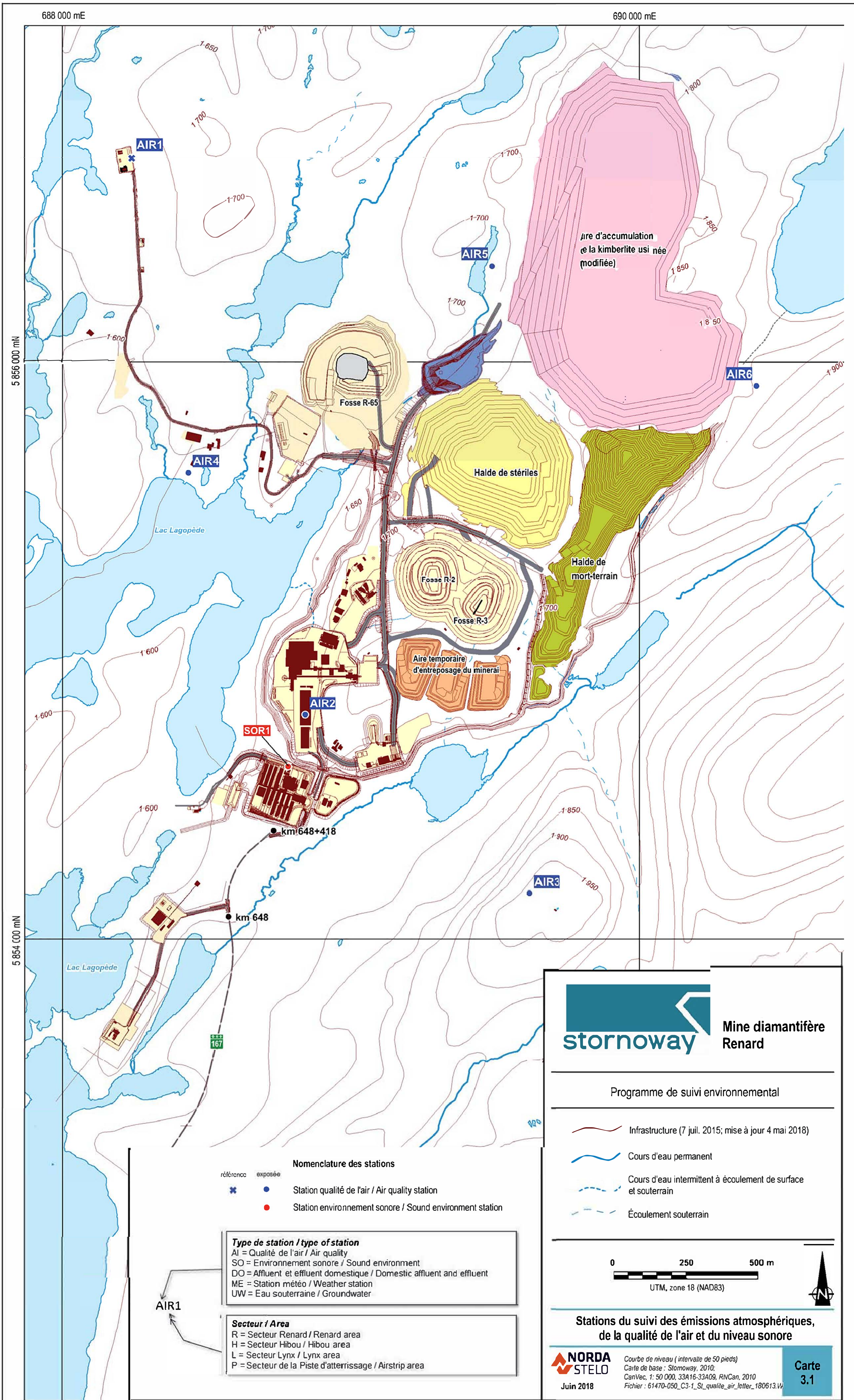
#### *3.2.2.3.1 AIR1 et AIR 3*

The AIR1 reference station is located upwind of the mine site in relation to the prevailing wind direction (along the northwest-southeast axis). It used to establish a baseline for total suspended particulates (TSP), PM2.5 fine particles, metals, SO2 and NO2 and dustfall rates.

The AIR3 station is generally located downwind of the mine in relation to the prevailing wind direction. A high-volume air sampler (TE-6070-2.5V) for $PM_{2.5}$ was installed at this station in November 2017 at the top of the telecommunications mountain, where it is exposed to the prevailing winds. Data from this station is compared with $PM_{2.5}$ measurements from the AIR1 station to assess the impact of the mine on ambient air quality at the edge of the property

#### *3.2.2.3.2 AIR2*

The first of the exposed stations, AIR2, provides specific observations.



688 000 mE
690 000 mE
5 856 000 mN
5 854 000 mN
AIR1
AIR2
AIR3
AIR4
AIR5
AIR6
SOR1
Aire d'accumulation de la kimberlite usinée (modifiée)
Fosse R-65
Halde de stériles
Halde de mort-terrain
Fosse R-2
Fosse R-3
Aire temporaire d'entreposage du minerai
Lac Lagopède
km 648+418
km 648
167
stornoway
Mine diamantifère Renard
Programme de suivi environnemental
Infrastructure (7 juil. 2015; mise à jour 4 mai 2018)
Cours d'eau permanent
Cours d'eau intermittent à écoulement de surface et souterrain
Écoulement souterrain
0
250
500 m
UTM, zone 18 (NAD83)
N
Stations du suivi des émissions atmosphériques, de la qualité de l'air et du niveau sonore
NORDA STELO
Juin 2018
Courbe de niveau ( intervalle de 50 pieds)
Carte de base : Stornoway, 2010;
CanVec, 1: 50 000, 33A16-33A09, RNCan, 2010
Fichier : 61470-050_C3-1_St_qualite_air_letter_180613.W
Carte 3.1
Nomenclature des stations
référence
exposée
Station qualité de l'air / Air quality station
Station environnement sonore / Sound environment station
Type de station / type of station
AI = Qualité de l'air / Air quality
SO = Environnement sonore / Sound environment
DO = Affluent et effluent domestique / Domestic affluent and effluent
ME = Station météo / Weather station
UW = Eau souterraine / Groundwater
AIR1
Secteur / Area
R = Secteur Renard / Renard area
H = Secteur Hibou / Hibou area
L = Secteur Lynx / Lynx area
P = Secteur de la Piste d'atterrissage / Airstrip area


**Photo 3.7 AIR1 sampling station (Sept. 2019)**

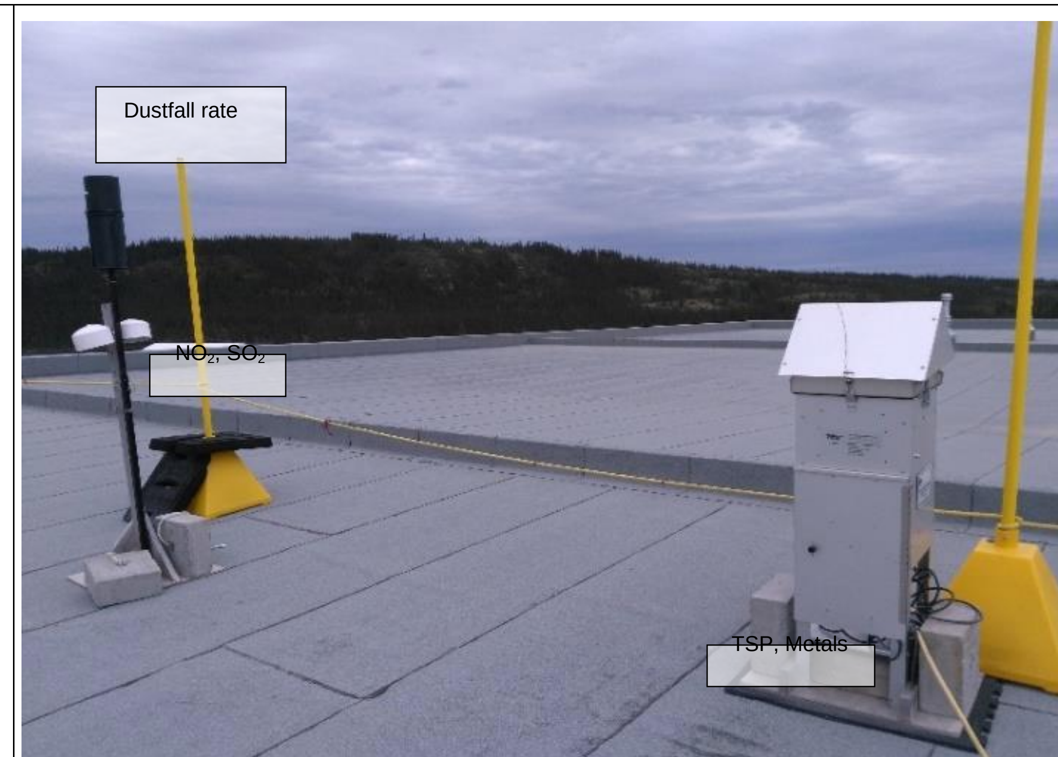



**Photo 3.8 AIR2 sampling station (June 2018)**

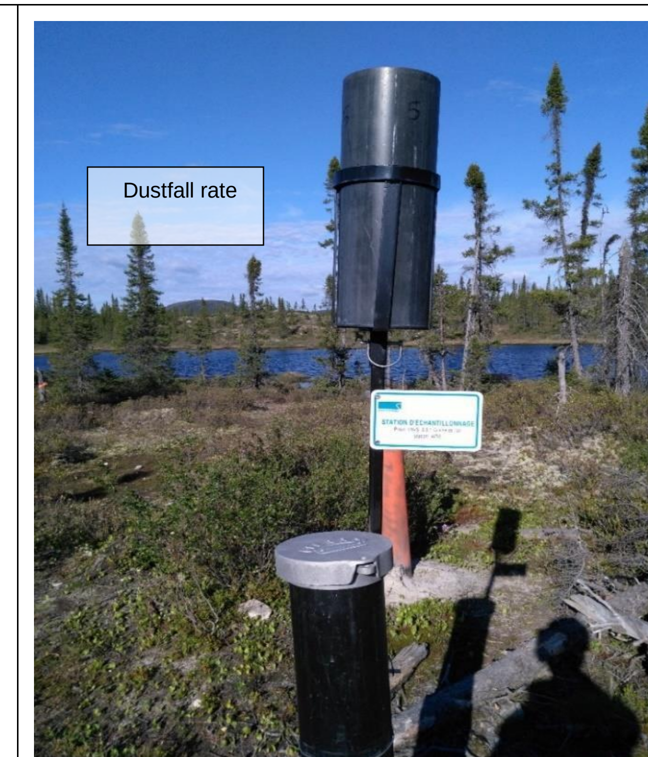



**Photo 3.9 AIR5 sampling station (June 2018)**


**Photo 3.10 AIR3 sampling station (June 2018)**


**Photo 3.11 AIR4 sampling station (June 2018)**

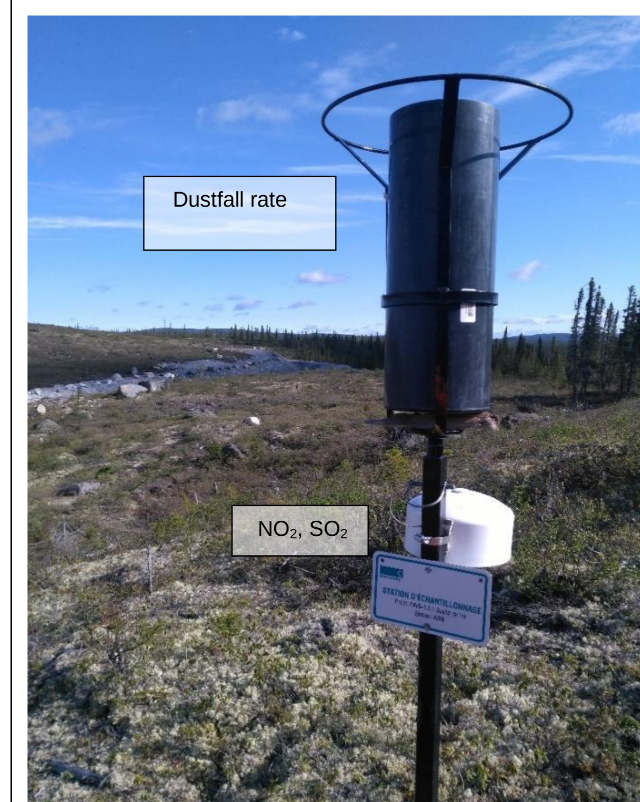



**Photo 3.12 AIR6 sampling station (June 2018)**

It is located at the heart of mining operations, between pit R2-R3 and the housing complex. The CAR air quality standards only apply to the property line, and therefore are not applicable to this station. The AIR2 station is used exclusively to monitor the exposure of workers in the centre of the the mine site and track emissions of total suspended particles (TSPs), metals, $SO_2$, $NO_2$ and dustfall near mining operations.

#### *3.2.2.3.3 AIR4 et AIR5*

Two other stations, AIR4 and AIR5, were also installed to measure dustfall rates from non-point sources (ex. pit R65) on Lake Lagopede (AIR4) and Lake F3298 (AIR5) (ex. From the MPKC facility). These measurements are used to compare annual ambient air quality results with the results of the air dispersion model (AERMOD) established in 2014 from nonpoint sources on Lake Lagopede and Lake F3298.

#### *3.2.2.3.4 AIR6*

Finally, an additional station (AIR6) was set up west of the modified processed kimberlite containment (MPKC) facility.

Data collected from this station is used to determine the levels of contaminants generated by mining operations in the area where the contaminant dispersion model estimated ambient nitrogen dioxide ($NO_2$) concentrations to be the highest.

### 3.2.2.4 Meteorological conditions

Wind speed and direction, along with precipitation, have a significant impact on air quality, in particular total suspended particles (TSP).

The relevant measurements are taken at the MER1 permanent weather station, which is located near the AIR4 air quality monitoring station.

### 3.2.2.5 Sampling period

Air quality sampling (TSP and $PM_{2.5}$) is to be conducted over a 24-hour period once every six days, in accordance with the NAPS program. The concentration of metals in ambient air is determined by analyzing the same filter used to calculate TSP concentrations.

### 3.2.2.6 2021 Results

#### *3.2.2.6.1 Meteorological conditions*

The meteorological data from station MER1 was used to develop the four seasonal wind roses for 2021 shown in Figures 3.2 to 3.5 in Section 3.1. According to the wind roses and for the three seasons during which the Renard mine was in operation in 2020 (winter, summer, fall):

- the AIR3 station was located upwind of the mine site in relation to the prevailing wind direction,
- and AIR1, AIR4 and AIR5 were located downwind of the Renard mine site.

For the third year in a row, the direction of prevailing winds as compared to the locations of the AIR1 and AIR3 stations was reversed. According to the meteorological data measured in the field in 2021, the AIR station was downwind and the AIR3 station was upwind of the mine site in relation to the prevailing winds. The meteorological models used for the 2011 impact assessment placed these two stations respectively upwind (AIR1) and downwind (AIR3) of the mine site.

#### *3.2.2.6.2 TSP and PM2.5*

Between January and December 2021, total suspended particulates (TSP) and PM2.5 concentrations were measured 61 times, which is comparable to 2019. The average TSP and PM2.5 levels measured at the property line (AIR1 and AIR3 stations) are presented in Table 3.7

**Table 3.7 Annual average TSP and PM2.5 concentrations at AIR1 and AIR3 from 2017 to 2021**

| Station | Annual average TSP concentration (CAR standard: 120 µg/$m^3$) (Annual recommendation from the WHO: 20 µg/$m^3$) | | | | |
|---|---|---|---|---|---|
| | 2017 | 2018 | 2019 | 2020* | 2021 |
| AIR1 | <23 | 10 | 7 | 3 | 8 |
| AIR3 | <10 | 7 | 4 | 3 | 9 |
| AIR2 | 55 | 40 | 25 | 9 | 53 |

**Table 3.7 Annual average TSP and PM2.5 concentrations at AIR1 and AIR3 from 2017 to 2021 (continued)**

| Station | Annual average PM2.5 concentration (CAR standard: 30 µg/m3 for a 24-hour period) (Annual recommendation from the WHO: 20 µg/m3) | | | | |
|---|---|---|---|---|---|
| | 2017 | 2018 | 2019 | 2020* | 2021 |
| AIR1 | <1,4 | 4 | 3 | 3 | 4 |
| AIR3 | N/A | 4 | 2 | 3 | 3 |

*: temporary halt in mining activity from March to October

N/A: below the limit of detection

In 2021, the average concentrations of TSP and PM2.5 were similar along the property line (AIR1: 8 µg/m³; AIR3: 9 µg/m³) and meet the relevant standards from the CAR (Consulair, 2021). In addition, they respect the annual recommendation from the WHO, which in turn means that they respect the recommendation for PM10 (Consulair, by email on February 16th, 2022).

In conclusion, the results of TSP and PM2.5 monitoring in 2021 show that mining activities do not cause the CAR's air quality standards to be exceeded at the perimeter of the property (AIR1 and AIR3 stations).

The same goes for TSP at the AIR2 station, which is located at the heart of mining operations. This has been true ever since 2017, even though CAR standards do not technically apply to this station (Consulair, 2020). The average TSP concentration at the AIR2 station increased in 2021. The data collected at this station in 2021 is comparable to that from 2017. Total production in 2021 was similar to that of 2019, so the TSP numbers for the AIR2 station are not the result of increased use of the crusher.

However, 2021 was a very dry year, and there were many dry days in May, June, and July. The water truck was used during daytime hours on several occasions in order to reduce dustfall, but this was not enough (Consulair, 2021).

It is important to note that the highest concentrations at AIR2 are generally observed in spring and summer, because during the two other seasons (fall and winter), the presence of snow cover tends to limit the suspension of particles caused caused by wind.

#### *3.2.2.6.3 Metals*

**In 2021, all concentrations of metals measured (24-hour concentrations) or calculated (annual average concentrations) at the property boundaries (AIR1 and AIR3 stations) as well as the AIR2 station met the applicable daily and yearly standards as laid out in the CAR (Consulair, 2020).**

Since there is no standard for total chromium, additional analyses are performed for trivalent and hexavalent chromium when the most restrictive standard for hexavalent chromium (0.004 µg/m³) is exceeded.

Additional analysis was performed on samples with elevated concentrations in order to confirm they complied with the standard. In 2020, the average total chromium concentration was less than the applicable CAR standards, including the most restrictive standard for hexavalent chromium.

#### *3.2.2.6.4 NO2 and SO2 concentrations*

Table 3.8 shows the annual concentrations of nitrogen dioxide ($NO_2$) and sulphur dioxide ($SO_2$) measured at the property limits (AIR1 and AIR3 stations) and in the heart of mining operations (AIR2) since 2017.

**In 2021, the concentrations measured at the stations, including AIR2, were well below CAR standards (NO2 and SO2)**

**Table 3.8 Annual average NO2 and SO2 concentrations at AIR1, AIR2 and AIR3 from 2017 to 2021**

| Station | Annual average $NO_2$ (ppb) [Standard: 54.8] | | | | |
|---|---|---|---|---|---|
| | 2017 | 2018 | 2019 | 2020 | 2021 |
| AIR1 | 0.6 | 0.4 | 0.2 | 0.2 | 0.2 |
| AIR3 | 0.8 | 0.6 | 0.7 | 1.0 | 0.3 |
| AIR6* | 1.0 | 0.5 | 0.4 | 1.0 | 0.3 |
| **Station** | **Annual average $SO_2$ (ppb) [Standard: 19.8]** | | | | |
| | 2017 | 2018 | 2019 | 2020 | 2021 |
| AIR1 | 0.2 | < 0.2 | < 0.2 | 0.1 | 0.1 |
| AIR3 | 0.2 | < 0.2 | < 0.2 | 0.1 | 0.1 |
| AIR6* | 0.2 | < 0.2 | < 0.2 | 0.1 | 0.2 |

**Table 3.8 Annual average NO2 and SO2 concentrations at AIR1, AIR2 and AIR3 from 2017 to 2021 (continued)**

| Station | Annual average $NO_2$ (ppb) [Standard: 3,000] | | | | |
|---|---|---|---|---|---|
| | 2017 | 2018 | 2019 | 2020 | 2021 |
| AIR 2 | N/A | N/A | 3.8 | 2.4 | 5.2 |
| **Station** | **Annual average $SO_2$ (ppb) [Standard: 2,000]** | | | | |
| | 2017 | 2018 | 2019 | 2020 | 2021 |
| AIR2 | N/A | N/A | 0.1 | 0.1 | 0.2 |

*: annual standards only apply to the property limits (AIR1 and AIR3 stations)

##### *3.2.2.6.5 Dustfall*

Table 3.9 presents the average annual dustfall rates measured at the five stations (AIR1, AIR3, AIR4, AIR5 and AIR6) and at the AIR2 station. Although there is not currently an applicable standard for this parameter, dustfall rates are compared with the reference value of 7.5 t/km$^2$/30 days set out in the CAR (Q-2, r.38 – standard which has since been repealed).

**In 2021, the annual average dustfall rates at the property limits were low, and well below the CAR standard, as has been observed since 2017 (Consulair, 2021).**

**Table 3.9 Annual average dustfall rates from 2017 to 2021**

| Station | Dustfall rate (Standard: 7.5 tonnes / km$^2$ / 30 days) Annual Average | | | | |
|---|---|---|---|---|---|
| | 2017 | 2018 | 2019 | 2020 | 2021 |
| AIR1 | 2.3 | 3.6* | 1.0 | 0.4 | 0.8 |
| AIR2 | N/A | N/A | 2.6 | 0.8 | 4.5 |
| AIR3 | 2.4 | 1.4 | 1.4 | 0.8 | 1.3 |
| AIR4 | 1.9 | 1.2 | 0.9 | 0.9 | 1.1 |
| AIR5 | 3.9 | 2.9 | 2.0 | 0.5 | 1.6 |
| AIR6 | 2.6 | 1.1 | 0.8 | 0.8 | 1.0 |

* value includes the effect of forest fires in June 2018,
value excluding this effect: 0.7 t/km$^2$/30 days

The highest monthly dustfall rate was measured in June 2021 at the AIR3 station. During this month, the AIR3 station was often downwind of the mine, which explains to the maximum rate measured of 3.0 t/km$^2$/30 days. This value, however, represents just 40% of the reference value of 7.5 t/km$^2$/30 days, which has since been repealed.

The standards listed in the CAR do not apply to the AIR2 station. However, the annual dustfall rate did increase in 2021, due to the dryness of the soil in spring. A dust suppressant was used on the mine site twice a day from spring (May) into summer (July), but was not enough, in particular in May (11.8 t/km$^2$/30 days) and June (9.2 t/km$^2$/30 days).

In conclusion, the parameters measured in 2021 as part of the ambient air quality monitoring program were all in compliance with applicable CAR standards at the Renard mine property limits.

### 3.2.3 Atmospheric and Greenhouse Gas (GHG) Emissions

Since 2016, Consulair has calculated the annual atmospheric emissions produced by mining activities at the Renard mine. These calculations include the emissions of greenhouse gases (GHG) and other pollutants often released by mining operations.

SWY submits the results of these calculations to the National Pollutant Release Inventory (NPRI), the Quebec Atmospheric Emissions Inventory (QAEI) and Environment and Climate Change Canada's (ECCC) Greenhouse Gas Reporting Program.

The environmental impact assessment estimated the total annual GHG emissions of equipment at the Renard mine to be on the order of 75,000 t (Co2-eq) [metric tons of CO2 equivalent] (Roche, 2011a).

Under the *Regulation for the Mandatory Reporting of Certain Emissions of Contaminants into the Atmosphere* (RDOCECA), an emissions audit must be conducted whenever annual GHG emissions generated by stationary equipment exceed 25,000 t ($CO_2$-eq).

#### 3.2.3.1 2021 GHG Report

Since the amount of GHG emissions produced by stationary equipment at the Renard mine in 2021 was in excess of 25,000 t.m. ($CO_2$-eq), a greenhouse gas report was filed. In addition, the amount of GHG emissions generated by stationary equipment was declared and subjected to an external verification process.

**The external audit of the Renard mine's greenhouse gas emissions is sent to the MELCC each year as part of its QAEI declaration.**

The 2021 GHG emissions report and the values for the standard unit of SWY operations were approved by an external auditing firm, Tetra Tech. An audit of the GHG emissions was conducted by a third party (Tetra Tech, 2022) and SWY declared their total GHG emissions to the government in April 2022.

**In 2014, SWY chose to use liquefied natural gas (LNG) as their primary energy source, rather than diesel fuel. The LNG used for Renard mine operations is transported on an Énergir truck.**

**The LNG is used to generate electricity (via seven or eight 2.1MWh generators) and heat the underground mine and other buildings located around 350 km north of Chibougamau.**

***(Source: MELCC's 2030 Energy Policy)***

For stationary equipment, this choice of fuel generates a lower quantity of GHGs, estimated at around 45,000 t.m. ($CO_2$-eq) (SWY, 2014).

In 2021 the total GHG emissions generated by the Renard mine site were approximately 63,373 t.m. (Co2-eq), which was less than 2019, for similar activity and production time. This remains below the estimates in the 2011 impact study, which was based on the use of diesel as the primary energy source (Roche, 2011a).

More specifically, the GHG emissions generated by stationary equipment amounted to 41,941 t.m. (CO2-eq) The total GHG emissions generated by the use of mobile equipment were 21,432 t.m. (CO2-eq), which is comparable to 2018 and 2019. The overall GHG emissions were therefore lower for 2021 than in previous years (excluding 2020), for a similar duration of activity and level of production (Table 3.10).

**Table 3.10 GHG emissions by type of equipment (mobile or stationary) since 201**

| Year | GHG emissions of mobile equipment (t.m. CO2-eq) | GHG emissions of stationary equipment (t.m. CO2-eq) |
|---|---|---|
| **2017** | 24,200 | 39,268 |
| **2018** | 21,336 | 44,464 |
| **2019** | 23,726 | 49,840 |
| **2020** | 11,036 | 28,524 |
| **2021** | 21,432 | 41,941 |

### 3.2.3.2 Key Performance Indicator for GHG emissions (2017-2021)

**The Renard mine opted to use tonnes of processed kimberlite expressed as dry matter as its standard unit.**

This value enables Stornoway to establish a performance indicator expressed in kilograms of GHG emitted per tonne of processed kimberlite each year. The GHG emissions generated by stationary equipment as compared to the standard unit for 2017 to 2021 are indicated in Table 3.11. The performance indicator obtained for stationary equipment on the mining site in 2021 is the lowest it has been since the beginning of the production phase. It is lower than 2018 or 2019, for a similar duration of activity and level of production (Figure 3.6).

In 2021, SWY decreased the energy consumption of its stationary equipment by decreasing its consumption of LNG, which is used for the generators on the mine site. The amount of GHG emitted by the generators on site decreased by 14.35% from 2019 to 2021, despite providing heating and electricity for the mine site for a similar period of time.

**Table 3.11 Amount of GHG generated by stationary equipment as compared to the standard unit since 2017**

| Year | GHG (kg) per tonne of ore processed | GHG emissions generated by stationary equipment (t.m. CO2-eq) | Ore processed (dry tons) |
|---|---|---|---|
| **2017** | 19.72 | 39,268 | 1,991,000 |
| **2018** | 19.09 | 44,464 | 2,328,000 |
| **2019** | 19.49 | 49,840 | 2,556,459 |
| **2020** | 25.77 | 28,524 | 1,106,697* |
| **2021** | 16.77 | 41,241 | 2,458,846 |

* aucune extraction de minerai de mars à octobre 2020

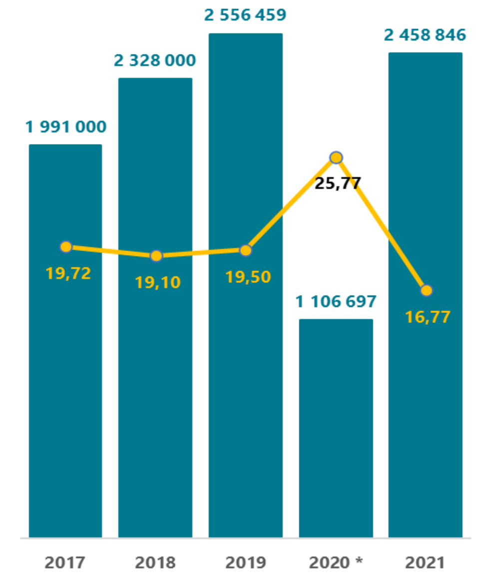



**Figure 3.6 Variation in the performance indicator (in yellow) for GHG (categories 1 and 2) as compared to the annual production of processed kimberlite (in blue)**

#### 3.2.3.3 Renard Mine's carbon offsets

Since 2017, in addition to monitoring atmospheric emissions and GHG, the Renard mine has also been registered on the carbon market, a system for capping and trading (C&T) the rights to GHG emissions.

The carbon market regulates GHG emissions for the mining industry for a given compliance period. A compliance period lasts three years, during which time a certain amount of GHG must be covered by the Renard mine. Each mine receives an allowance from the MELCC of approximately 75% of the total amount of GHG emissions to be covered for the year. This allowance makes it possible to offset a portion of the GHG emissions for each year of the compliance period, in accordance with Article 40 of the Cap-and-Trade regulations (RSPEDE).

Table 3.12 shows the importance of the carbon offsets handled by Stornoway for activity at the Renard mine since 2018. This offset is expressed in tonnes of carbon credits (tonnes of CO2 eq).

For the last compliance period, Stornoway took responsibility for 27.2% of the GHG emissions to be covered by the Cap-and-Trade program.

**Table 3.12 Stornoway's carbon offsets since 2018**

| Compliance period (year) | GHG emissions to be covered | Allowance from the MELCC | SWY's carbon offset |
|---|---|---|---|
| | in tons of CO2 equivalent | | |
| **2018*** | 0 | 0 | 0 |
| **2019** | 48,840 | 39,907 | 9,933 |
| **2020** | 28,508 | 17,099 | 11,409 |
| **Total from 2018-2020** | 78,348 ***(100%)*** | 57,006 ***(72.8%)*** | 21,342 ***(27.2%)*** |
| **2021** | 41,941 | *tbd* | |

* (not subject to the Cap-and-Trade System in 2018)

## 3.3 Noise and Vibration Levels

In compliance with Directive 019, Stornoway made a commitment to the MELCC to monitor noise and vibration levels throughout the construction and production phases at the mine. Noise limits are set at 55 dBA (A-weighted decibels) during the day and 50 dbA (A-weighted decibels) at night. However, the goals set by SWY as part of the environmental impact assessment are 45 dBA during the day and 40 dBA at night. The limit for vibrations is set at 12.7 mm/s and the limit for air pressure is set at 128 dBL (linear decibels), in accordance with Directive 019.

### MONITORING OBJECTIVES

**To observe noise levels resulting from mining activities.**

**To measure vibrations during blasting operations to confirm the effectiveness of mitigation measures.**

**To identify sources of noise that are likely to be a source of annoyance or disturbance for workers.**

**To make any changes deemed necessary.**

### 3.3.1 Noise Levels

#### 3.3.1.1 Methodology

The method used to assess noise levels is set out in the *Memorandum of Instruction 98-01* (“Handling of noise-related complaints and requirements imposed on noise-producing companies”) (NI9801) (Yockell, 2020).

As specified in memorandum NI9801 (MELCC, 2006), noise level surveys must be conducted within sensitive zones as close to operations as possible. In the case of the Renard mine, the sector containing the housing complex and service area is the only one considered to have the potential to be disturbed, thereby making it a “sensitive zone”. A measuring point was selected north of the housing complex. Map 3.2 illustrates the location of the measuring point.

Short (1-hour) acoustic surveys were carried out within the only sensitive zone on the mine site, namely the housing complex and service area (Map 3.2). This sensitive zone is considered as a housing area within an industrial zone.

Photo 3.13 shows the calibration of the sonometer that was used to conduct the noise surveys. It is positioned between the “sensitive zone” and the site of the mining activities most likely to affect noise levels for workers.

Therefore, in order to qualify the noise generated by mining operations alone and due to the significant amount of other human activity taking place around the site, field observations were carried out during the surveys.

As with previous acoustic monitoring, a penalty of +5 dBA was applied to account for the significant number of backup alarms (Yockell, 2020).

**Photo 3.13 Location of the sonometer**

#### 3.3.1.2 2021 Results

##### *3.3.1.2.1 Survey period and conditions*

Over the course of 2021, 21 hour-long samples were taken during the production phase:

- June: 2 samples;
- July: 7 samples;
- August: 5 samples;
- September: 4 samples;
- October: 3 samples.

Noise level surveys only took place under the following conditions: when wind speeds were less than 20 km/h, relative humidity was less than 90%, air temperature was between -10 °C and 50 °C, the soil was dry, and there was no precipitation.

The meteorological conditions were measured at the Lake Lagopede weather station prior to surveying to ensure the 2021 data could be compared with the NI9801 standard (MELCC, 2006).

##### *3.3.1.2.2 Surveys*

**The noise levels measured in 2021 were of the same order of magnitude as those in 2018 and 2019 (Yockell, 2020).**

There were no complaints from workers in 2021. Noise levels were slightly above the NI9801 standard. Overall, the LAr noise levels varied between 44.5 dBA and 55 dBA. The standards laid out in the NI9801 are 50 dBA at night and 55 dBA during the day. Daytime noise levels at the mine were always compliant. Nighttime noise levels were sometimes compliant, and sometimes not. Of the five surveys conducted at night, there were three periods of non-compliance during which noise levels exceeded the limits by 1 to 5 dBA.

##### *3.3.1.2.3 Objectives set by Stornoway*

With the addition of a 5-dBA penalty (during the day), the noise levels exceeded Stornoway’s objectives of 40 dBA at night and 45 dBA during the day. The average deviation from the norm recorded in 2021 was +6 dBA.


**Carte / Map 3.2**

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**NOISE IMPACT STUDY**

Location of the sound assessment point

Sound evaluation point

Residential complex

N

Échelle = 1 : 4000

NOTE : Ce plan n'a pas été préparé par un arpenteur-géomètre et par conséquent, ne doit pas être considéré comme tel.

Préparé par:

Yockell
ASSOCIÉS INC.

Projet : 21511075

Février 2020

This deviation is less than that of 2020 (10 dBA), 2019 (8.9 dBA), 2018 (8.5 dBA), 2017
(8.4 dBA), or 2016 (8.5 dBA). The noise levels for the mine site as a whole are comparable from year to year.

#### *3.3.1.2.4 Noise level surveys at the plant and crusher during operations*

Since 2017, several rounds of monitoring have been carried out to evaluate the source of noise generated by different types of mining equipment. As in 2018 and 2020, a survey was conducted in 2021 both during normal operations and when the crusher was not in operation.

The 2021 results indicate first that the crushing system and plant operations have no significant impact on the fluctuating noise levels, and second that the noise levels recorded during operations are similar to those when the crusher is not in use.

**These surveys indicate that the crusher and the plant are not the primary source of noise for the mine site as a whole**.

#### *3.3.1.2.5 2022 Results*

Although the 2021 noise monitoring results remain similar to previous years, SWY will continue to maintain strict targets, monitor back-up alarms and conduct noise surveys during planned shutdowns in order to track and reduce the propagation of noise emissions throughout the mine site.

Noise surveys will be carried out, taking site-specific weather constraints into consideration, in order to gather more data about other types of mining operations and gain a better understanding of the impact of each activity. Finally, the consultant in charge of noise monitoring provided a special training session on February 19th, 2021 (Yockell, 2020). In accordance with their recommendations, SWY will be checking the calibration of the sound level meter and measuring noise levels on a regular basis for the next monitoring campaign.

## 3.3.2 Vibrations

### 3.3.2.1 Measuring protocol

Excess air pressure during blasting operations was measured using a seismograph connected to a microphone (Map 3.3). Since 2019, most blasting activity has taken place underground. Therefore, the microphone was only used during surface blasting operations that had the potential to affect the camp. In 2020, the vibration sensor device was verified by an external consultant and found to be suitable for recording blasting activities (Yockell, 2020). No modifications were made to the sensor in 2021.

SWY continued to monitor vibrations triggered by blasting operations in 2021. Since mining of the R65 pit ceased in 2019 and there is no longer any surface blasting, the P1 measurement point was removed.

In early 2020, the seismograph was placed at a permanent location, P2, for all measurements, based on recommendations from a consultant (Yockell, 2020; map 3.3; photo 3.14).


**Photo 3.14 Site for recording vibrations near the housing complex**

This marks a significant improvement to how blasting activity is monitored, as the selected location is considered to be more representative of the vibration and air overpressure levels within the sensitive zone, i.e. the housing complex (Yockell, 2020).

In 2021, 48 out of 80 blasts were detected by the seismograph (60%). Some blasts were not detected because they were not very strong, while others were missed because of the settings on the device. The settings were adjusted after that.

#### 3.3.2.2 Authorized limit values

According to Directive 019 for the mining industry, Stornoway is not required to have a system in place for the monitoring of ground vibrations or air pressure associated with blasting activities at the mine. This restriction is only applicable if the affected areas (sensitive zones) are not on the operator's property. In this case, the only sensitive point is the workers' camp, which is owned by Stornoway.

However, the operator is committed to complying with industry best practises with regards to monitoring noise nuisance associated with vibration and air pressure caused by blasting.

Therefore, according to Directive 019, the limits for the workers' camp are 12.7 mm/s for ground vibration speed, and 128 dBL for maximum air pressure.

#### 3.3.2.3 2021 surveys

##### *3.3.2.3.1 Pit R65*

In 2021, no measurements were taken at P1, as the open-air pit has not been used since April 2019.

##### *3.3.2.3.2 Housing complex*

In 2021, most underground blasts were detected and recorded (60%).

All vibrations measured at point P1 in 2021 were well below the limit of 12.7 mm/s, with the maximum measurement being 8.74 mm/s. In 2021, vibrations caused by blasting met the relevant standards for the mine site, in particular the housing complex, just as they did in 2018, 2019 and 2020.

#### 3.3.2.4 2022 Results

Noise and vibration level monitoring will continue in 2022.

## 3.4 Hydrological Regime

Water from Lake Lagopede is used for activity at the Renard mine to supply the housing complex and services area with drinking water, as well as for mining operations. Downstream from the drinking water intake point, treated mine water is discharged into the north basin of the lake and treated domestic wastewater is released into the south basin of the lake.

**MONITORING OBJECTIVES**

**To facilitate the interpretation of environmental monitoring data**

**To distinguish between direct effects of the project and those resulting from natural meteorological and hydrological variations in the environment.**

**To confirm the predictions for Lake Lagopede water quality based on the mine and domestic affluent dispersion model created as part of the impact study (Roche, 2011a).**

**To gain a better understanding of water flow conditions during the winter at riffle A-A'.**

In 2021, monitoring of the hydrological regime of Lake Lagopede was focused exclusively on measuring water levels and taking vertical profiles in Lake Lagopede, since the results of the monitoring carried out in 2019 confirmed the presence of a continuous flow of water between the northern and southern basins of the lake, to the right of the A-A' riffle, including during winter.

Since the water level in Lake Lagopede and other nearby lakes are measured constantly, SWY does not plan to conduct any new seasonal campaigns in 2022. However, maintenance of the measuring devices by an external consultant is scheduled for summer 2022.

### 3.4.1 Water Levels at Water Level Stations and Estimated Flows

In order to monitor the hydrological regime of streams and the water levels in nearby lakes, four water level stations were installed to measure levels on an hourly basis at strategic locations in the Lake Lagopede watershed, i.e., the north basin of Lake Lagopede, Lake F3294, Lake F3296 and Lake F3300 (Map 3.4). These stations, which were installed in 2011, improve the quality and temporal scope of flow data for Lake Lagopede's main tributaries. The four water level stations are equipped with telemetry instrumentation that enables the stations to be controlled remotely and data on water level and flow speed to be uploaded.


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**NOISE IMPACT STUDY**

Map 3.3: Location of seismograph

- Location of seismograph
- Residential complex
- Service areas

N

Échelle = 1 : 4000

NOTE : Ce plan n'a pas été préparé par un arpenteur-géomètre et par conséquent, ne doit pas être considéré comme tel.

Préparé par:

Yockell ASSOCIÉS INC.

Projet : 21511075 Mars 2022

ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM
Annual Report 2021 – May 2022

Although data recorded at these four stations can now be accessed remotely, the stations are all maintained in each of the campaigns carried out by an external consultant. SWY's environment technician also visits them monthly to make sure they remain in good physical condition (Photo 3.15).

**Photo 3.15 Inspection of the water level station at Lake F3300 in July 2021**

#### 3.4.1.1 Flood period

In 2021, the variation in water level recorded at the water level stations for Lakes F3296

And Lake F3300 shows that water levels began to drop in late April. The high point of spring flooding occurred between May 21st and 19th, with a maximum variation in water levels being recorded on May 26th, 2021, after the spring runoff. Thus in 2021, the rising and lowering of water levels occurred earlier than in 2019 or 2020 (late May), further evidence of the mild winter.

The spring runoff in Lake F3294, Lake Lagopede's primary tributary, was measured on April 22nd, 2021, while the spring runoff in Lake Lagopede was measured on April 24th, 2021. The high point of spring flooding in 2021 was also earlier than in 2020 (May 29th-31st), 2019 (May 24th), or 2018 (June 3rd), and similar to historical data recorded from 2011 to 2016 (late April to mid-May).

#### 3.4.1.2 Flood levels

Table 3.13 shows the spring runoff levels at Lake F3294 and Lake Lagopede since 2011.

For the year 2021, the spring flood peaks for Lake F3294 (491.48 m) and Lake Lagopede (riffles A-A' and C-C'; 483.68 m) were comparable to those recorded in 2020 and similar to historical flood levels (Table 3.10).

**Table 3.13 Water levels during spring runoff season in lakes Lagopede and F3294 since 2011**

| Year | Highest recorded water level (m) | |
|---|---|---|
| | Lake Lagopede | Lac F3294 |
| 2011 | 484.24 | 492.09 |
| 2012 | 484.08 | 492.16 |
| 2013 | 484.24 | 492.14 |
| 2014 | 484.44 | 492.26 |
| 2015 | 483.83 | 491.93 |
| 2016 | 484.06 | 491.91 |
| 2017 | 484.20 | 492.11 |
| 2018 | 484.35 | 492.34 |
| 2019 | 484.10 | 492.05 |
| 2020 | 484.23 | 492.12 |
| 2021 | 483.68 | 491.48 |

The water level reached in the northern basin of Lake

Lagopede during the peak of the spring flooding in 2021 was lower than that measured in 2020 (Table 3.11) and represents the lowest flood peak value since the water level station was installed in 2011. It is worth noting that this year had one of the warmest winters ever recorded in the province (more information available in section 3.1).

#### 3.4.1.3 Discharge rating curves

In order to gain a better understanding of the hydrology of Lake Lagopede, water levels recorded at the four water level stations are combined with flow measurements taken during hydrological monitoring campaigns to establish stage-discharge rating curves for Lake Lagopede and its three main tributaries.

### *3.4.1.3.1 Update of discharge curves*

The four rating curves were updated based on measurements taken between 2010 and 2019. As spring runoff flow rates are often underrepresented in the rating curves, the flow rates measured during the 2019 spring runoff (upper part of the curves) for the Lake F3294 (Photo 3.16) and Lake Lagopede stations (A-A' and C-C' riffles), as well as the high water levels measured at the F3296 and F3300 stations were used to improve the representativeness of flood events in the rating curve (Tetra Tech, 2020a). For the three stations installed on the main tributaries of Lake Lagopede (lakes F3294, F3296 and F3300), the discharge curves now have more than 20 points each and the curve associated with the Lake Lagopede station has about 15 points. The rating curves therefore present a wider range of flow rates associated with water level data.

**Photo 3.16 Taking measurements at site 2 on Lake F3294 - Spring monitoring campaign (May 22, 2019)**

### *3.4.1.3.2 Estimated flows in 2021*

The improved rating curves completed in 2019 are used to calculate an estimated flow corresponding to each water level measured at the three water level stations. The time series of estimated flows at each station in 2021 are presented in Figure 3.8.

### *3.4.1.3.3 Flow rate at the outlet of Lake F3298*

A graded V-shaped spillway was put in place in July 2020 at the outlet of Lake F3298 (Photo 3.2) in order to estimate the flow rate of stream 170. The flow measurements taken there are combined with the water levels of the lake to calculate the rating curve. This rating curve is used to estimate the flow rate of the lake based on its water level.

The water flow at the V-shaped spillway is measured weekly in summer, as is the water level in the lake, by a land surveyor. These measurements were used to come up with a preliminary stage-discharge rating curve (Figure 3.7). It shows a correlation between the water level in the lake and the flow rate at its outlet. For example, when the water level is approximately 509 m, the flow rate at the outlet is slightly less than 3 litres per second.

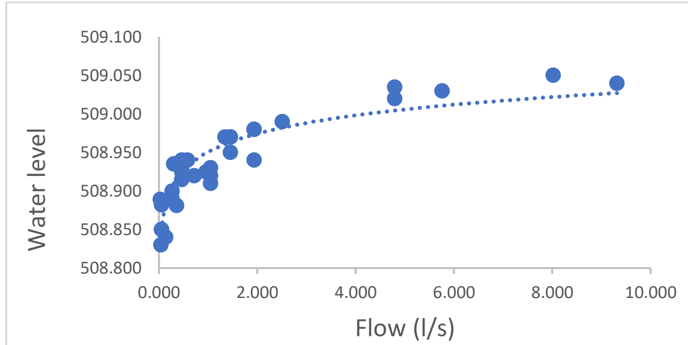



**Figure 3.7 Rating curve for Lake F3298 in 2021**

However, the rating curve is not yet complete. It significantly overestimates the flow of the lake water during the spring runoff, due to a lack of reliable data during this period. In order to improve the discharge rating curve and use it to evaluate the annual flow of Lake F3298, SWY intends to continue measuring the flow rate at the lake outlet and the water level of the lake in 2022. Particular attention will be given to spring and fall runoff periods (high water levels), when the elevation of the lake can reach more than 509.20 m.

The measurements taken by the pressure gauge (HOBO probe) installed at the water level station on Lake F3298 in October 2016, are used to calculate water levels (Map 3.4). The pressure is measured every two hours, and data is collected twice a year. Measurements were taken using the HOBO logger in July 2021 and again in fall, before the lake froze over.

### 3.4.1.4 Lake F3298's hydraulic renewal time

In 2012, the water renewal time of Lake F3298 in its natural state was estimated to be an average of 13 days in summer conditions, and 148 days after the digging of boundary ditches to manage mine water (Golder, 2012).

The size of Lake F3298's watershed had to be reduced as part of the development of the mine (Norda Stelo, 2017a).

The rating curve established in 2021 will need to be improved in 2022, notably by measuring flow rates when the water levels at Lake F3298 are higher than 509.20 m, as that is the least accurate portion of the stage-discharge rating curve.

#### 3.4.1.5 Status of hydrological regime in 2021

Comparing recent water level and flow data (from 2015 to today) since the start of mining operations with data from the reference period (2010-2014) showed no clear upward or downward trend at the Lake Lagopede station. Therefore, mining activities have had no measurable impact on the hydrological regime of Lake Lagopede to date.

### 3.4.2 Winter Flow Monitoring at the A-A’ Riffle

As was determined through hydrological monitoring in 2019, the A-A' riffle, a shoal that separates the north basin from the south basin of Lake Lagopede, does not impose any vertical restrictions on water flow from north to south in Lake Lagopede (Map 3.4). It was important to confirm this fact, particularly during winter low-flow periods when this part of the lake is quite shallow and ice cover is observed. The A-A' riffle does not restrict water flow during summer low-flow periods, either.

For 2021, the winter low-flow level of Lake Lagopede was higher than in 2019. The 2019 hydrological monitoring results continue to be representative of general low-flow conditions in Lake Lagopede, as the measurements were taken during the lowest water levels recorded in Lake Lagopede in 2019, but also the lowest winter low-flow levels recorded at the Lake Lagopede station since 2010 (Tetra Tech, 2020a).

These conclusions will be verified once again during the hydrological monitoring campaigns scheduled for 2024, i.e. five years after the 2019 monitoring, including winter low-flow surveys (ice thickness, water depth and flow rates at the A-A' and C-C’ riffles).

#### 3.4.2.1 A-A’ riffle

##### *3.4.2.1.1 Flow section*

During previous winter hydrological monitoring, a flow section was consistently observed at the A-A’ riffle, even in the years when the water levels measured in Lake Lagopede were the lowest (Tetra Tech, 2020a). In 2019, it was confirmed that there is permanent flow at the A-A' riffle. It was to be expected that winter low flow would occur in 2021.

##### *3.4.2.1.2 Flow rate measurement*

The flow rates measured at riffle A-A’ since 2013 are provided in Table 3.12.

**Table 3.14 Flow rate measurements at the A-A' riffle from 2013 to 2018**

| Date | Time (HNE) | Flow rate measurement ($m^3/s$) |
|---|---|---|
| 2013-03-26 | 13:10:00 | 0.35 |
| 2015-08-07 | 16:18:00 | 2.375 |
| 2016-02-23 | 15:30:00 | 0.50 |
| 2016-10-06 | n/a | 1.248 |
| Roche – Water balance Qmin10years | n/a | 0.33 |
| 2016-10-06 | 13:00:00 | 1.172 |
| 2017-03-30 | 10:31:44 | 0.50 |
| 2017-09-12 | 15:11:00 | 0.63 |
| 2018-03-29 | 13:30:00 | 0.27 |
| 2018-09-16 | 10:35:00 | 1.248 |

##### *3.4.2.1.3 Estimated flow rate from discharge curves*

The Lake Lagopede rating curve was updated in 2019 (Tetra Tech, 2020a) (Figure 3.6). It is now used to calculate, with a higher level of certainty, estimated flow rates based on the water levels measured each year at the Lake Lagopede gauging station, particularly during winter low-flow periods, when there is the lowest flow of the year.

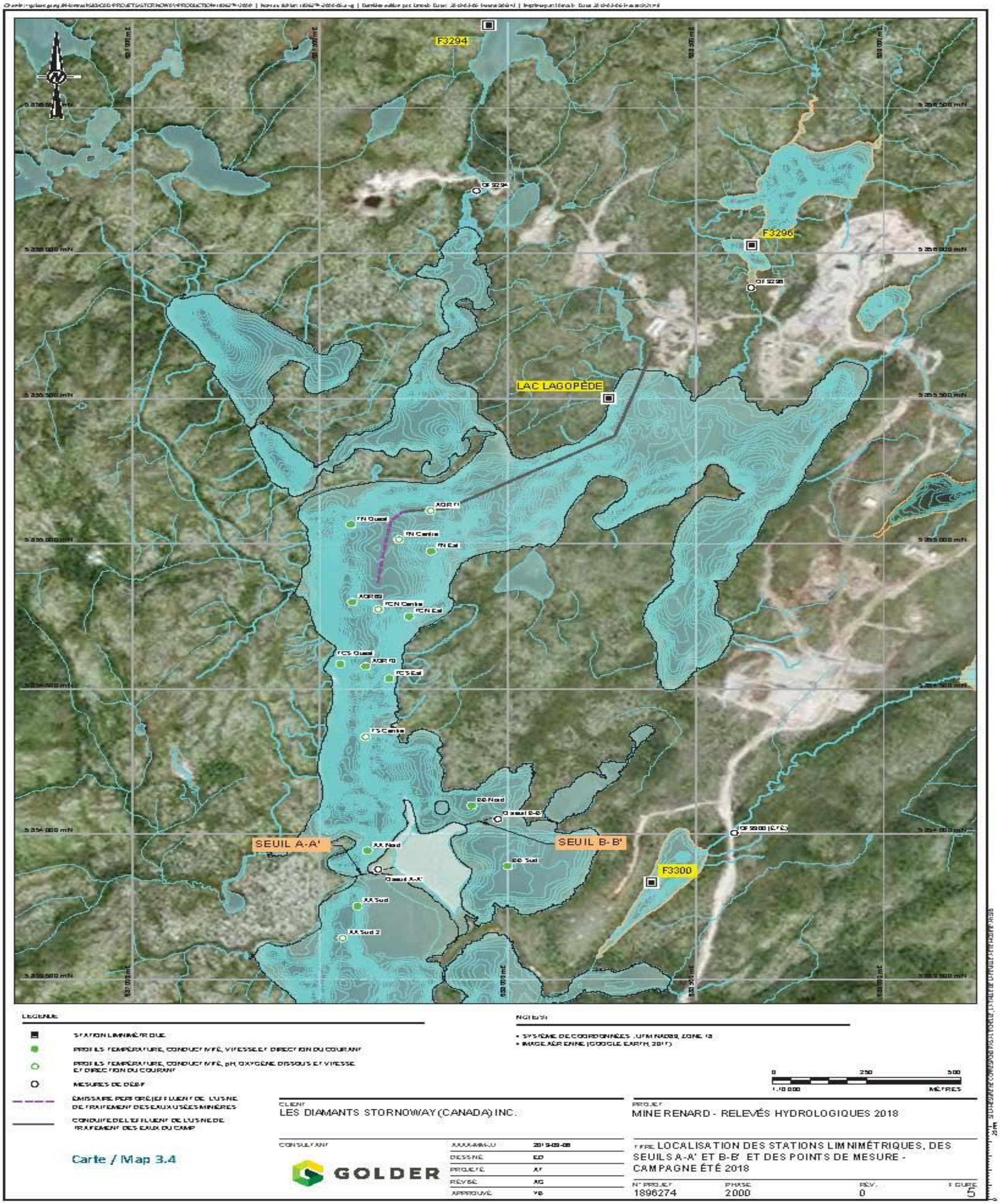
In 2021, the winter low-flow calculated at the A-A' riffle was 0.42 $m^3/s$, which is similar to the flow rate recorded in 2017, i.e. before the start of mining activities. It is also on the same order of magnitude as the winter low flow measured during the previous campaigns (Table 3.14). The flow rate calculated at the A-A' riffle for 2021 (Table 3.15) is also comparable to the flow rates calculated during winter low flow in previous years.

**Table 3.15 Winter low-flow rate calculated at A-A' riffle using rating curves**

| Date | Calculated flow rate ($m^3/s$) |
|---|---|
| 2016-04-08 | 0.36 |
| 2017-04-04 | 0.40 |
| 2018-03-29 | 0.27 |
| 2019-03-12 | 0.40 |
| 2020-04-02 | 0.38 |
| 2021-03-01 | 0.42 |

* based on Equation 1 from Tetra Tech, 2020a

## Map 3.4 Location of water level stations, gauges and shoals



#### *3.4.2.1.4 Conclusion*

Using the stage-discharge rating curve calculated for monitoring the flow rate of Lake Lagopede at the A-A' riffle, the flow rate was estimated for winter low flow in 2021. The calculated flow rate was comparable to historical flow rates before and after the start of mining activities.

## 3.4.3 Monitoring Flow in Lake Lagopede

The mine effluent dispersion model created in 2011 (Environnement Illimité, 2011) and its updated version from 2017 (Englobe, 2017) revealed the presence of two restrictions to mixing and water flow in Lake Lagopede:

- a seasonal horizontal barrier formed by natural thermal stratifications known as winter and summer *thermoclines,* which prevent the uniform mixing of effluent in the water column at certain periods of the year; and
- a vertical barrier located at the A-A' riffle, which prevents mine effluent from flowing to the southern part of Lake Lagopede under certain conditions.

Seasonal mixing alternates and enables effluent to mix throughout the entire water column, thereby ensuring the flow of effluent beyond the A-A' riffle (Englobe, 2017). The objective of this monitoring is to confirm our understanding of the hydrological regime in the north and south basins of Lake Lagopede, along with modelling assumptions for mine effluent dispersion.

To this effect, a number of surveys (current velocity and direction, temperature and conductivity) were conducted between 2015 and 2019 in the water column of Lake Lagopede's north basin during the three hydrological monitoring campaigns. The location of these monitoring stations is shown on Map 3.4.

### 3.4.3.1 Current velocity and direction

After the 2019 sampling campaign and based on recommendations from an external hydrology expert, SWY decided that continuing to measure the current velocity, even continuously, would add little to our understanding of the behaviour of effluent in the receiving environment(Tetra Tech, 2020a).

Note that flow velocities recorded in the north basin of Lake Lagopede since 2015:

- Are generally very low,
- Vary between 0 and 0.1 m/s (Englobe, 2015 and 2016; SNC, 2017b; SWY, 2018a; SWY, 2019; SWY, 2020), and
- Are comparable to the velocities measured in the context of the September 2011 impact study (0.01 to 0.05 m/s) (Englobe, 2015).

### 3.4.3.2 Temperature and conductivity in the north basin of Lake Lagopede

Temperature and conductivity are generally considered to be good indicators of the presence and mixing of mining effluent in the water of Lake Lagopede. In spring and fall, temperature changes in the water column can indicate seasonal mixing or the stratification (thermoclines) of the water. The conductivity of mine effluent measured at the mine wastewater treatment plant (MWWTP) is greater than the conductivity of Lake Lagopede. Consequently, it can be used to track the behaviour of effluent during seasonal mixing and thermoclines in Lake Lagopede.

#### *3.4.3.2.1 Monthly Vertical Profiles*

According to the mine effluent plume dispersion model (Englobe, 2017), seasonal thermoclines and elevated conductivity under said thermoclines are observed alternating with seasonal mixing at three specific stations in Lake Lagopede:

- AQR69, located at the deepest point in the north basin of Lake Lagopede, just over 20 m below the surface;
- AQR70, downstream of the effluent diffuser; and
- AQR71, just upstream of the effluent diffuser.

Since September 2015, SWY has created monthly vertical temperature and conductivity profiles for these three stations located in the mine effluent dispersion plume. Monthly vertical temperature and conductivity profiles were created for these three stations in 2021.

#### 3.4.3.2.2 *Continuous Temperature Profiles*

In 2016, in addition to the monthly temperature profiles, which provide a physical-chemical portrait of the water at a given point in time, SWY also decided to install a row of thermographs (at one-metre intervals) in the deepest part of the north basin (AQR69) of Lake Lagopede and another in the deepest part of the south basin (AQR66) of Lake Lagopede. These thermographs record water temperature daily, making it possible to detect weekly temperature variations throughout the water column, in particular during periods of seasonal mixing.

#### 3.4.3.2.3 *2021 Data*

About the 2021 monitoring, only monthly vertical temperature, and conductivity profiles at AQR69 station are shown (Figures 3.9 and 3.10). As it is the deepest station, AQR69 provides a better picture of the extent of the winter and summer thermoclines, as well as the effects of seasonal mixing on the dispersion of effluent 20 m below the surface in the north basin of the lake.

Figure 3.9 shows the continuous temperature profiles for station AQR69.

### 3.4.3.3 Effluent dispersion in the north basin

Stornoway analyzes the monthly vertical temperature and conductivity profiles for station AQR69 each year to validate the dispersion of mine effluent into the north basin of Lake Lagopede. In 2021, the temperature and conductivity measurements at station AQR69 indicate alternating seasonal mixing and thermoclines (Figures 3.7 and 3.8).

There was a marked increase in conductivity in winter and summer, under each seasonal thermocline (Figure 3.8), located at approximately 6.5 m and 16 m below the surface (Map 3.4)

#### 3.4.3.3.1 *Winter*

A thermal inversion gradually occurred between the surface (cold water, 0°C) and the bottom (warm water, 4°C) of the water column, while a loosely defined winter thermocline developed briefly from January to March at between 2 and 3 m depth (Figure 3.7).

Conductivity remained low from the surface down to 5 meters below the ice cover, and increased considerably under the winter thermocline (from 6 to 15 m under the surface). This seems to suggest that the thermocline acts as a horizontal barrier, preventing the dispersion of effluent in the water column, as predicted in the 2017 model.

#### 3.4.3.3.2 *Spring*

The winter thermal inversion disappeared in May 2021, and was replaced with a new thermal stratification: the water began to grow warmer at the surface and cooler near the bottom (Figure 3.7). This thermal inversion can also be seen on the continuous temperature profiles (Figure 3.8).

It was accompanied by a marked increase in conductivity starting in January at a depth of approximately 8 m. Conductivity at the lake bottom increased until April, then decreased starting in May due to the mixing of the water. Thus, even though temperature and conductivity never became completely uniform, as was observed in spring 2020, the thermal inversion triggered a very brief mixing of the waters in spring 2021.

#### 3.4.3.3.3 *Summer*

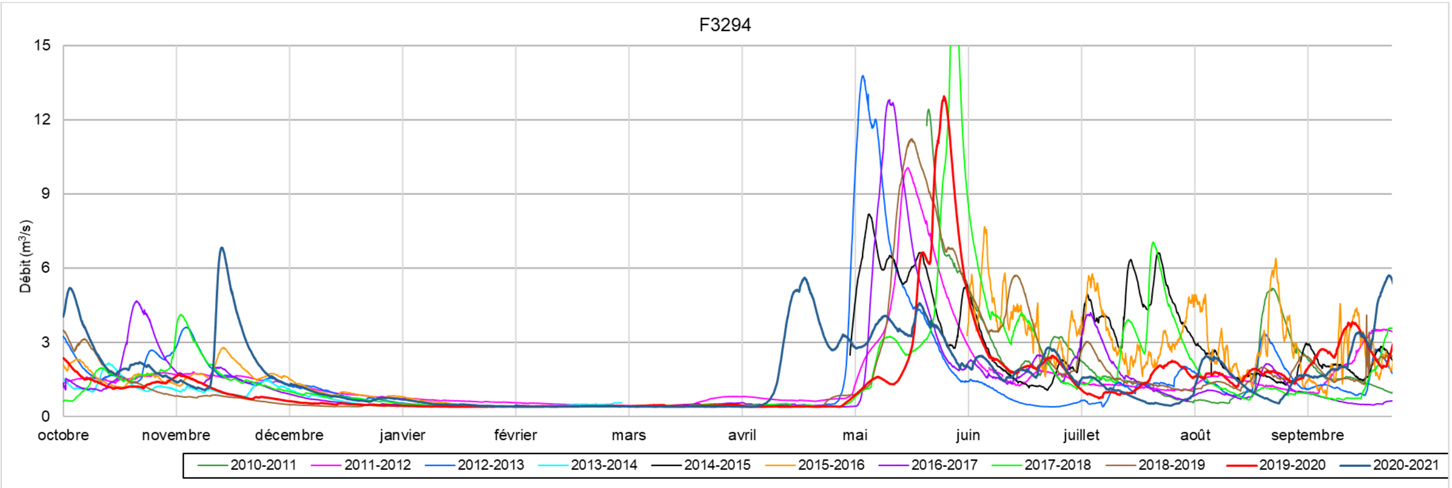
In summer, the thermal inversion disappeared without any apparent thermal stratification. In July and August, a clearly defined double thermocline formed at between 5 and 8 meters of depth, as well as at 16 meters, whereas conductivity suddenly increased at depths of between 4 and 8 m and between 16 and 18 m under the effect of these two thermoclines. In late summer, conductivity was generally more elevated in the middle of the water column, and lower at the surface and the bottom.

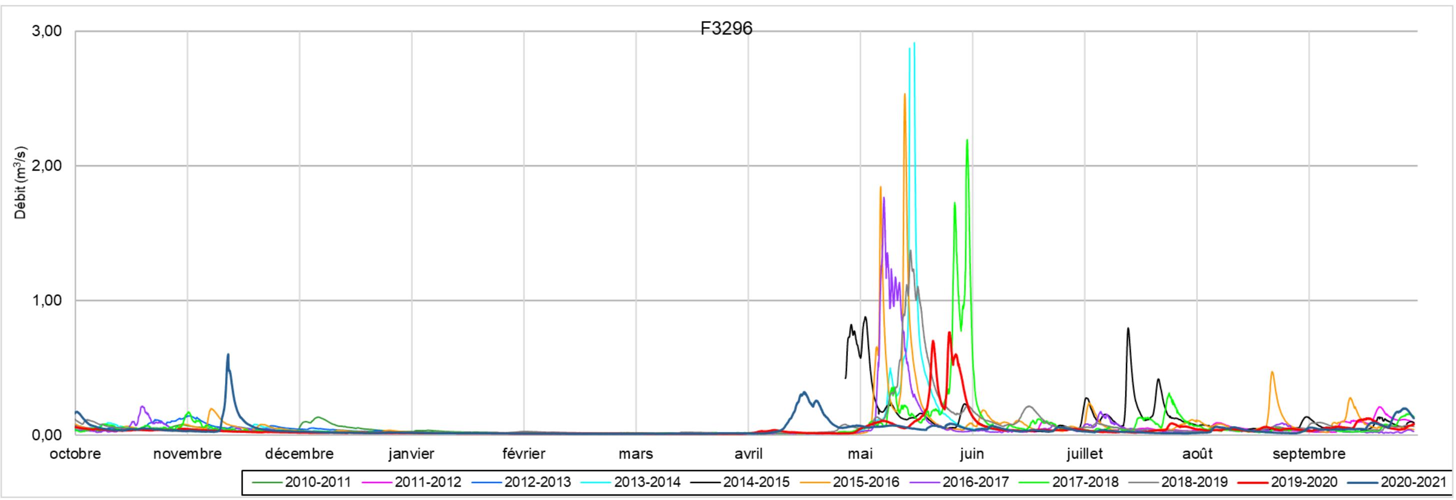
#### 3.4.3.3.4 *Fall*

In October, fall winds and lower air temperatures caused the disappearance of the summer thermocline at the surface of the water column, and conductivity suddenly dropped in the upper and middle layers of the water column. These variations in temperature and conductivity marked the start of fall mixing in the deepest part of the lake, mainly at a depth of

0 to 16 m. The temperature of the water column became uniform in November, whereas the conductivity remained higher at the bottom into December (Figures 3.7 and 3.8).

The analysis of temperature and conductivity variations in the spring and fall confirm that mine effluent was indeed dispersed throughout the water column, as predicted in the 2017 model (Englobe, 2017).



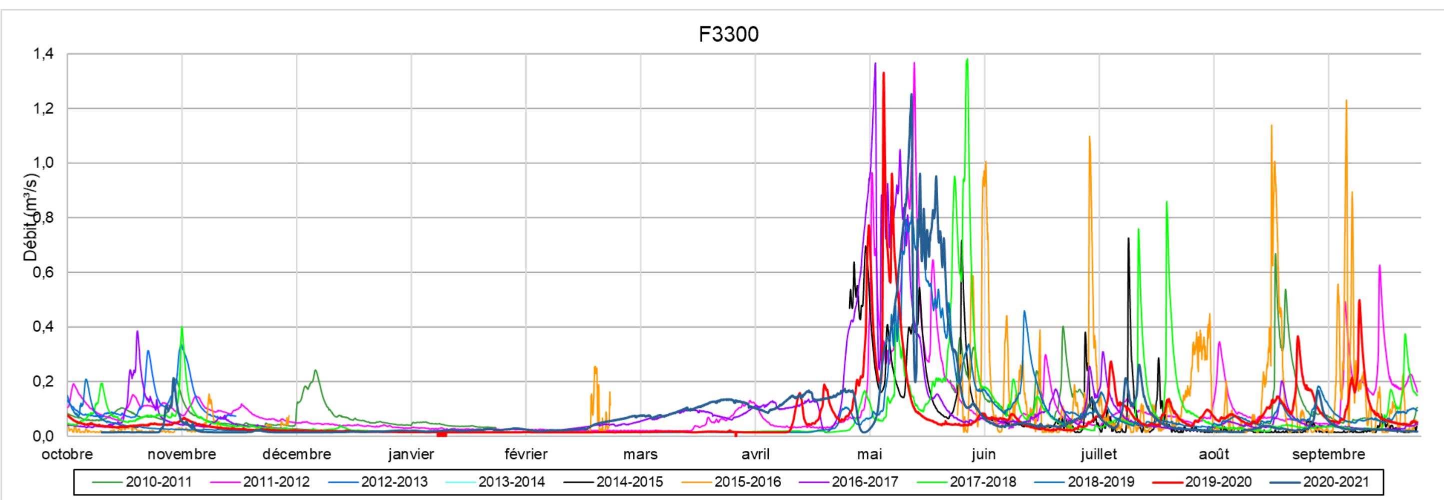




**Figure 3.8 Time series of flow rates based on water levels at the F3294, F3296, F3300 and Lagopede stations**

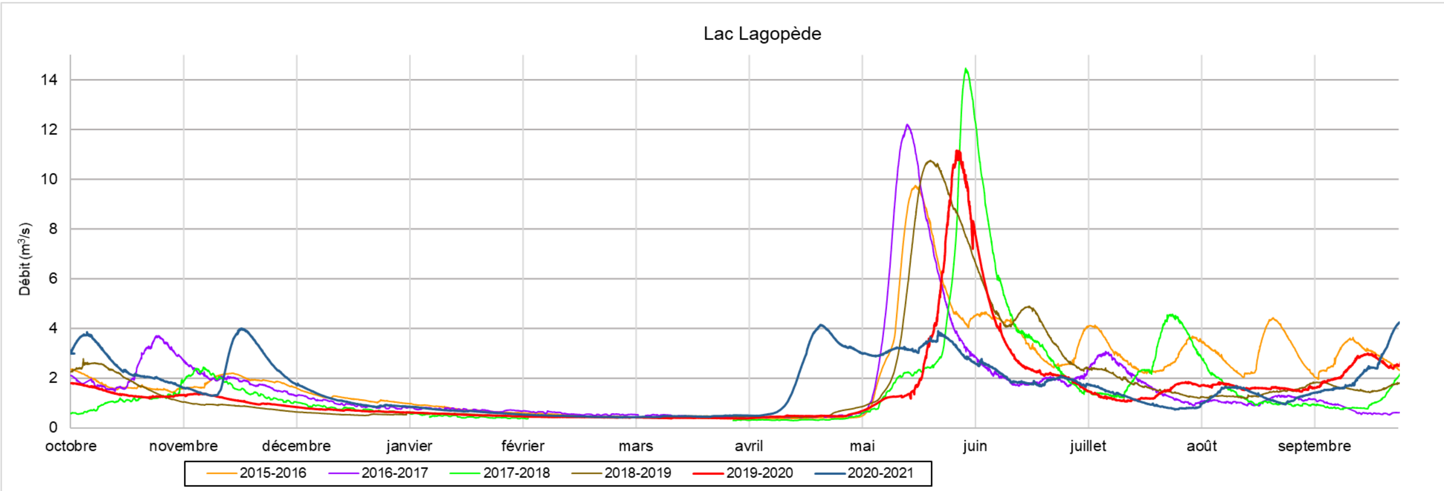



**Figure 3.8 (continued) Time series of flow rates based on water levels at the F3294, F3296, F3300 and Lagopede stations**

#### 3.4.3.4 Effluent dispersion in the south basin (A-A' riffle)

Stornoway continues to monitor effluent dispersion at the A-A' riffle, the shoal separating the two main basins (north and south) of Lake Lagopede. Based on the vertical conductivity and temperature profiles created at the A-A' riffle and on both sides of the riffle, previous monitoring has made it possible for Stornoway to conclude that:

- No vertical restrictions were observed at or south of the A-A' riffle;
- Effluent flows well from the north basin to the south basin, crossing the A-A' riffle (Stornoway, 2019); and
- The hypotheses used in the effluent dispersion modelling from 2017 (Englobe, 2017) are confirmed;

During monitoring, Stornoway tracks the dynamics of seasonal mixing in order to confirm the dispersion of effluent in the south basin. The dynamics of seasonal mixing (spring and fall) and dispersion of mining effluent follow this sequence:

During low-flow periods:

- Thermoclines appear in the early winter and summer and create a thermal stratification under which mine effluent accumulates;
- Effluent does not appear to flow downstream of the A-A' riffle because of this thermal stratification;
- The water flowing downstream of the A-A' riffle comes solely from the surface layer, above the thermocline.

During seasonal mixing:

- Water masses begin to mix;
- The winter and summer thermoclines disappear;
- Conductivity gradually increases, especially in late spring and early fall, just after the disappearance of the thermoclines;
- The conductivity of the water flowing downstream of the A-A' riffle is similar to that of the water in the northern basin of Lake Lagopede;
- Mining effluent, now uniformly diluted throughout the water column, flows without any horizontal or vertical obstructions into the south basin of Lake Lagopede.

### 3.4.4 Water balance for Lake Lagopede

Data on the hydrological regime is combined with data from the weather station on the shore of Lake Lagopede's north basin to establish the water balance for this part of the lake.

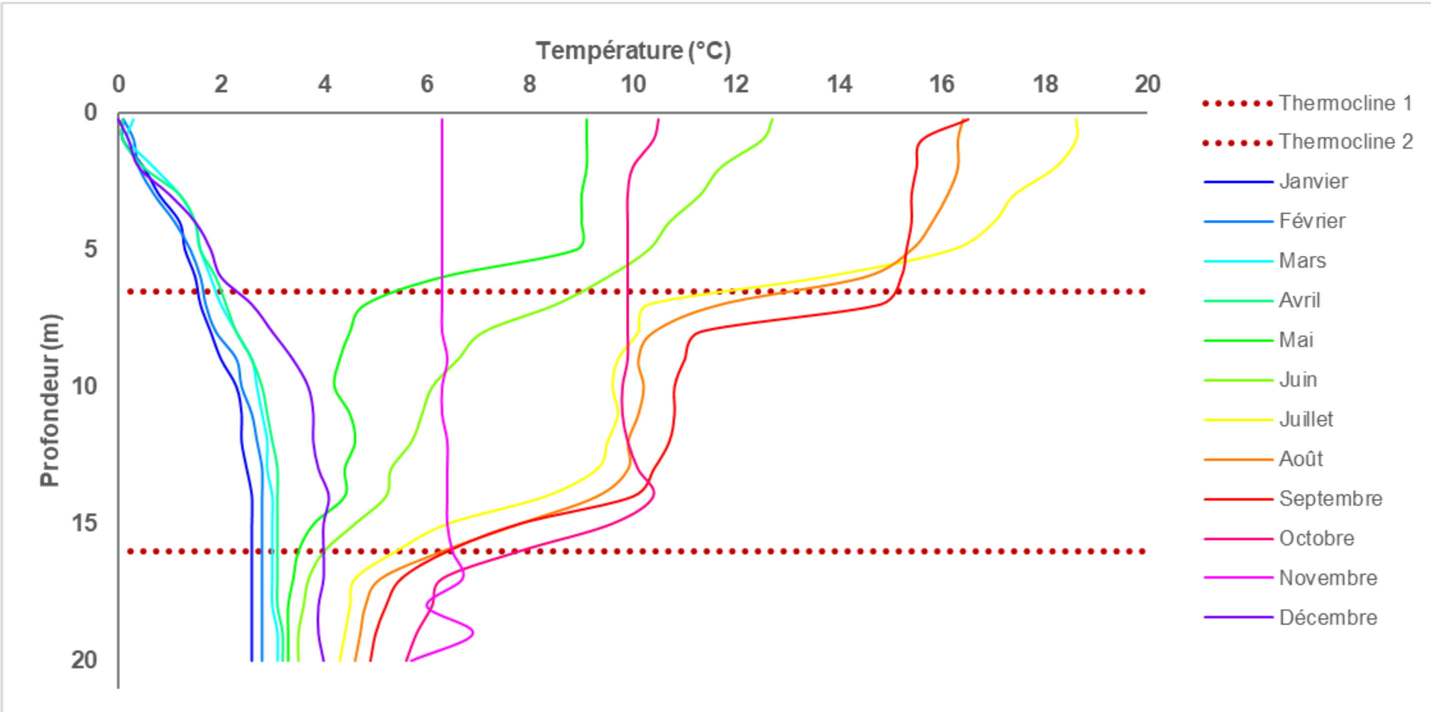



**Figure 3.9 Vertical monthly temperature profile for station AQR69 in 2021 (the horizontal lines represent the double thermocline observed in August 2020)**

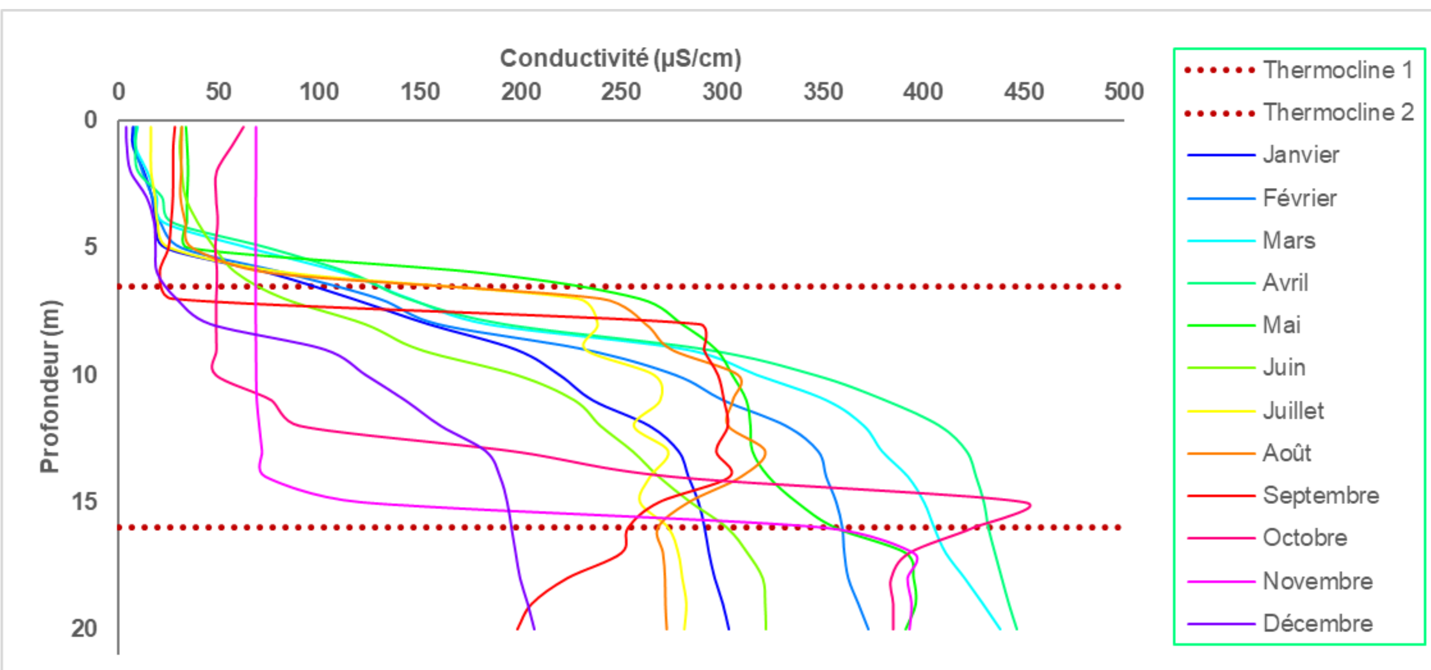



**Figure 3.10 Vertical monthly conductivity profile for station AQR69 in 2021 (the horizontal lines represent the effect of thermoclines)**

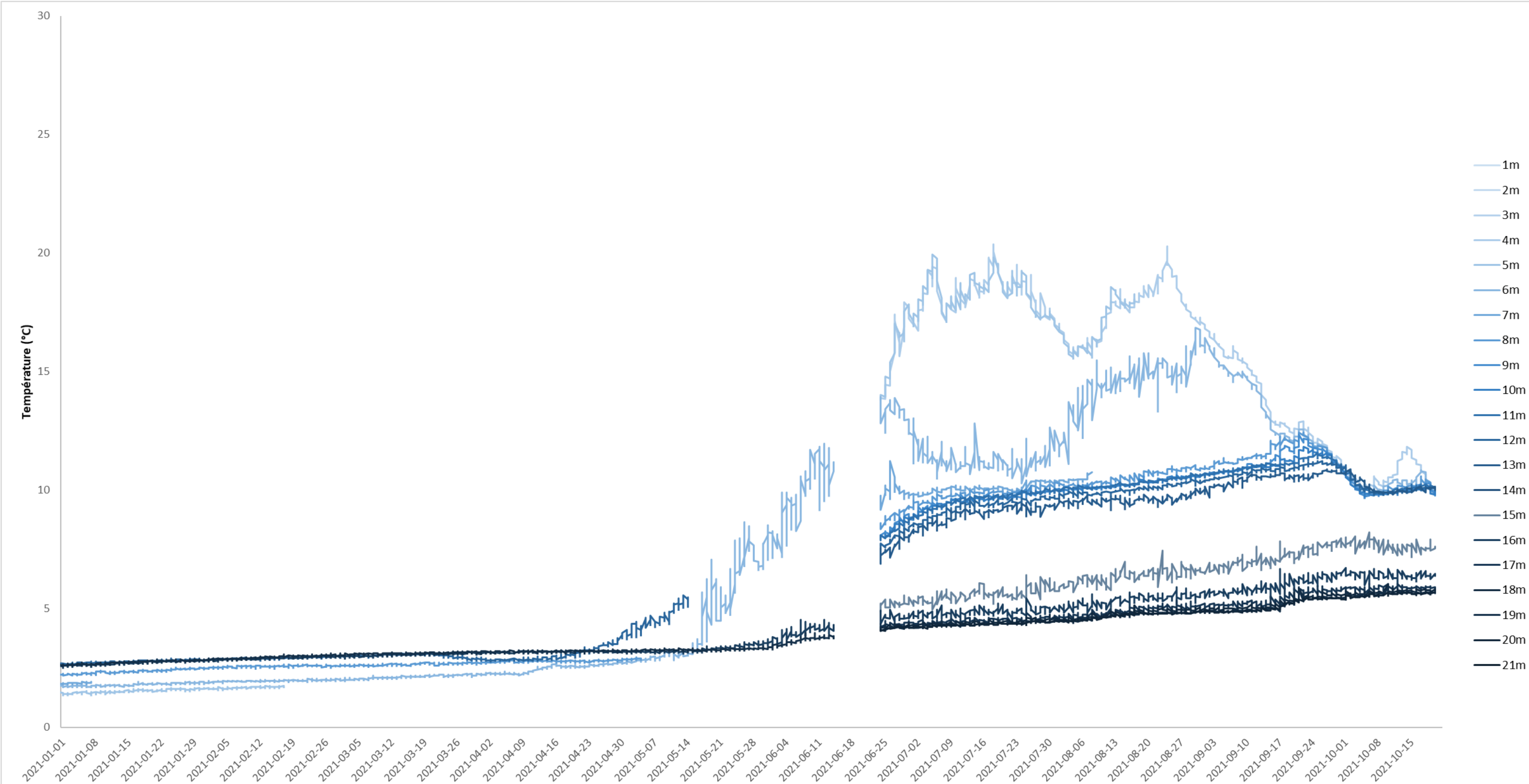



**Figure 3.11 Variation in temperatures measured continuously by depth (1 to 21 m) at the AQR69 station in 2021**

The first water balance was determined in 2017, exclusively for the north basin. It was calculated based on water losses and inflows for Lake Lagopede (Tetra Tech, 2020a).

Water losses include:

- evaporation;
- withdrawals of fresh water for use in the mine;
- discharge into the south basin of Lake Lagopede.

Water inflows include:

- precipitation ;
- runoff;
- dewatering water;
- mine water discharge after treatment.

#### 3.4.4.1 Previous monitoring

As reported in the updated 2019 overall water balance, the variation in water volume in Lake Lagopede was about 0.01% of the water stored in the north basin of Lake Lagopede. This variation is very small and can be considered as negligible (Tetra Tech, 2020a).

The last two water balances (2018 and 2019) calculated using lake inflow and outflow volumes had very similar results. The difference between inflow and outflow volumes was 0.21% in 2019 and 0.16% in 2018.

The results of the 2019 water balance therefore demonstrate the reliability of the water level measuring stations and the strong correlation between the water levels measured and the flow rates calculated for the entire range of the rating curves for 2019 (Tetra Tech, 2020a).

#### 3.4.4.2 2021 Results

The Renard mine temporarily halted operations from March to October 2020 (COVID-19). As a result, the amount of fresh water withdrawn for mine purposes was significantly lower in 2020 than in 2019. Water withdrawals in 2021 (2.42 Mm³) returned to a level similar to that of 2019 (2.76 Mm³) for a similar period of activity and level of production.

Figure 3.12 shows the amount of fresh water removed from Lake Lagopede since 2017.

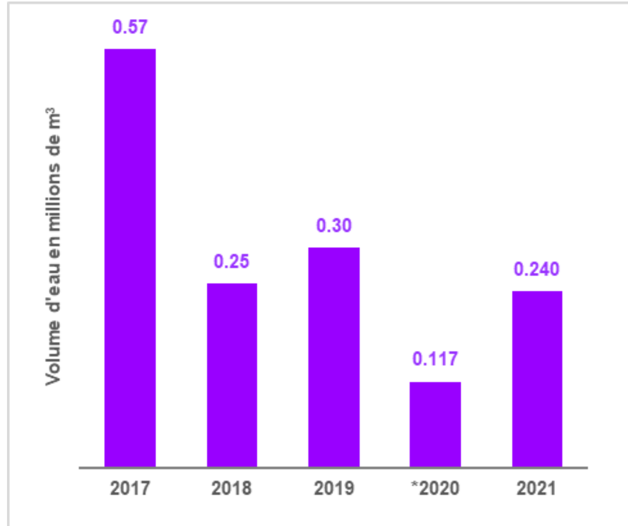



**Figure 3.12 Amount of fresh water removed from Lake Lagopede since 2017**

### 3.4.5 2022 Monitoring

The temperature and conductivity sampling conducted in 2021 confirmed the hypotheses of the effluent dispersion model. They also confirm the hydrodynamic conditions of effluent dispersion in Lake Lagopede predicted by the 2017 modelling (Englobe, 2017).

Characterizing effluent dynamics remains a significant technical challenge demanding substantial effort and use of technology, as well combining several different types of survey results in order to interpret them correctly. Hydrological monitoring will continue in 2022 to confirm the stability of effluent dynamics over time.

A review of all available data could be undertaken to determine the relevance of the current monitoring campaigns, along with other changes or additions to the monitoring protocol to contribute to a deeper understanding of the hydrological regime.

## 3.5 Drinking water quality

### 3.5.1 Drinking water consumption

In 2021, 34,822 m³ of drinking water from Renard mine's water treatment plant was distributed to the mine site, with a 100% availability rate. This distribution of drinking water represents a 42% increase in the volume of treated water since 2020. This is explained primarily by a return to normal mining operations. The amount of drinking water treated in 2021 is similar to that of 2019 (38,956 m³) for similar operating conditions.

#### 3.5.1.1 Monthly distribution

Figure 3.13 illustrates the average amount of water distributed each day by month, as well as the number of workers on the mine site and the average consumption of drinking water per person per day.

After some variation due to the pandemic in 2020, the number of employees present on the mine site stabilized in 2021 with operating conditions similar to those of 2019. The average monthly number of employees on site increased from 2020 (146) to 2021 (255). The average consumption measured in 2021 was 389 litres per person per day, which is similar to 2019 (372 litres per person per day) for the same operating conditions. No leaks were detected in the drinking water distribution system in 2021. Stornoway conducts a visual inspection of the drinking water tanks on an annual basis. The drinking water tanks are cleaned every five years. The next cleaning is scheduled for 2024.

#### 3.5.1.2 Monitoring water distribution

Analysis of daily distribution helps detect abnormal peaks in consumption, which can result from system failure, leaks in the distribution system, or water wastage. When applicable, the relevant maintenance teams are immediately informed and quickly mobilized to make any necessary repairs.

In 2021, a few incidents resulted in elevated consumption of drinking water. An equipment failure at the ore processing plant led to the temporary use of drinking water in order to continue operations. The amount of water used for this purpose was relatively minor.

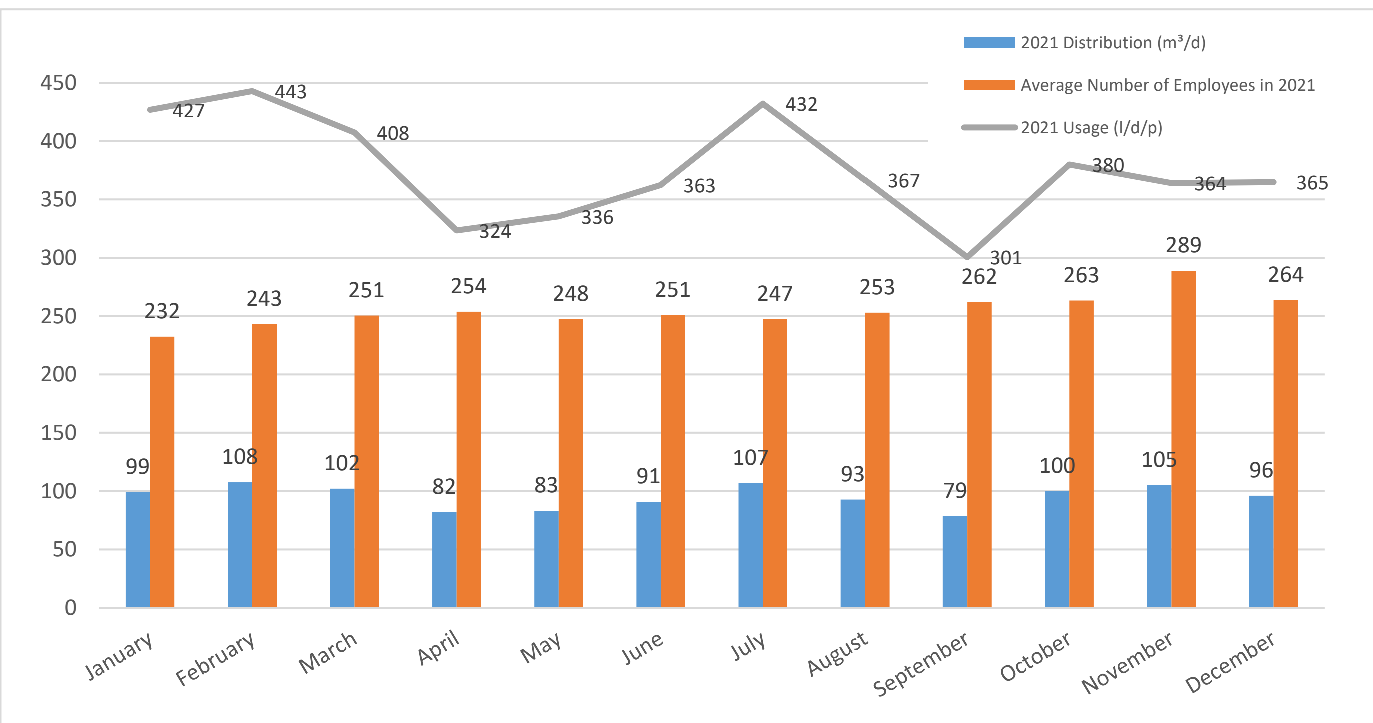



**Figure 3.13 Population at the camp, distribution and consumption of drinking water in 2021**

#### 3.5.1.3 Raising awareness

With a view to encouraging responsible use of water, in 2016 SWY launched a campaign to raise awareness among employees of how important water is for both humans and the environment and to reduce the consumption of bottled water at the mine site.

New employees are informed when they arrive on site of the efforts made to produce and distribute high-quality water on the mine site, and are made aware of the importance of using this natural resource wisely.

### 3.5.2 Drinking water quality monitoring

The *Regulation respecting the Quality of Drinking Water* (RQEP) does not require companies to do any kind of monitoring. In the interest of transparency, however, SWY has voluntarily chosen to set up a drinking water quality monitoring program in line with RQEP requirements and the *Regulation respecting Occupational Health and Safety* (RSST). Table 3.16 shows the average concentrations of the various parameters tested in 2021 as part of the Drinking Water Quality Monitoring Program, along with annual sampling values from July.

**Table 3.16 Drinking water quality analyses compared to Appendix 1 of the RQEP'S drinking water quality standards**

| Parameters | Unitss | RQEP | Mean Concentration | Maximal Value | Annual Sampling (July 2021) |
|---|---|---|---|---|---|
| **Inorganic Substances** | | | | | |
| Antimony (Sb) | mg/l | 0.006 | -- | -- | <0,003 |
| Arsenic (As) | mg/l | 0.010 | -- | -- | <0,0003 |
| Barium (Ba) | mg/l | 1.0 | -- | -- | <0,02 |
| Boron (B) | mg/l | 5.0 | -- | -- | <0,05 |
| Cadmium (Cd) | mg/l | 0.005 | -- | -- | <0,001 |
| Free residual chlorine | mg/l | 0.3 (1) | 0.55(2) | 0.30(1) | 0.50(3)/0.05(4) |
| Chromium (Cr) | mg/l | 0.050 | -- | -- | <0,005 |
| Copper (Cu) | mg/l | 1.0 | -- | -- | 0.0095(3)/0.0057(4) |
| Fluorides ($F^-$) | mg/l | 1.50 | -- | -- | <0,1 |
| Nitrites + nitrates (in N) | mg/l | 10.0 | 0.4 | 0.42 | 0.18 |
| Nitrites (in N) | mg/l | 1.0 | <0,02 | <0,02 | <0,02 |
| Mercury (Hg) | mg/l | 0.001 | -- | -- | <0,0001 |
| pH | pH Units | 6.5 à 8.5 | 7.1 | min:6.9 max:7.6 | 7.3 |
| Lead (Pb) | mg/l | 0.010 | -- | -- | 0.001(3)/0.001(4) |
| Selenium (Se) | mg/l | 0.010 | -- | -- | <0,001 |
| Turbidity | UTN | 0.2 | 0.08 | 0.2 | 0.1 |
| Uranium (U) | mg/l | 0.020 | -- | -- | <0,002 |
| **Organic Substances** | | | | | |
| Total trihalomethanes (THM) | µg/l | 80 (5) | 74 (5) | 94 | 94 |
| **Bacteriological** | | | | | |
| Atypical bacteria | UFC/100 ml | 200 | 0 | 1 | 0 |
| Total coliforms | UFC/100 ml | 10 | 0 | 1 | 0 |
| *Escherichia coli* | UFC/100 ml | 0 | 0 | 3 | 0 |

(1) Minimum value, at the outlet of the treatment plant
(2) Samples taken at the outlet of the treatment plant
(3) Sample taken from the middle of the distribution system
(4) Sample taken from the end of the distribution system
(5) Maximum average concentration for all four quarters combined

All parameters analyzed in 2021 were in compliance with RQEP standards, except for one bacteriological test which was conducted a second time in order to confirm the drinking water supply was not contaminated. To date, no boil-water or drinking water advisories have been issued since the MWWTP came online, because the water quality has always met the standards for consumption.

#### 3.5.2.1 Trihalomethane (THM) concentrations

An elevated concentration of trihalomethane (THM) was measured at the end of the distribution network in 2021, just as it had been in previous years. THM are byproducts of chlorination of water. They are formed when chlorine reacts with organic substances that are naturally present in the water. One example of organic material is biofilm, which forms on the insides of pipes over time.

In 2021, the annual average THM concentration (74 µg/l) complies with the applicable RQEP standard (80 µg/l). Note that RQEP regulations require compliance with the standard for the average of the maximum values obtained for four consecutive quarters, not for each individual quarterly analysis. However, the annual average concentration of THM was higher than 2020 (64 µg/l) or 2019 (36 µg/l).

As a preventive measure, and in accordance with the action plan SWY put in place in 2018, several steps were taken in 2021 to reduce the risk of high THM concentrations. One of these steps was the installation of a toilet near the end of the network, at the core library, to cut down on water stagnation by increasing the demand for water.

Stornoway analyzed THM in 2021 at the end-of-system monitoring stations at the dryhouse (EPR4), alternating with the core library (EPR11).

To continue monitoring sources of THM in the drinking water system on a preventive basis, SWY will keep testing samples of drinking water for THM in 2022 and purge the ends of the system to improve water circulation.

#### 3.5.2.2 Bacteriological monitoring

With regards to the bacteriological quality of the water, through rigorous monitoring and verifications, we were able to confirm the absence of fecal contamination in the drinking water supply.

#### 3.5.2.3 Water disinfection

In 2021, the residual chlorine concentration was always kept above the required limit of 0.3 mg/l at the outlet from the treatment plant, thereby ensuring optimal disinfection. The average chlorine concentration at the start of the distribution network in 2021 was 0.55 mg/l.

#### 3.5.2.4 Facilities maintenance

To keep the equipment at the MWWTP working properly, preventive maintenance is carried out on a regular basis by operators, mechanics and electricians.

The membranes in the two nanofiltration units are washed monthly, or as needed, to preserve the physical integrity of the filtration system and its service life. An equipment maintenance log has been in use since 2015 to record relevant information regarding any corrective actions taken to address problems that arise.

## 3.6 Surface Water and Sediment Quality

### 3.6.1 Background

Stornoway Diamonds (Canada) Inc. committed to monitoring surface water and sediment quality as part of the Renard diamond mine project. This monitoring is also required under condition 4.1 of the Global Certificate of Authorization issued on December 4th, 2012, by the MELCC (MDDEFP, 2012), and the monitoring guidelines set out in the comprehensive study report (CSR) produced by the Impact Assessment Agency of Canada (IAAC).

Modelling was also done by Environnement Illimité (2011) as part of the ESIA to determine effluent dispersion and dilution patterns in Lake Lagopede.

These models were updated in 2017 to include the addition of dewatering water as an intermediate effluent in 2018 (see section 3.13.1).

The modelling was based on a hypothesis from the impact study that assumed that mine effluent could accumulate below a thermocline, which is defined as a layer of water that is less dense at the surface with water that is more dense below. Thermoclines restrict the dispersion of the plume throughout the entire water column.

However, seasonal mixing of the water causes the effluent to disperse uniformly throughout the water column each year, during the spring flooding and fall mixing periods, thereby significantly lessening the accumulation.

### 3.6.2 Objectives

The primary objective of the surface water and sediment quality monitoring program is to characterize the condition of the receiving environment during and after the project construction and production phases, as well as any changes in relation to the baseline conditions established in the EBS for the Renard mine (Roche, 2011b).

More specifically, the water quality monitoring program is designed to ensure compliance with the monitoring guidelines and directives set out in Appendix 10 of the CEAA's CSR (2013),

namely to:

- Document changes in water and sediment quality in the receiving environment;
- Prevent changes to Lake Lagopede's trophic state with respect to excessive nutrients (e.g., total suspended solids (TSP) or phosphorus);
- Track thermal stratification in the water column, which affects the accumulation of effluent in the receiving environment, particularly in Lake Lagopede;
- Evaluate the effectiveness of design and mitigation measures put in place to minimize the project's impact on the water system;
- Track the performance of the domestic and mine water management system as well as the ore and tailings infrastructure;
- Oversee any changes to mining operations or other project components that may affect water or sediment quality;
- Measure environmental variables used to interpret the results of benthic and fish monitoring and surveillance;
- Implement any necessary preventive or corrective measures in accordance with the results of monitoring.

### 3.6.3 Sampling area and period

To accomplish these objectives, since 2015, samples have been taken at a number of water and sediment quality monitoring stations on the Renard mine site (exposed areas), as well as on the periphery of mining facilities (control zones) (Map 3.5). Sites on the lake include two monitoring stations, one on the surface and another at the bottom of the lake, whereas sites on streams have a single station.

The locations for these monitoring sites were defined in the 2011 impact assessment and confirmed during the development of the monitoring program, in order to take potential sources of contaminants into consideration.

The locations of the sampling sites provide a good representation of the hydrological network in the study area by including control zones not influenced by mining activities.

In compliance with the schedule outlined in the ESMP (Norda Stelo, 2016), the sampling campaigns follow the hydrological seasons in order to correlate the concentrations of different substances found in the water and sediment with winter and summer low-flow periods, as well as spring and fall flooding. Surface water sampling is therefore carried out in March, June and July, and October, and sediment sampling in October.

### 3.6.4 Surface Water Quality

#### 3.6.4.1 2021 Sampling Stations and Schedule

In 2021, four surface water sampling campaigns were carried out in the lakes and streams in the mine and airstrip areas. The March, June, and July monitoring campaigns focused on the mine sector, taking samples from 17 different sites. In October, during the fall flooding, the sample area also included the airstrip sector, which contains the two airport sites, for a total of 19 sites visited (Photos 3.17 and 3.18).

**Photo 3.17 Surface water sampling campaign (October 2021)**

**Photo 3.18 Sampling at an underwater station (October 2021)**

#### 3.6.4.2 2021 Results

Table 3.17 presents a summary of the descriptive statistics for surface water quality in the 2010 baseline study, as well as measurements from 2015 to 2021.

The water quality data is compared with:

- Criteria from the MELCC for the prevention of contamination and the protection of aquatic life and surface water;
- The CCME's guidelines for the protection of aquatic life;
- Monitoring guidelines and requirements as defined by the federal authorities (Appendix 10 of the CSR; CEAA, 2013);
- Initial concentrations measured in surface water in the receiving environment when establishing the baseline conditions in 2010 (Roche, 2011b).

These criteria are used to assess the quality of surface water. Notes on these criteria are presented in Appendix III.

Overall, in 2021, the surface water quality in lakes and streams in the Renard mine area was comparable to the period from 2015 to 2020 and differed only slightly from the 2010 baseline results (Roche, 2011a and 2011b). Note that some parameters (e.g. chlorophyll *a*) showed higher average concentrations in 2021 (median of 2.3 µg/l) than in 2020 (median of 1 µg/l), and that surface water quality has tended to vary throughout the study area since the 2010 baseline study.

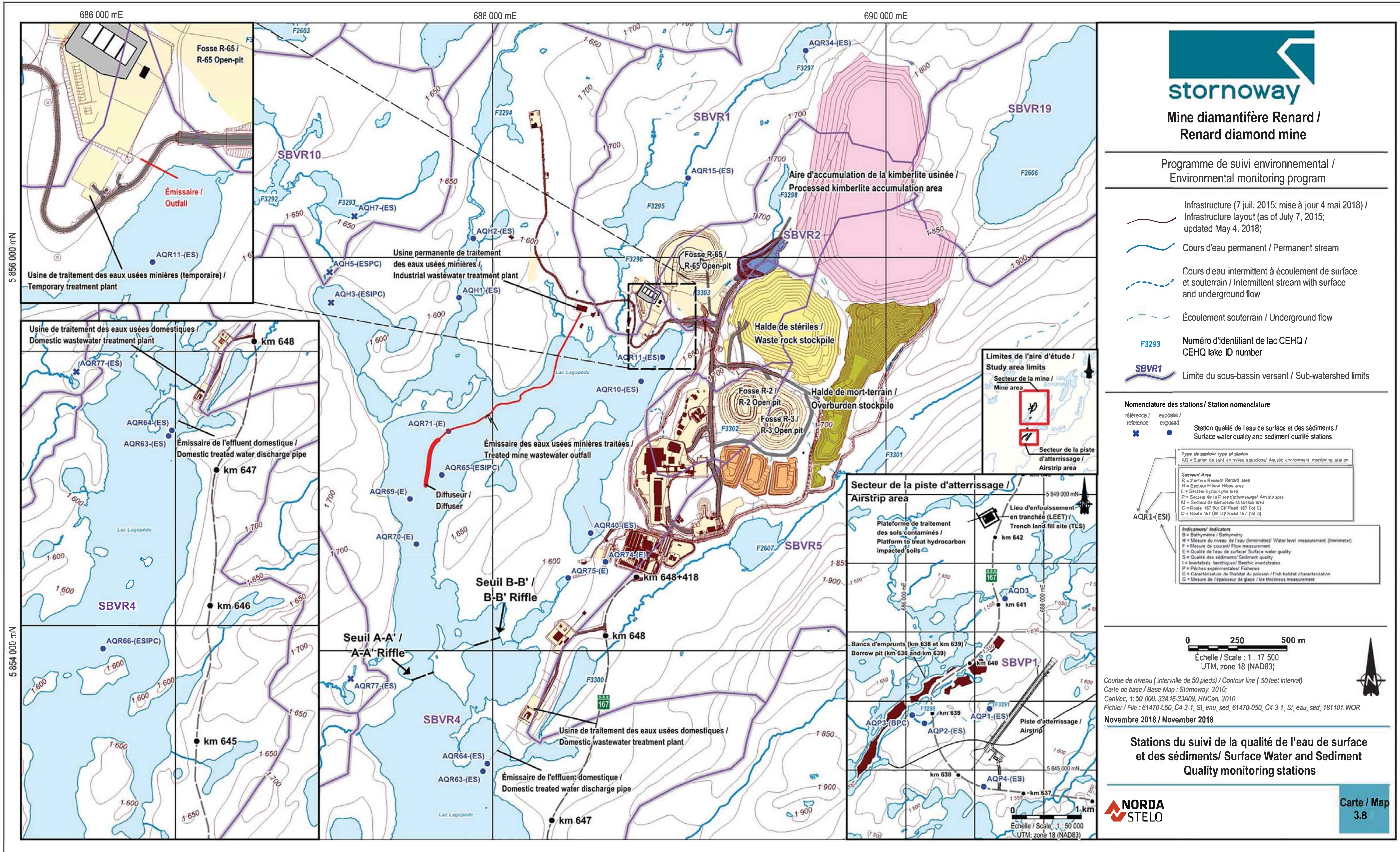
The following sections describe the primary surface water quality characteristics for 2021.

##### *3.6.4.2.1 Physical-Chemical Characteristics*

The physical-chemical characteristics of the lakes and streams for the year 2021 remained stable and comparable to previous years.

Suspended solids

In 2021, the water in lakes and streams had very low levels of suspended solids (median value of 3 mg/l), just as in the baseline study conducted in 2010.


stornoway
Mine diamantifère Renard /
Renard diamond mine
Programme de suivi environnemental /
Environmental monitoring program
Infrastructure (7 juil. 2015; mise à jour 4 mai 2018) /
Infrastructure layout (as of July 7, 2015; updated May 4, 2018)
Cours d'eau permanent / Permanent stream
Cours d'eau intermittent à écoulement de surface et souterrain / Intermittent stream with surface and underground flow
Écoulement souterrain / Underground flow
F3293 Numéro d'identifiant de lac CEHQ / CEHQ lake ID number
SBVR1 Limite du sous-bassin versant / Sub-watershed limits
Nomenclature des stations / Station nomenclature
référence / reference
exposée / exposed
Station qualité de l'eau de surface et des sédiments / Surface water quality and sediment quality stations
AQR1-(ESI)
Limites de l'aire d'étude / Study area limits
Secteur de la mine / Mine area
Secteur de la piste d'atterrissage / Airstrip area
0 250 500 m
Échelle / Scale : 1 : 17 500
UTM, zone 18 (NAD83)
Courbe de niveau ( intervalle de 50 pieds) / Contour line ( 50 feet interval)
Carte de base / Base Map : Stornoway, 2010;
CanVec, 1: 50 000, 33A16-33A09, RNCan, 2010
Fichier / File : 61470-050_C4-3-1_SI_eau_sed_61470-050_C4-3-1_SI_eau_sed_181101.WOR
Novembre 2018 / November 2018
Stations du suivi de la qualité de l'eau de surface et des sédiments/ Surface Water and Sediment Quality monitoring stations
NORDA STELO
Carte / Map 3.8
686 000 mE
688 000 mE
690 000 mE
5 856 000 mN
5 854 000 mN
Fosse R-65 / R-65 Open-pit
Émissaire / Outfall
Usine de traitement des eaux usées minières (temporaire) / Temporary treatment plant
Usine de traitement des eaux usées domestiques / Domestic wastewater treatment plant
Émissaire de l'effluent domestique / Domestic treated water discharge pipe
Usine permanente de traitement des eaux usées minières / Industrial wastewater treatment plant
Aire d'accumulation de la kimberlite usinée / Processed kimberlite accumulation area
Halde de stériles / Waste rock stockpile
Halde de mort-terrain / Overburden stockpile
Fosse R-2 / R-2 Open pit
Fosse R-3 / R-3 Open pit
Émissaire des eaux usées minières traitées / Treated mine wastewater outfall
Diffuseur / Diffuser
Seuil B-B' / B-B' Riffle
Seuil A-A' / A-A' Riffle
Secteur de la piste d'atterrissage / Airstrip area
Plateforme de traitement des sols contaminés / Platform to treat hydrocarbon impacted soils
Lieu d'enfouissement en tranchée (LEET) / Trench land fill site (TLS)
Bancs d'emprunts (km 638 et km 639) / Borrow pit (km 638 and km 639)
Piste d'atterrissage / Airstrip
Échelle / Scale : 1 : 50 000
UTM, zone 18 (NAD83)
SBVR1
SBVR2
SBVR4
SBVR5
SBVR10
SBVR19
SBVP1
AQR34-(ES)
AQR15-(ES)
AQH7-(ES)
AQH2-(ES)
AQH5-(ESPC)
AQH3-(ESIPC)
AQH1-(ES)
AQR11-(ES)
AQR10-(ES)
AQR71-(E)
AQR65-(ESIPC)
AQR69-(E)
AQR70-(E)
AQR40-(ES)
AQR74-(E)
AQR75-(E)
AQR77-(ES)
AQR64-(ES)
AQR63-(ES)
AQR66-(ESIPC)
AQD3
AQP1-(ES)
AQP2-(ES)
AQP3-(BPC)
AQP4-(ES)
km 648
km 647
km 646
km 645
km 648+418
km 642
km 641
km 640
km 639
km 638
km 637
Lac Lagopède

Dissolved oxygen

Lakes and streams generally remain well oxygenated (Table 3.17). During winter low-flow periods, the stations at the bottom of the lake are generally less well oxygenated than those at the surface. When there is a thermocline in the water column of a lake, as is the case in Lake Lagopede during low-flow periods, it limits the exchange between water at the bottom of the lake and water at the surface, thus decreasing oxygen levels at the bottom of the lake.

The highest concentration of dissolved oxygens in 2021 (118.9%) was measured on February 15th at the AQR77 station. It is normal for cold water in motion (such as water in a stream) to be more highly oxygenated than warm standing water (such as water in a lake). The lowest concentration of dissolved oxygens (6.8%) was measured at the bottom of the lake at station AQH3, in the reference zone, during the fall monitoring campaign. This value is to be expected, because the thermocline limits the dispersion of water from the bottom of the bay where the AQH3 station is located. This water remains in place all summer and all winter, and is only renewed during seasonal mixing in spring and fall. This value is lower than it has been in the past, because during the fall 2021 monitoring, the thermocline in Lake Lagopede was still present, and the seasonal mixing had not yet taken place, unlike in previous years of monitoring. The monitoring of vertical profiles confirmed that the seasonal mixing occurred in November 2021 (see section 3.4.4), while the surface water was monitored in October 2021.

Dissolved Organic Carbon (DOC)

The average and maximum DOC concentrations measured in lakes and streams in 2021 were comparable to those measured from 2015 to 2020 (Table 3.17). There are no water quality standards for DOC. However, it plays a role in defining the criteria for aluminium and zinc (Table 3.15).

#### *3.6.4.2.2 pH values*

When the baseline values were established (2010), the results showed the water from the natural environment to be relatively acidic (pH values of up to 4.7). The values measured were generally less than 6.5, which is the lower limit for the prevention of contamination of water or organisms, as well as the criteria for the protection of aquatic life (chronic, MELCC; long-term, CCME).

Consequently, it is not surprising that in 2021 the streams and lakes were found to be acidic or slightly acidic, and that the results showed the average pH to be somewhat higher in streams and lower in lakes than the baseline conditions and conditions from 2015 to 2019, while remaining quite comparable (Table 3.17). The pH values remain slightly below the lower limit of the CCME and MELCC criteria. The pH values measured in 2021 varied from 4.65 to 7.71, which was similar to the reference values from 2010.

Finally, it should be noted that the mine effluent treated and discharged into Lake Lagopede in 2021 had an average pH of around 7 (neutral pH).

Thus, it is unlikely that the mining effluent discharged into the lake contributed to lowering the pH values of the surface water of Lake Lagopede (Tetra Tech, 2020b).

#### *3.6.4.2.3 Trophic level monitoring*

In 2021, the trophic state and physical-chemical characteristics of the lakes and streams remained stable and comparable to previous years. As in the 2010 baseline conditions, the streams and lakes had low concentrations of nutrients and could be defined as oligotrophic environments.

Two parameters are used to track the trophic state in lakes and streams on the site:

- Total phosphorus, which promotes or limits the growth of algae and aquatic plants;
- Chlorophyll *a*, a plant pigment involved in photosynthesis of phytoplankton.

Total Phosphorus

**The average total phosphorous concentrations measured in 2021 in lakes (3,5 µg/l) and streams (4,3 µg/l) remained characteristic of ultraoligotrophic (< 4 µg/l) and oligotrophic (4 to 10 µg/l) environments as defined by the MELCC (2017).**

They were comparable to the concentrations measured from 2015 to 2020, and lower than the reference values from 2010 (6 µg/l in lakes and streams) (Table 3.17).

The highest concentrations were measured at three stations located far below the surface, including two exposed stations (AQR64 and AQR65) and two reference stations (AQH3 and AQH7). Although they exceed the applicable criteria, the results from all four stations are very similar to one another, indicating that the reference and exposed areas have the same levels of total phosphorus.

Samples from all four stations were taken in the presence of a thermocline (between June and October), which may have contributed to the accumulation of phosphorous in the lower level of the lake water.

The 2021 results nonetheless indicate that phosphorous levels in the study area were generally lower than in the baseline study, perhaps due to natural variations from year to year (Table 3.17). The median value for the total phosphorous concentrations of the lakes in 2021 was 3.5 µg/l, whereas the median value from the baseline study in 2010 was 6 µg/l (Table 3.17).

Chlorophyll *a*

Chlorophyll *a* levels measured at twelve stations in the lakes in the study area in 2021 (median of 2.3 µg/l) were higher than during previous monitoring campaigns (median of 0.67 µg/l). However, phosphorous and chlorophyll levels vary naturally from one year to the next, based on several different factors (MELCC, 2017).

There are no water quality standards for chlorophyll a. Elevated levels of chlorophyll a are not cause for concern as long as phosphorous levels are not also elevated. Several factors must be taken into account when judging the trophic state of a lake, and the lakes in the study area remain ultraoligotrophic or oligotrophic in terms of phosphorous and chlorophyll *a* (MELCC, 2017).

#### *3.6.4.2.4 Other nutrients*

The majority of the parameters measured during the 2021 campaigns generally complied with provincial surface water quality criteria and recommendations (MELCC) (Table 3.17). During the production period from 2015 to 2021, surface water quality in the Renard mine area generally remained comparable with 2010 baseline conditions and the monitoring results from 2015 to 2021.

#### *3.6.4.2.5 Nitrates and nitrites*

In 2021, the samples with nitrate (n=6) or nitrite (n=2) levels that exceeded the applicable criteria were from lake-bottom stations located in the immediate vicinity of the mine effluent. Note that these samples were also taken in the presence of a thermocline. The effect of the hydrological regime must therefore be taken into account in order to fully understand the median and maximum nitrate and nitrite levels in 2021 (see section 3.6.9 for more details).

Nitrates

The median nitrate concentration in lakes in 2021 (0.25 mg/l) was similar to the results from 2015 to 2020 (0.21 mg/l), but still higher than during the baseline study (<0.1 mg/l). However, only 6 of 89 samples exceeded water quality standards.

**For 2021, the median nitrate concentration in streams (<0.02 mg/l) was also similar to both previous years (<0.02 mg/l) and the baseline study (<0.1 mg/l).**

After the August 2021 campaign, a statistical analysis was conducted in order to support the analysis of the results. The results show there was no significant difference between the exposed zones and the reference zone, nor was there any significant difference between the exposed zone in August 2021 and the reference values from summer 2015. In fact, even though the median result was higher in 2021, most of the samples had similar nitrate concentrations.

Nitrites

**The nitrite concentrations in lakes and streams in 2021 (<0,02 mg/l) were identical to those measured during the baseline study in 2010 (<0.02 mg/l) (Table 3.15).**

## Table 3.17 Overall descriptive statistics of surface water quality in streams and lakes based on sampling between 2015 and 2021 and the 2010 baseline study

crosshatched | **bold** | *italicized* | underlined | border | Gre

| Parameters | Unit | Federal (CCME) | | Provincial (MELCC) | | | | LDR 2021 | STREAMS | | | | | | | | | | | | | | | | | | LAKES | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Guidelines for the protection of aquatic life; | | Protection of aquatic life | | Prevention of contamination | | | 2021 monitoring | | | | | | 2015 to 2020 Monitoring | | | | | | 2010 baseline study | | | | | | 2021 monitoring | | | | | | 2015 to 2020 monitoring | | | | | | 2010 baseline study | | | | | |
| | | Short term | Long term | Chronic effect | Acute effect | With drinking water intake | Without drinking water | | Number of values | <LD | Exceeds criteria | Minimum | Median | Maximum | Number of values | <LD | Exceeds criteria | Minimum | Median | Maximum | Number of | <LD | Exceeds criteria | Minimum | Median | Maximum | Number of | <LD | Exceeds criteria | Minimum | Median | Maximum | Number of | <LD | Exceeds criteria | Minimum | Median | Maximum | Number of | <LD | Exceeds criteria | Minimum | Median | Maximum |
| **Conventional parameters** | | exceeds | **exceeds criteria** | *exceeds criteria* | exceeds | exceeds criteria | exceeds | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity | mg/l | - | - | sensitivity to acidification high: < 10 mg/l average 10 - 20 mg/l low > 20 mg/l (i) | - | - | - | 1 | 21 | 0 | 21 | 1.3 (high) | 2.4 (high) | 16 (average) | 89 | 21 | 88 | <1 (high) | 2 (high) | 23 (low) | 21 | 48% | 0% | <1 (high) | 1 (high) | 4 (high) | 89 | 2 | 0 | <1.0 (high) | 2.7 (high) | 42 (low) | 402 | 44 | 399 | <1 (high) | 2 (high) | 36 (low) | 25 | 36% | 0% | <1 (high) | 2 (high) | 7 (high) |
| Ammoniacal nitrogen (N-NH3) | mg/l | - | 0.767 (depending on the temperature and the | > 3.8 (pH < 6.5 and Temperature < 11°C) (l) | > 33 (pH < 6.5 and temperature < 14°C) (k) | > 0.2 and 1.5 (j) | - | 0.02 | 16 | 11 | 0 | <0,020 | 0.02 | 0.056 | 89 | 46 | 7 | 0.012 | <0,02 | 0.75 | 21 | 90% | 0% | <0,02 | <0,02 | 0.02 | 67 | 48 | 2 | <0,020 | <0,020 | 0.39 | 402 | 154 | 44 | 0.014 | 0.026 | 04:34:00 | 25 | 88% | 0% | <0,02 | <0,02 | 0.04 |
| Total nitrogen (TN) | mg/l | - | - | - | - | - | - | 0.02 à 0.2 | 21 | 0 | - | 0.133 | 0.217 | 0.675 | 78 | 47 | - | <0,02 | <0,3 | 08:16:00 | 0 | - | - | - | - | - | 89 | 0 | 0 | 0.141 | 0.48 | 11.8 | 340 | 110 | - | <0,02 | 0.334 | 12.6 | 0 | - | - | - | - | - |
| Total Kjeldahl nitrogen (TKN) | mg/l | - | - | - | - | - | - | 0.4 | 4 | 4 | - | <0,40 | 0.4 | <0,40 | 52 | 41 | - | 0.14 | 0.3 | 01:53:00 | 21 | 0% | - | 0.24 | 0.44 | 0.69 | 33 | 29 | 0 | <0,40 | <0,40 | 0.65 | 240 | 171 | - | 0.0256 | 0.3 | 03:34:00 | 25 | 0% | - | 0.22 | 0.45 | 0.72 |
| Bromides (Br-) | mg/l | - | - | >0.00027 | >0.0024 | - | - | 0.1 | 21 | 19 | 21 | <0.10 | <0.10 | 0.14 | 86 | 82 | 86 | <0,10 | 0.1 | 0.6 | 0 | - | - | - | - | - | 89 | 81 | 0 | <0.10 | <0.10 | 0.9 | 389 | 362 | 389 | <0.10 | <0.1 | 0.88 | 0 | - | - | - | - | - |
| Total organic carbon (TOC) | mg/l | - | - | - | - | - | - | 0.2 | 21 | 0 | - | 3.4 | 5.5 | 15 | 89 | 0 | - | 2.88 | 5.95 | 22.2 | 0 | - | - | - | - | - | 89 | 0 | 0 | 2.6 | 4.8 | 11 | 411 | 0 | - | 1.7 | 05:33:00 | 24 | 0 | - | - | - | - | - |
| Dissolved Organic Carbon (DOC) | mg/l | - | - | - | - | - | - | 0.2 | 21 | 0 | - | 3.8 | 5.4 | 14 | 89 | 1 | - | <0,20 | 5.3 | 21.6 | 0 | - | - | - | - | - | 89 | 0 | 0 | 2.6 | 4.6 | 9.6 | 411 | 1 | - | <0,20 | 4.88 | 15.2 | 0 | - | - | - | - | - |
| Chlorophyll a | mg/l | - | - | - | - | - | - | 0.0001 | - | - | - | - | - | - | 10 | 0 | - | 0.00012 | 0.00044 | 0.0008 | 0 | - | - | - | - | - | 12 | 0 | 0 | 0.0008 | 0.0023 | 0.0034 | 59 | 2 | - | <0,00005 | 0.00067 | 0.0017 | 0 | - | - | - | - | - |
| Chloride (Cl-) | mg/l | >640 | >120 | 230 (under review) | 860 (under | >250 | - | 0.05 | 21 | 0 | 0 | 0.079 | 0.19 | 12 | 89 | 6 | 0 | 0.06 | 0.202 | 45.8 | 21 | 0% | 0% | 0.06 | 0.11 | 0.49 | 89 | 0 | 0 | 0.073 | 3.6 | 60 | 402 | 25 | 0 | <0,05 | 1.045 | 85.9 | 25 | 0% | 0% | 0.05 | 0.26 | 0.85 |
| Conductivity | µS/cm | - | - | - | - | - | - | 1 | 21 | 0 | - | 1.6 | 9.2 | 63.5 | 87 | 1 | - | <1 | 12 | 311 | 21 | 0% | - | 6.1 | 10.3 | 26.9 | 89 | 0 | 0 | 4.8 | 25 | 412.2 | 405 | 1 | - | <1 | 24.7 | 660 | 25 | 0% | 0% | 6.8 | 10.7 | 28.4 |
| BOD5 | mg/l | - | - | 3 (for EDO only) | - | - | - | 2 à 4 | 21 | 21 | 0 | <2,0 | <2,0 | <2,0 | 89 | 83 | 9 | <2,0 | <2 | 6 | 0 | - | - | - | - | - | 89 | 86 | 2 | <2,0 | <2,0 | 5.3 | 402 | 375 | 38 | <2,0 | 2 | 59 | 0 | - | - | - | - | - |
| COD | mg/l | - | - | - | - | - | - | 5 | 21 | 3 | - | <5,0 | 13 | 31 | 89 | 13 | - | <3 | 17 | 263 | 0 | - | - | - | - | - | 89 | 10 | 0 | <5,0 | 11 | 21 | 402 | 43 | - | <3 | 14 | 103 | 0 | - | - | - | - | - |
| Total hardness (CaCO3) | mg/l | - | - | - | - | - | - | 0.04 | 21 | 0 | - | 2.3 | 3.2 | 18 | 83 | 0 | - | 1.6 | 2.8 | 72.6 | 21 | 67% | - | <1 | <1 | 6.5 | 89 | 0 | 0 | 2.3 | 9.3 | 110 | 392 | 0 | - | 1.61 | 05:34:00 | 135 | 25 | 76% | - | <1 | <1 | 14 |
| Fluorides (F-) | mg/l | - | >0.12 | 0.2 (provisional; hardness ≤ 120 mg/l) | 4 (provisional; hardness ≤ 120 | >1.5 | - | 0.1 | 21 | 20 | 1 | <0,10 | <0,10 | 0.22 | 89 | 44 | 3 | <0,01 | 0.038 | 0.223 | 0 | - | - | - | - | - | 89 | 77 | 9 | <0,10 | <0,10 | 0.53 | 411 | 225 | 32 | <0,01 | 0.054 | 0.419 | 0 | - | - | - | - | - |
| Suspended solids (SS)* | mg/l | 25 above natural state | 5 above natural state (q) | 5 above natural state (o) | 25 above natural state (n) | - | - | 2 | 21 | 2 | 3 | <2,0 | 3 | 95 | 89 | 52 | 2 | 0.2 | 1 | 272 | 21 | 95% | - | <3 | <3 | 3 | 89 | 13 | 2 | <2,0 | 3 | 6 | 402 | 198 | 5 | <0,2 | 1 | 23 | 25 | 96% | - | <2 | <2 | 19 |
| Nitrates ($NO_3^-$) | mg/l | >550 | >13 | >3 | - | >10 (Nitrates and nitrites: > 10) | - | 0.02 | 21 | 12 | 0 | <0,020 | <0,020 | 0.63 | 89 | 35 | 1 | <0,01000 | <0,02 | 7.85 | 19 | 100% | 0% | <0,1 | <0,1 | <0,1 | 89 | 15 | 6 | <0,020 | 0.25 | 7.5 | 400 | 60 | 19 | <0,01 | 0.205 | 12.6 | 25 | 100% | 0% | <0,1 | <0,1 | <0,1 |
| Nitrites ($NO_2^-$) | mg/l | - | >0.06 | 0.02 to 0.20 (depending on | > 0.06 to 0.60 (depending on | 1 (nitrates and nitrites | - | 0.02 | 21 | 21 | 0 | <0,020 | <0,020 | <0,020 | 89 | 78 | 11 | <0,01 | <0,01 | 0.105 | 11 | 100% | 0% | <0,01 | <0,01 | <0,01 | 89 | 86 | 2 | <0,020 | <0,020 | 0.12 | 402 | 324 | 43 | <0,01 | 0.014 | 5.88 | 15 | 100% | 0% | <0,01 | <0,01 | <0,01 |
| Dissolved oxygen (%) | % | - | - | < 54 to 63% (depending on temperature) (c) | - | - | - | | 21 | 0 | 0 | 78 | 92 | 118.9 | 87 | 0 | 0 | 61.1 | 87.5 | 125.7 | 19 | 0% | 0% | 60.6 | 86.8 | 106 | 89 | 0 | 10 | 6.8 | 92.7 | 99.7 | 406 | 0 | 38 | 2.1 | 89.5 | 152.3 | 22 | 0% | 0% | 65.5 | 88.0 | 105 |
| Dissolved oxygen (mg/l) | mg/l | - | < 5.5 (d) | < 5 to 8 mg/l (depending on | - | - | - | | 21 | 0 | 0 | 08:2 | 09:5 | 17:39:00 | 88 | 0 | 3 | 5.69 | 10.3 | 16:53:00 | 19 | 0% | 11% | 5.84 | 7.65 | 11:33:00 | 89 | 0 | 9 | 0.89 | 9.79 | 13.89 | 406 | 0 | 52 | 0.3 | 10:36:00 | 30 | 22 | 0% | 5% | 05:28:00 | 08:05:00 | 09:32:00 |
| pH | pH Unit | - | < 6.5 or > 9.0 | < 6.5 or > 9.0 | unlikely to be be harmful between | < 6.5 or > 8.5 | - | | 21 | 0 | 19 | 05:09:00 | 5.94 | 7.71 | 89 | 0 | 76 | 3.99 | 5.88 | 8 | 21 | 0% | 90% | 4.97 | 5.82 | 7.93 | 89 | 0 | 69 | 4.65 | 6.3 | 07:5 | 406 | 0 | 330 | 4 | 06:25:00 | 7.63 | 25 | 0% | 72% | 4.7 | 5.9 | 7.1 |
| Phenols by 4AAP | mg/l | - | - | - | - | - | >0.005 | 0.002 | 21 | 21 | 0 | <0,0020 | <0,0020 | <0,0020 | 86 | 38 | 24 | <0,0020 | 0.003 | 0.019 | 0 | - | - | - | - | - | 89 | 88 | 0 | <0,0020 | <0,0020 | 0.0028 | 388 | 180 | 94 | <0,0020 | 0.002 | 0.018 | 0 | - | - | - | - | - |
| Total phosphorus | mg/l | - | ultra-oligotrophic: < 4; oligotrophic: 4 to | 50% increase as compared to natural concentration (t) | - | - | - | 0.0006 | 21 | 0 | 2 | 0.0022 | 0.004 | 0.0102 | 89 | 6 | 13 | <0,0006 | 0.0043 | 0.257 | 21 | 14% | - | <0,005 | 0.006 | 0.011 | 89 | 0 | 3 | 0.0008 | 0.0035 | 0.0155 | 402 | 20 | 67 | 0.0000036 | 0.0037 | 0.152 | 25 | 40% | - | <0,005 | 0.006 | 0.022 |
| Oxidation-reduction potential | mV | - | - | - | - | - | - | | 21 | 0 | - | 42.6 | 147.2 | 257.5 | 56 | 0 | - | 102 | 266.8 | 394.5 | 21 | 0% | - | 100 | 220.8 | 297.8 | 59 | 0 | 0 | 48.3 | 170.4 | 410.2 | 140 | 0 | - | 83.9 | 263.35 | 395 | 25 | 0% | - | 105.0 | 232.9 | 293.3 |
| Total dissolved solids | mg/l | - | - | - | - | - | - | 10 | 21 | 0 | - | 1 | 6 | 41 | 89 | 20 | - | <9 | 24 | 194 | 21 | 5% | - | <10 | 30 | 54 | 89 | 2 | 0 | <10 | 39 | 270 | 233 | 0 | - | 2 | 15 | 330 | 25 | 64% | - | <25 | <25 | 57 |
| Total solids | mg/l | - | - | - | - | - | - | 10 | 21 | 0 | - | 16 | 48 | 140 | 89 | 10 | - | <4 | 28 | 1100 | 0 | - | - | - | - | - | 89 | 0 | 0 | 12 | 60 | 300 | 402 | 22 | - | <4 | 32 | 400 | 0 | - | - | - | - | - |
| Sulfates ($SO_4^{2-}$) | mg/l | - | - | > 500 (hardness < 100 mg/l); equation (v) | > 500 (hardness < 100 | > 500 | - | 0.05 | 21 | 1 | 0 | <0,50 | 0.81 | 12 | 89 | 8 | 0 | <0,5 | 01:41:00 | 29.8 | 21 | 0% | 0% | 0.5 | 0.9 | 6 | 89 | 2 | 0 | <0,50 | 5.7 | 82 | 400 | 10 | 0 | 0.0006 | 2.885 | 101 | 25 | 0% | 0% | 0.2 | 0.9 | 6.75 |
| Temperature | °C | - | (b) | (a) | - | - | - | | 21 | 0 | 0 | 0 | 10.8 | 17.6 | 88 | 0 | 0 | -0.3 | 9 | 21.6 | 20 | 0% | 0% | 9.6 | 15.5 | 26 | 89 | 0 | 0 | 0.1 | 9.9 | 19.2 | 405 | 0 | 0 | -0.2 | 7.3 | 22.3 | 25 | 0% | 0% | 12:09:00 | 16:52:00 | 26.7 |
| Transparency | m | - | - | - | - | - | - | | | | | | | | 11 | 0 | - | 0.2 | 0.3 | 1.4 | 0 | - | - | - | - | - | | | | | | | 121 | 0 | - | 0.3 | 3 | 5.5 | 0 | - | - | - | - | - |
| Turbidity* | UTN | 8 above natural value (24h) (g) | 2 above natural value (30 days) (h) | 2 above natural value (f) | 8 above natural value (e) | - | - | | | | | | | | 77 | 0 | 4 | 0 | 0.01 | 591 | 21 | 0% | - | 0 | 0.88 | 02:41:00 | | | | | | | 341 | 0 | 12 | 0 | 0 | 11.4 | 25 | 0% | - | 0 | 0.88 | 29.5 |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminium (Al)* | mg/l | - | 0.005 when pH < 6.5; > 0.1 when pH ≥ 6.5 | 0.00063 (depends on DOC, pH and hardness) (w) | 0.001 (depends on (DOC, pH and hardness) (x) | > 0.2 | - | 0.005 | 21 | 0 | 21 | 0.069 | 0.14 | 0.5 | 88 | 0 | 87 | 0.056 | 0.141 | 4.68 | 21 | 14% | 100% | <0,01 | 0.13 | 0.48 | 89 | 0 | 89 | 0.051 | 0.12 | 0.24 | 410 | 0 | 384 | 0.0011 | 0.119 | 1.3 | 25 | 32% | 80% | <0,03 | 0.08 | 0.87 |
| Antimony (Sb) | mg/l | - | - | >0.24 | >1.1 | 0.006 (provisional) | >0.64 | 0.000005 | 21 | 0 | 0 | 0.000008 | 0.000013 | 0.000078 | 88 | 61 | 0 | <0,000005 | 0.000005 | <0,001 | 0 | - | - | - | - | - | 89 | 5 | 0 | <0,0000050 | 0.000021 | 0.00018 | 410 | 218 | 0 | <0,000005 | 0.0000055 | <0,001 | 0 | - | - | - | - | - |
| Silver (Ag) | mg/l | - | >0.00025 | >0.0001 | depends on hardness; | >0.1 | >11 | 0.000003 | 21 | 21 | 0 | <0,0000030 | <0,0000030 | <0,0000030 | 85 | 88 | 86 | 0.0000004 | <0,000003 | <0.0003 | 0 | - | - | - | - | - | 88 | 86 | 0 | <0,0000030 | 0.000003 | 0.0000053 | 399 | 325 | 55 | <0,0000030 | <0,000003 | <0.0003 | 0 | - | - | - | - | - |
| Arsenic (As) | mg/l | - | >0.005 | >0.15 | >0.34 | >0.0003 | 0.021 | 0.00008 | 21 | 8 | 0 | <0,000080 | 0.000088 | 0.00016 | 88 | 47 | 6 | <0,00008 | 0.000083 | <0,001 | 0 | - | - | - | - | - | 89 | 46 | 0 | <0,000080 | <0,000080 | 0.00019 | 410 | 236 | 26 | <0,000080 | 0.00008 | <0,008 | 0 | - | - | - | - | - |
| Barium (Ba) | mg/l | - | - | depends on hardness, | depends on hardness; | > 1 | > 160 | 0.00003 | 21 | 0 | 0 | 0.0029 | 0.004 | 0.012 | 88 | 0 | 0 | 0.00177 | 0.0033 | 0.0428 | 0 | - | - | - | - | - | 89 | 0 | 0 | 0.0025 | 0.0052 | 0.034 | 410 | 1 | 0 | 0.0013 | 0.0043 | 0.0762 | 0 | - | - | - | - | - |
| Beryllium (Be) | mg/l | - | - | depends on hardness, | depends on hardness; | > 0.004 | > 1.2 | 0.00001 | 21 | 19 | 0 | <0,000010 | <0,000010 | 0.000018 | 88 | 37 | 9 | <0,000006 | 0.00001 | <0.002 | 0 | - | - | - | - | - | 89 | 80 | 0 | <0,000010 | <0,000010 | 0.000015 | 410 | 194 | 22 | <0,000006 | 0.00001 | <0.002 | 0 | - | - | - | - | - |
| Boron (B) | mg/l | 29 | 1.5 | 5 | 28 | 0.2 | 160 | 0.0003 | 21 | 0 | 0 | 0.00043 | 0.00068 | 0.019 | 88 | 34 | 0 | <0,0003 | 0.0006 | 0.113 | 0 | - | - | - | - | - | 89 | 0 | 0 | 0.0004 | 0.0058 | 0.092 | 410 | 69 | 0 | <0,0003 | 0.0029 | 0.192 | 0 | - | - | - | - | - |
| Cadmium (Cd) | mg/l | 0.001 | 0.00009 | depends on hardness; | depends on hardness; | 0.0050.005 | 0.13 | 0.000006 | 21 | 11 | 0 | <0,0000060 | <0,0000060 | 0.000015 | 88 | 27 | 9 | <0,0000060 | 0.000008 | <0.0006 | 0 | - | - | - | - | - | 89 | 36 | 0 | <0,0000060 | 0.0000063 | 0.000019 | 410 | 99 | 19 | <0,000006 | 0.000008 | <0.0006 | 0 | - | - | - | - | - |
| Calcium (Ca) | mg/l | - | - | sensitivity to acidification high: < 4 mg/l; average: 4 - 8 mg/l; low: > 8 mg/l | - | - | - | 0.02 | 21 | 0 | 21 | 0.62 (high) | 0.85 (high) | 5.4 (average) | 88 | 1 | 83 | 0.324 (high) | 0.73 (high) | 22.8 (low) | 21 | 0% | 100% | 0.3 (high) | 0.8 (high) | 2.6 (high) | 89 | 0 | 0 | 0.63 (high) | 2.9 (high) | 34 (low) | 410 | 0 | 384 | 0.324 (high) | 1.5 (high) | 43 (low) | 25 | 8% | 100% | <0.5 (high) | 0.7 (high) | 2.85 (high) |
| Total chromium (Cr) | mg/l | - | Cr(III): 0.0089; Cr(VI): 0.001 | Cr(III): depends on hardness; equation | Cr(III): depends on hardness; equation | 0.05 | Cr(VI): 9.4 | 0.00004 | 21 | 0 | 0 | 0.000098 | 0.00028 | 0.0015 | 88 | 5 | 3 | <0,00004 | 0.00047 | 0.0223 | 0 | - | - | - | - | - | 89 | 0 | 0 | 0.000061 | 0.00026 | 0.00079 | 410 | 24 | 10 | <0,00004 | 0.000385 | 0.072 | 0 | - | - | - | - | - |
| Cobalt (Co) | mg/l | - | - | >0.1 | >0.37 | - | - | 0.000008 | 21 | 1 | 0 | <0,000008 | 0.00012 | 0.00034 | 88 | 3 | 0 | 0.000035 | 0.00013 | 0.00225 | 0 | - | - | - | - | - | 89 | 0 | 0 | 0.000039 | 0.0001 | 0.002 | 410 | 13 | 0 | <0,000005 | 0.000125 | 0.00172 | 0 | - | - | - | - | - |
| Copper (Cu) | mg/l | - | depends on hardness; | depends on hardness; | depends on hardness; | > 1 | > 38 | 0.00005 to | 21 | 0 | 0 | 0.00018 | 0.00024 | 0.001 | 88 | 3 | 24 | 0.00012 | 0.00032 | 0.00868 | 0 | - | - | - | - | - | 89 | 0 | 1 | 0.00016 | 0.00024 | 0.0028 | 410 | 14 | 58 | <0,00005 | 0.00034 | 0.0147 | 0 | - | - | - | - | - |
| Iron (Fe) | mg/l | - | >0.3 | 1, 3 (provisional) > 0.65 if < 10 mg/l MES; 0.43 if ≥ 10 mg/l MES | 3.4 (provisional) | >0.3 | - | 0.0005 | 21 | 0 | 2 | 0.062 | 0.13 | 0.61 | 88 | 0 | 10 | 0.064 | 0.14 | 10.3 | 21 | 5% | 10% | <0,1 | 0.2 | 0.55 | 89 | 0 | 3 | 0.034 | 0.081 | 2.5 | 410 | 1 | 27 | <0,0005 | 0.102 | 5.5 | 25 | 24% | 12% | 0.05 | 0.1 | 0.8 |
| Magnesium (Mg) | mg/l | - | - | - | - | - | - | 0.01 | 21 | 0 | - | 0.18 | 0.28 | 1.1 | 88 | 0 | - | 0.15 | 0.241 | 3.81 | 21 | 0% | - | 0.12 | 0.2 | 0.85 | 89 | 0 | 0 | 0.17 | 0.52 | 4.8 | 410 | 1 | - | <0,01 | 0.35 | 6.62 | 25 | 20% | - | <0,2 | 0.2 | 2.3 |
| Manganese (Mn) | mg/l | depends on hardness; equation | 190 (depends on pH and hardness) | depends on hardness; | depends on hardness; | > 0.05 | > 59 | 0.00003 to | 21 | 0 | 0 | 0.0012 | 0.0025 | 0.0063 | 88 | 0 | 0 | 0.00116 | 0.00316 | 0.0242 | 21 | 33% | 0% | <0,003 | <0,003 | 0.005 | 89 | 0 | 1 | 0.0011 | 0.0038 | 0.1 | 410 | 0 | 4 | 0.00142 | 0.0044 | 0.0795 | 25 | 48% | 0% | <0,003 | 0.003 | 0.012 |
| Mercury (Hg) | mg/l | - | >0.000026 | >0.00091 | >0.0016 | >0.0000018 | >0.0000018 | 0.000002 | 21 | 17 | 21 | <0,0000020 | <0,0000020 | 0.0000027 | 88 | 57 | 88 | <0,0000019 | 0.000002 | <0,000025 | 0 | - | - | - | - | - | 89 | 85 | 89 | <0,0000020 | <0,0000020 | 0.0000027 | 410 | 311 | 410 | <0,0000019 | 0.000002 | <0,000025 | 0 | - | - | - | - | - |
| Molybdenum (Mo) | mg/l | - | 0.073 | > 3.2 | > 29 | > 0.04 | > 10 | 0.00001 | 21 | 0 | 0 | 0.000035 | 0.000088 | 0.00098 | 88 | 3 | 0 | 0.00002 | 0.00008 | 0.00152 | 0 | - | - | - | - | - | 89 | 0 | 0 | 0.000033 | 0.001 | 0.03 | 410 | 14 | 0 | 0.00001 | 0.0003 | 0.022 | 0 | - | - | - | - | - |
| Nickel (Ni) | mg/l | - | hardness ≤ 60 mg/l: > 0.0025; hardness > 60 ≤180 mg/l: equation (aq); hardness >180 | depends on hardness; equation (ap) | depends on hardness; equation (ao) | > 0.07 | > 4.6 | 0.00003 to 0.00005 | 21 | 0 | 0 | 0.00031 | 0.00054 | 0.002 | 88 | 3 | 4 | 0.00018 | 0.00058 | 0.0107 | 0 | - | - | - | - | - | 89 | 0 | 0 | 0.0004 | 0.00075 | 0.0045 | 410 | 12 | 14 | <0,00003 | 0.00078 | 0.021 | 0 | - | - | - | - | - |
| Lead (Pb) | mg/l | - | - | depends on hardness; | depends on hardness; | > 0.01 | > 0.19 | 0.00001 to | 21 | 1 | 16 | 0.000033 | 0.0001 | 0.00031 | 88 | 4 | 73 | <0,00001 | 0.00011 | 0.00577 | 0 | - | - | - | - | - | 89 | 7 | 2 | 0.000022 | 0.000064 | 0.00037 | 410 | 15 | 194 | <0,00001 | 0.00007 | 0.0043 | 0 | - | - | - | - | - |
| Potassium (K) | mg/l | - | - | - | - | - | - | 0.01 | 21 | 0 | 0 | 0.17 | 0.24 | 1.3 | 88 | 3 | - | 0.06 | 0.202 | 3.84 | 21 | 10% | - | <0,1 | 0.2 | 0.9 | 89 | 0 | 0 | 0.17 | 0.59 | 6.8 | 410 | 10 | - | <0,01 | 0.424 | 09:07:00 | 25 | 12% | - | <0,1 | 0.2 | 1 |
| Selenium (Se) | mg/l | - | >0.001 | >0.005 | >0.062 | >0.01 | >4.2 | 0.00005 | 21 | 17 | 0 | <0,000050 | <0,000050 | 0.000071 | 88 | 53 | 9 | <0,00005 | 0.00005 | <0,003 | 0 | - | - | - | - | - | 89 | 49 | 0 | <0,000050 | <0,000050 | 0.00081 | 410 | 235 | 23 | <0,000050 | 0.00005 | 0.01 | 0 | - | - | - | - | - |
| Silicon (Si) | mg/l | - | - | - | - | - | - | 0.1 | 21 | 0 | - | 1.1 | 1.6 | 4.1 | 66 | 0 | - | 01:02:00 | 01:57:00 | 06:29:00 | 0 | - | - | - | - | - | 89 | 0 | 0 | 1 | 1.5 | 4 | 282 | 0 | - | 0.881 | 1.505 | 05:29:00 | 0 | - | - | - | - | - |
| Sodium (Na) | mg/l | - | - | - | - | >200 | - | 0.01 | 21 | 0 | 0 | 0.5 | 0.62 | 6.9 | 88 | 2 | 0 | 0.405 | 0.623 | 19.3 | 21 | 0% | 0% | 0.23 | 0.56 | 1.1 | 89 | 0 | 0 | 0.5 | 2.9 | 39 | 410 | 0 | 0 | 0.0088 | 1.2 | 34.9 | 25 | 4% | 0% | <0,03 | 0.47 | 01:25:00 |
| Strontium (Sr) | mg/l | - | - | >21 | >40 | >4 | - | 0.00004 to | 21 | 0 | 0 | 0.0059 | 0.0083 | 0.06 | 85 | 0 | 0 | 0.0044 | 0.0073 | 0.264 | 0 | - | - | - | - | - | 89 | 0 | 0 | 0.0057 | 0.046 | 0.72 | 399 | 0 | 0 | 0.00015 | 0.0177 | 0.677 | 0 | - | - | - | - | - |
| Uranium (U) | mg/l | >0.033 | >0.015 | hardness 20 to 100 mg/l: > 0.014; hardness 100 | hardness 20 to 100 mg/l: > 0.32; hardness | > 0.02 | - | 0.000001 | 21 | 0 | 0 | 0.0000054 | 0.0000081 | 0.000026 | 88 | 14 | 0 | 0.000004 | 0.000007 | <0,001 | 0 | - | - | - | - | - | 89 | 0 | 0 | 0.0000042 | 0.000019 | 0.00049 | 410 | 38 | 0 | <0,0000010 | 0.000012 | <0,001 | 0 | - | - | - | - | - |
| Vanadium (V) | mg/l | - | - | >0.012 | >0.11 | >0.22 | >2.2 | 0.00005 | 21 | 0 | 0 | 0.000073 | 0.00016 | 0.002 | 85 | 58 | 1 | <0,00002 | <0,00002 | 0.0163 | 0 | - | - | - | - | - | 89 | 0 | 0 | 0.000067 | 0.00012 | 0.00059 | 399 | 258 | 0 | <0,00002 | <0,00002 | 0.00731 | 0 | - | - | - | - | - |
| Zinc (Zn) | mg/l | depends on hardness and DOC; equation | depends on hardness; pH and DOC; equation (av) | depends on hardness; | depends on hardness; | > 5 | > 26 | 0.0005 to 0.0022 | 21 | 5 | 0 | < 0.00050 | 0.00097 | 0.0073 | 88 | 6 | 6 | <0,0005 | 0.0016 | 0.0489 | 21 | 100% | 67% | <0,002 | <0.005 | < 0,005 | 89 | 6 | 0 | 0.00056 | 0.0015 | 0.007 | 410 | 13 | 24 | < 0.00050 | 0.0023 | 0.094 | 25 | 100% | 76% | <0,002 | <0.005 | < 0,005 |

Table 3.17 Overall descriptive statistics of surface water quality in streams and lakes based on sampling between 2015 and 2021 and the 2010 baseline study

| Parameters | Unit | Federal (CCME) Guidelines for the protection of aquatic life; Short term | Federal (CCME) Guidelines for the protection of aquatic life; Long term | Provincial (MELCC) Protection of aquatic life: Chronic effect | Provincial (MELCC) Protection of aquatic life: Acute effect | Provincial (MELCC) Prevention of contamination: With drinking water intake | Provincial (MELCC) Prevention of contamination: Without drinking water | LDR 2021 |
|---|---|---|---|---|---|---|---|---|
| | | crosshatched | **bold** | *italicized* | <u>underlined</u> | border around it | Grey | |
| **Conventional parameters** | | exceeds | **exceeds criteria** | *exceeds criteria* | <u>exceeds criteria</u> | exceeds criteria | exceeds | |
| Hydrocarbons | | | | | | | | |
| Hydrocarbon $C_{10}$-$C_{50}$ | mg/l | - | - | >0.011 | >0.11 | - | - | 0.1 |
| Propylene glycol | mg/l | - | >500 | >500 | >1,000 | >580 | >47,000 | 10 |
| Bacteriological | | | | | | | | |
| Atypical bacteria | nb/membrane | - | - | - | - | - | - | |
| Fecal coliforms | UFC/100 ml | - | - | - | - | >200 | - | |
| Total coliforms | UFC/100 ml | - | - | - | - | - | - | |
| *Escherichia coli* | UFC/100 ml | - | - | - | - | >150 | - | |
| Phenols | | | | | | | | |
| 2,4-Dimethylphenol | - | | | | | | | |
| 2,4-Dinitrophenol | - | | | | | | | |
| 2-Methyl-4,6-Dinitrophenol | - | | | | | | | |
| 4-Nitrophenol | - | | | | | | | |
| Phenol | - | | | | | | | |
| 2-Chlorophenol | - | | | | | | | |
| 3-Chlorophenol | - | | | | | | | |
| 4-Chlorophenol | - | | | | | | | |
| 2,3-Dichlorophenol | - | | | | | | | |
| 2,4 + 2,5-Dichlorophenol | - | | | | | | | |
| 2,6-Dichlorophenol | - | | | | | | | |
| 3,4-Dichlorophenol | - | | | | | | | |
| 3,5-Dichlorophenol | - | | | | | | | |
| Pentachlorophenol | - | | | | | | | |
| 2,3,4,6-Tetrachlorophenol | - | | | | | | | |
| 2,3,5,6-Tetrachlorophenol | - | | | | | | | |
| 2,4,5-Trichlorophenol | - | | | | | | | |
| 2,4,6-Trichlorophenol | - | | | | | | | |
| 2,3,5-Trichlorophenol | - | | | | | | | |
| 2,3,4-Trichlorophenol | - | | | | | | | |
| 2,3,6-Trichlorophenol | - | | | | | | | |
| 2,3,4,5-Tetrachlorophenol | - | | | | | | | |
| 3,4,5-Trichlorophenol | - | | | | | | | |
| o-Cresol | - | | | | | | | |
| p-Cresol | - | | | | | | | |

| STREAMS | 2021 monitoring | | | | | | 2015 to 2020 Monitoring | | | | | | 2010 baseline study | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameters | Number of values | <LD | Exceeds criteria | Minimum | Median | Maximum | Number of values | <LD | Exceeds criteria | Minimum | Median | Maximum | Number of values | <LD | Exceeds criteria | Minimum | Median | Maximum |
| **Conventional parameters** | | | | | | | | | | | | | | | | | | |
| Hydrocarbons | | | | | | | | | | | | | | | | | | |
| Hydrocarbon $C_{10}$-$C_{50}$ | 21 | 21 | 21 | <0,1 | <0,1 | <0,1 | 89 | 81 | 89 | <0,1 | <0,1 | *<u>0.274</u>* | 19 | 100% | 0% | *<u><0.1</u>* | *<u><0.1</u>* | *<u><0.1</u>* |
| Propylene glycol | 1 | 1 | 0 | <10 | <10 | <10 | 5 | 5 | 0 | <5 | 5 | <10 | 0 | - | - | - | - | - |
| Bacteriological | | | | | | | | | | | | | | | | | | |
| Atypical bacteria | | | | | | | - | - | - | - | - | - | 0 | - | - | - | - | - |
| Fecal coliforms | | | | | | | - | - | - | - | - | - | 0 | - | - | - | - | - |
| Total coliforms | | | | | | | - | - | - | - | - | - | 0 | - | - | - | - | - |
| *Escherichia coli* | | | | | | | - | - | - | - | - | - | 0 | - | - | - | - | - |
| Phenols | | | | | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | 2 | 1 | 0 | <0,0006 | <0,0006 | <0,0006 | 0 | - | - | - | - | - |
| 2,4-Dinitrophenol | | | | | | | 2 | 1 | 0 | <0,01 | <0,01 | <0,01 | 0 | - | - | - | - | - |
| 2-Methyl-4,6-Dinitrophenol | | | | | | | 2 | 1 | 0 | <0,01 | <0,01 | <0,01 | 0 | - | - | - | - | - |
| 4-Nitrophenol | | | | | | | 2 | 1 | 0 | <0,001 | <0,001 | <0,001 | 0 | - | - | - | - | - |
| Phenol | | | | | | | 2 | 1 | 0 | <0,0006 | <0,0006 | <0,0006 | 0 | - | - | - | - | - |
| 2-Chlorophenol | | | | | | | 2 | 1 | 0 | <0,0005 | <0,0005 | <0,0005 | 0 | - | - | - | - | - |
| 3-Chlorophenol | | | | | | | 2 | 1 | 0 | <0,0005 | <0,0005 | <0,0005 | 0 | - | - | - | - | - |
| 4-Chlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 2,3-Dichlorophenol | | | | | | | 2 | 1 | 0 | <0,0005 | <0,0005 | <0,0005 | 0 | - | - | - | - | - |
| 2,4 + 2,5-Dichlorophenol | | | | | | | 2 | 1 | 0 | <0,0003 | <0,0003 | <0,0003 | 0 | - | - | - | - | - |
| 2,6-Dichlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 3,4-Dichlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 3,5-Dichlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| Pentachlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 2,3,4,6-Tetrachlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 2,3,5,6-Tetrachlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 2,4,5-Trichlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 2,4,6-Trichlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 2,3,5-Trichlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 2,3,4-Trichlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 2,3,6-Trichlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 2,3,4,5-Tetrachlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| 3,4,5-Trichlorophenol | | | | | | | 2 | 1 | 0 | <0,0004 | <0,0004 | <0,0004 | 0 | - | - | - | - | - |
| o-Cresol | | | | | | | 2 | 1 | 0 | <0,001 | <0,001 | <0,001 | 0 | - | - | - | - | - |
| p-Cresol | | | | | | | 2 | 1 | 0 | <0,001 | <0,001 | <0,001 | 0 | - | - | - | - | - |

| LAKES | 2021 monitoring | | | | | | 2015 to 2020 monitoring results | | | | | | 2010 baseline study | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameters | Number of values | <LD | Exceeds criteria | Minimum | Median | Maximum | Number of values | <LD | Exceeds criteria | Minimum | Median | Maximum | Number of values | <LD | Exceeds criteria | Minimum | Median | Maximum |
| **Conventional parameters** | | | | | | | | | | | | | | | | | | |
| Hydrocarbons | | | | | | | | | | | | | | | | | | |
| Hydrocarbon $C_{10}$-$C_{50}$ | 89 | 89 | 89 | <0,1 | <0,1 | <0,1 | 413 | 382 | 413 | <0,1 | <0,1 | <u>15.5</u> | 24 | 96% | 100% | *<0,1* | *<0,1* | *<u>0.42</u>* |
| Propylene glycol | 1 | 1 | 0 | <10 | <10 | <10 | 5 | 5 | 0 | <5 | <5 | <10 | 0 | - | - | - | - | - |
| Bacteriological | | | | | | | | | | | | | | | | | | |
| Atypical bacteria | 16 | 0 | 0 | 8 | 123 | >200 | 58 | 6 | 0 | 1 | 95 | 980 | 0 | - | - | - | - | - |
| Fecal coliforms | 12 | 0 | 0 | 0 | 0 | 1 | 74 | 7 | 0 | 0 | 32.5 | 860 | 0 | - | - | - | - | - |
| Total coliforms | 8 | 0 | 0 | 6 | 19.5 | 32 | 72 | 50 | 0 | 0 | 2 | <10 | 0 | - | - | - | - | - |
| *Escherichia coli* | 16 | 0 | 0 | 0 | 0 | 3 | 78 | 58 | 0 | 0 | 2 | <10 | 0 | - | - | - | - | - |
| Phenols | | | | | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | | | | | | | 16 | 1 | 0 | <0,0006 | <0,0006 | *<0,0006* | 0 | - | - | - | - | - |
| 2,4-Dinitrophenol | | | | | | | 16 | 1 | 0 | <0,01 | <0,01 | *<0,01* | 0 | - | - | - | - | - |
| 2-Methyl-4,6-Dinitrophenol | | | | | | | 16 | 1 | 0 | <0,01 | <0,01 | *<0,01* | 0 | - | - | - | - | - |
| 4-Nitrophenol | | | | | | | 16 | 1 | 0 | <0,001 | <0,001 | *<0,001* | 0 | - | - | - | - | - |
| Phenol | | | | | | | 16 | 1 | 0 | <0,0006 | <0,0006 | *<0,0006* | 0 | - | - | - | - | - |
| 2-Chlorophenol | | | | | | | 16 | 1 | 0 | <0,0005 | <0,0005 | *<0,0005* | 0 | - | - | - | - | - |
| 3-Chlorophenol | | | | | | | 16 | 1 | 0 | <0,0005 | <0,0005 | *<0,0005* | 0 | - | - | - | - | - |
| 4-Chlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 2,3-Dichlorophenol | | | | | | | 16 | 1 | 0 | <0,0005 | <0,0005 | *<0,0005* | 0 | - | - | - | - | - |
| 2,4 + 2,5-Dichlorophenol | | | | | | | 16 | 1 | 0 | <0,0003 | <0,0003 | *<0,0003* | 0 | - | - | - | - | - |
| 2,6-Dichlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 3,4-Dichlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 3,5-Dichlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| Pentachlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 2,3,4,6-Tetrachlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 2,3,5,6-Tetrachlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 2,4,5-Trichlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 2,4,6-Trichlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 2,3,5-Trichlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 2,3,4-Trichlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 2,3,6-Trichlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 2,3,4,5-Tetrachlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| 3,4,5-Trichlorophenol | | | | | | | 16 | 1 | 0 | <0,0004 | <0,0004 | *<0,0004* | 0 | - | - | - | - | - |
| o-Cresol | | | | | | | 16 | 1 | 0 | <0,001 | <0,001 | *<0,001* | 0 | - | - | - | - | - |
| p-Cresol | | | | | | | 16 | 1 | 0 | <0,001 | <0,001 | *<0,001* | 0 | - | - | - | - | - |

Legend:

crosshatched Result exceeds Canadian recommendation for the protection of aquatic life (short term)

**bold Result exceeds Canadian recommendation for the protection of aquatic life (long term)**

*italicized Result exceeds Quebec recommendations for the protection of aquatic life (chronic effect)*

<u>Underlined</u> <u>Result exceeds Quebec criteria for the protection of aquatic life (acute effect)</u>

Result exceeds Quebec criteria for the prevention of contamination (with water intake)

Result exceeds Quebec criteria for the prevention of contamination (without water intake)

* Data compared to baseline (see annex 3)

##### 3.6.4.2.6 Ammoniacal nitrogen

In 2021, for ammoniacal nitrogen, only two stations showed results exceeding the applicable criteria (AQR65-F and AQR69-F)

The median ammoniacal nitrogen level (< 0.02 mg/l) measured in the surface water across all stations and all sampling campaigns was below the median value measured in lakes from 2015 to 2020 (0.026 mg/l).

With regards to the maximum ammoniacal nitrogen level (0.39 mg/l), which exceeds the MELCC's criteria for the prevention of contamination (water and aquatic life), the criteria mentions that "the presence of ammoniacal nitrogen at higher concentrations (above 0.2 mg/l) can make disinfection less effective" (MELCC, 2017).

This maximum concentration was recorded in winter at the lake bottom (AQR69 station), i.e. in the presence of the winter thermocline in February. This natural dynamic occurs at the deepest point of the lake and temporarily blocks the dispersion of substances throughout the entire water column (more details in section 3.4), causing nitrogen to remain in the form of ammoniacal nitrogen due to the low oxygen levels at the bottom of the lake (79%).

As a reminder, during the 2019 monitoring, the maximum ammoniacal nitrogen level (1.39 mg/l), which was the highest since 2016, was measured in July, at the lake bottom, in the reference zone (AQH1).

Effects of seasons or stations

It is also important to note that the ammoniacal nitrogen levels measured in 2021 sometimes varied from one station to the next. No clear spatial or seasonal trends related to mining operations were observed. For example, the highest concentrations measured in 2021 were just as likely to be found in the reference zone (AQR40, AQH3, AQR34) as in the stations located far from the effluent discharge point (AQR66) or near the effluent discharge point (AQR65 and AQR69 in winter). As observed in 2019 and 2020:

**The ammoniacal nitrogen levels measured in the surface water in the 2021 study area showed no immediate correlation between the concentration of ammoniacal nitrogen in the surface water and the output of final mining effluent (Tetra Tech, 2020b).**

##### 3.6.4.2.7 Biochemical Oxygen Demand (BOD5)

$BOD_5$ is a way to measure the amount of biodegradable organic matter in the aquatic environment. $BOD_5$ in lakes and streams seems to have been trending upwards since 2015. However, it has decreased since 2020.

In 2021, the median $BOD_5$ concentration (< 2 mg/l) in Lake Lagopede was below the detection limit at all stations where samples were taken, and therefore well below the MELCC requirement for the protection of aquatic life (chronic effect).

##### 3.6.4.2.8 Heavy metals

In 2021, a majority of the parameters analyzed generally complied with MELCC and CCME criteria. The concentrations of most metals in surface water were low and near the limits of detection (Tetra Tech, 2020b), as was observed in the 2011 impact assessment (Roche, 2011b).

Note that in the 2010 baseline study (Roche, 2011b) and as part of the 2015-2016 monitoring campaign (Stornoway, 2017a), the natural concentrations (natural geochemical background levels) of some metals were recorded, including aluminium, beryllium, copper, mercury and lead. These concentrations exceeded at least one of the criteria for the protection of aquatic life.

Thus, in the study area, the natural geochemical background, which is influenced by the geology of the area, naturally contains metals. As a result, it is no surprise that metals were detected in lakes and streams in 2021 at concentrations that naturally exceeded the surface water quality criteria.

In 2021, for example, concentrations that exceeded the criteria were measured naturally upstream of the effluent discharge point, well outside the areas exposed to mining activities (Map 3.5), for aluminium, iron, chromium, copper, nickel and lead (Table 3.15).

As expected, these concentrations exceeded either the MELCC standard for the protection of aquatic life (chronic effect) or the CCME guidelines for the protection of aquatic life (long-term) (Table 3.14).

The metals for which maximum concentrations were detected in 2019 (cadmium and manganese) presented only one value exceeding the criteria for the prevention of contamination (with drinking water intake) for manganese, and no values exceeding the criteria for cadmium.

The maximum arsenic concentration in 2021 (0.19 µg/l) measured in the fall near the airstrip (AQP3) was just half of that measured in October 2020 (0.44 µg/l at AQR65), although it did exceed the criteria used for the prevention of contamination with drinking water intake (0.3 µg/l). Moreover, "this criterion differs from the standard for drinking water" and "some high-quality surface water may contain natural concentrations that exceed this quality criterion" (Appendix III).

#### *3.6.4.2.9 Petroleum hydrocarbons C10-C50*

As with metals, the concentrations of petroleum hydrocarbons (PH) $C_{10}$-$C_{50}$ measured in surface water during the 2010 baseline study (< 0.1 mg/l) and before mining operations were launched (2015) already exceeded the MELCC criteria for the protection of aquatic life (chronic effect: 0.01 mg/l). However, the decomposition of organic matter in fens and bogs in the study area could well explain the sporadic natural presence of PH $C_{10}$-$C_{50}$ (Tetra Tech, 2020b).

The average concentration of hydrocarbons C10-C50 (<0.1 mg/l) across all stations and all monitoring campaigns was comparable to the level from the baseline study and the levels measured in 2015-2020. It is therefore to be expected that it exceeded the MELCC criteria for the protection of aquatic life (chronic effect) in 2021 throughout the sampling zone (Table 3.15).

#### *3.6.4.2.10 Impact of the hydrological regime*

The quality of surface water in lakes and streams within the study area is affected by Lake Lagopede's natural hydrological regime. The mine effluent dispersion conditions modelled in 2017 (Englobe, 2017), along with the naturally occurring geochemical background levels, may affect the concentrations of some metals.

It is important to note the existence of winter and summer thermoclines as described in the effluent dispersion model (Englobe, 2017). Thermoclines naturally restrict plume dispersion throughout the entire water column and prevent water from mixing during low-flow periods.

This leads to the accumulation of certain contaminants discharged into the bottom of Lake Lagopede's northern basin. This phenomenon is accentuated during the summer and winter low-water periods, when the mixing of the effluent is limited to the area immediately around the discharge point (Englobe, 2017).

It is therefore natural that substances sampled from the surface and the bottom of the water column present different concentrations. The differences vary with the seasons and the depth in the water column, as was noted in the 2021 monitoring results.

The expected effect of Lake Lagopede's hydrological regime on effluent dispersion (Englobe, 2017) increases the maximum concentrations of certain parameters in lakes and streams, particularly in the presence of winter and summer thermoclines, as was the case in 2021 for ammoniacal nitrogen, nitrites and nitrates, including at reference stations. Therefore, the 2021 results cannot be attributed solely to the discharge of effluent from the Renard mine. Future water quality surveys in 2022 will help identify potential trends and determine surface water quality conditions and changes from the baseline conditions.

***Statistical tests***

Certain statistical analyses were conducted after the summer 2021 campaign. The results of the summer campaign were retained as a better comparison for the data collected during the baseline study conducted in summer 2010. A comparison was made for several parameters of interest between 2021 and 2010, between 2021 and 2019, and between exposed and reference zones in 2021. Of these parameters, only conductivity and iron levels were judged to be significantly different in certain comparisons.

<u>Conductivity</u>

The conductivity of the exposed zone in summer 2021 was found to be statistically different ($p < 0.05$) from that of 2010. In summer 2021, the conductivity in the exposed zone was generally higher than during the baseline study conducted in 2010.

However, no difference was detected between the exposed zone and the reference zone during the summer 2021 campaign, which may indicate that the increase was not caused exclusively by mining effluent.

Iron

The iron levels measured in summer 2021 in the station downstream of the effluent discharge point were generally lower than those measured in stations upstream of said point. The same difference was noted during the 2010 baseline study. Since iron levels in the water in the region are naturally high, the stations located downstream of the effluent discharge point show iron levels that are diluted by the mine effluent after treatment at the MWWTP. This decreases the iron levels downstream of the effluent discharge point.

In addition, the amount of water treated at the MWWTP, as well as days when production was stopped at the ore processing plant can influence the amount of treated effluent discharged into Lake Lagopede. This causes a variable dilution of certain elements present in the lake water, such as iron. For a similar period of activity and level of production, the volume of effluent treated at the MWWTP in July 2021 was less than in summer 2019. Less treated effluent was discharged into the lake in 2021, which explains why the iron levels were less diluted in the receiving environment and were therefore higher than those measured in summer 2019.

It is important to note that no significant difference was found between the iron levels measured in 2021 and those measured during the baseline study in 2010. However, the average iron levels measured during the 2010 baseline study were higher than those measured in 2021, during the production phase (Figure 3.14), which emphasizes the dilution effect observed downstream of the treated mining effluent discharge point.

### 3.6.4.3 Conclusion

The results of surface water quality monitoring for 2021 were largely comparable to the 2010 baseline conditions, as well as monitoring results during the production phase from 2015 to 2020.

Very few spatial trends or seasonal variations were observed. The 2021 monitoring results indicate that the natural state of the lakes and streams of the receiving environment seems to have evolved since 2010, depending on the hydrological regime and possibly the intensity of biological activity in the lakes.

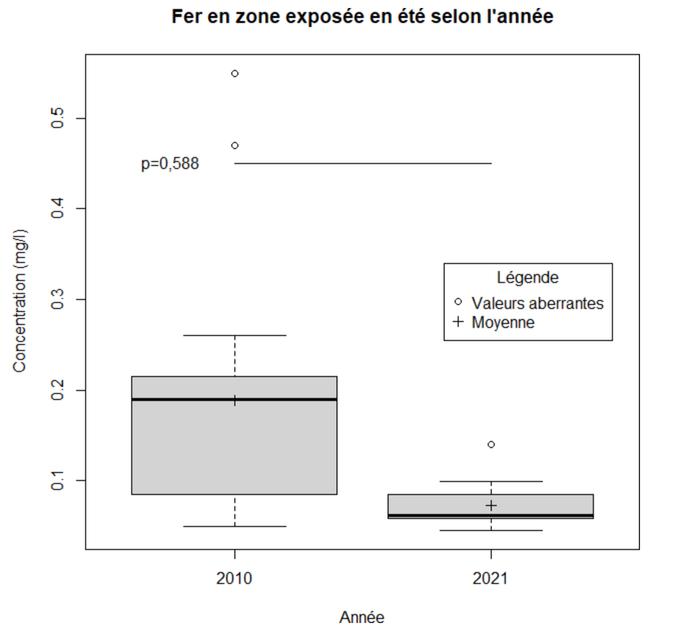



**Figure 3.14 Iron levels in the waters of Lake Lagopede in the area that is exposed in summer: summer 2010 and summer 2021**

Although some parameters are an exception, the differences in the concentrations of various parameters from 2017 to 2021 remain strongly linked to the alternating thermoclines and seasonal mixing of the water column, as predicted in the effluent dispersion model.

Some trends have been detected and supported by statistical analysis, notably with regards to conductivity and iron levels.

First, the conductivity measurements for summer 2021 were similar in the exposed zone and the reference zone, but higher than during the 2010 baseline study. Since the conductivity in the reference zone was also higher than in 2010, this increase cannot be attributed solely to mining activity, but also to natural variations in the environment.

As for iron levels, there are differences in concentration between the exposed zone and the reference zone, between the monitoring results from 2019 and 2021, and, to a lesser degree, between the 2010 baseline study and the 2021 monitoring results. The iron levels detected during monitoring in 2021 were lower in the zone exposed to effluent than in the reference zone, and lower than the values measured during the 2010 baseline study. The current hypothesis is that mining effluent helps dilute iron in the exposed zone, thereby decreasing iron levels in the stations exposed to said effluent.

### 3.6.5 Sediment Quality

Sediments are recognized as the ultimate sink for contaminants, metals and organic matter (Roche, 2011a). Monitoring sediment quality is therefore an essential part of evaluating the potential impact of mining activities on the receiving environment.

#### 3.6.5.1 2021 sampling stations and schedule

The conditions for sediment quality monitoring in 2021 were the same as those outlined for surface water quality (see section 3.6.4). In 2021, sediment quality was sampled only once, in October 2021 (Photo 3.19).

**Photo 3.19 Sediment sampling (October 2021)**

#### 3.6.5.2 2021 Results

A summary of the descriptive statistics for sediment quality from the 2021 fall sampling campaign is provided in Table 3.19 and the results are compared with the sediment quality standards presented in the document from Environment Canada and the MDDEP (2007).

The 2021 sediment results are generally comparable to the 2010 baseline conditions (Roche, 2011b) and monitoring results prior to the start-up of operations (2015), as well as the results from 2015 to 2020 monitoring during the production phase.

##### *3.6.5.2.1 Particle size and physical-chemical characteristics*

The sediment on the bottoms of lakes and streams in the study area consists primarily of fine sediment, which contains more organic matter (Roche, 2011a) than coarse particles. Table 3.18 presents the categories of grain sizes used for monitoring. The exposed area is composed primarily of silt, while the reference zone is composed largely of sand (Table 3.18).

**Table 3.18 Grain sizes of sediment**

| Category | Particle diameter (mm) |
|---|---|
| Clay | <0,004 |
| Silt | 0.004 à 0.060 |
| Sand | 0.060 à 0.200 |
| Gravel | >0,200 |

It is important to note that the highest concentrations of suspended solids (SS) measured in lake water in 2021 (6 mg/l) were similar to the the 2010 baseline (19 mg/l) and years of normal mining activity, 2015 to 2020 (23 mg/l) (Table 3.19).

##### *3.6.5.2.2 Nutrients*

Note that the proportion of fine sediments is correlated with the concentrations of total phosphorus and total organic carbon (TOC). Total phosphorus therefore serves as a good indicator of sediment quality in Lake Lagopede (Roche, 2011a). As for TOC, it is used to assess the quantity of organic matter present in sediment samples (CEAQ, 2014).

Total Phosphorus

In 2021, the median total phosphorus concentrations of the sediment in the reference zone (515 mg/kg) and the exposed zone (630 mg/kg) were higher than in previous monitoring campaigns in the reference zone (252 mg/kg) and the exposed zone (599 mg/kg), and higher than the baseline conditions (360 mg/kg).

The phosphorous levels in sediment at the mine site reference station range from 190 to 1,100 mg/kg. They are approximately the same near the MPKC and in the airstrip area (Map 3.5).

Moreover, the analyses conducted during the impact study (Roche, 2011a) anticipated that there could be localized enrichment of total phosphorus in the sediment just downstream of the domestic effluent discharge point.

It is therefore to be expected that the total phosphorus in sediment near the domestic effluent (AQR63) discharge point be higher than at other stations, which was observed during the 2021 monitoring campaign (710 mg/kg), as well as in sediment collected at the deepest point of the lake (AQR69) (1,700 mg/kg), immediately downstream of the mining effluent discharge point (Table 3.19).

Thus, the evolution of the total phosphorus concentration in 2021 indicates that this parameter tends to increase locally around the mining and domestic effluents, as was anticipated in the 2011 impact study (Roche, 2011a).

Total organic carbon

The 2021 sediment samples had a higher median proportion of TOC (8%) than in 2020 (4.2%) and the 2010 baseline (1.3%). The proportions of TOC in 2021 were highly variable (from < 0.50 to 20%) and may have been influenced by the granulometric composition of the substrate. The proportions have decreased slightly from 2020 (<0.50 to 50%).

#### *3.6.5.2.3 Nitrogen compounds*

In 2021, nitrogen compounds measured in sediment were present in low concentrations, all sectors combined.

The median nitrite levels for 2021 were identical to the results since 2017 (< 0.2 mg/kg) and to those measured in the summer and fall of 2015 (before the mine was in operation). The median concentrations of nitrates in the sediment in 2021 (< 1.0 mg/kg) were identical to those measured before the production phase began (2015).

It is important to note that in 2021, the levels of both nitrites and nitrates in the sediment in the mine area were the same upstream and downstream of the effluent discharge point. The same is true for the concentrations of nitrogen compounds measured at the airstrip area stations (Table 3.19).

Therefore, there was no difference in spatial distribution of nitrogen compounds in the sediment between the reference stations and the exposed stations of the study area in 2021.

#### *3.6.5.2.4 Heavy metals*

Most of the metals detected in the sediment in 2010 (mercury, cadmium, lead and arsenic) are part of the natural geochemical background of the sediment in lakes and streams on the mine site. These metals tend to be absorbed by fine sediment, as well as the organic material it is composed of (Roche, 2011a).

Arsenic

The median concentration of arsenic in the sediment in 2021 (1.3 mg/kg) met all the regulatory sediment quality standards. It was identical to the levels measured in 2020, and higher than the levels measured during previous monitoring campaigns and the baseline conditions (0.5 mg/kg).

The highest concentration of arsenic (12 mg/kg) recorded was measured at the reference station (AQH3), while all exposed stations had concentrations ranging from < 1.0 to 2.6 mg/kg, well below the applicable criteria.

Cadmium

The median concentration of cadmium in the sediment in 2021 (0.21 mg/kg) was similar to 2010 (< 0.2 mg/kg) and previous monitoring campaigns. It was also identical to the level measured in sediment before mining began in 2015 (0.2 mg/kg), and similar to 2019 (0.3 mg/kg).

As the maximum concentration of cadmium in fall 2010 (0.5 mg/kg) was already above the REC sediment quality standard (Table 3.19), it was to be expected that the maximum cadmium concentration measured in sediment in 2021 (0.48 mg/kg) be comparable to that found during the 2010 baseline study and previous monitoring campaigns.

It is important to note that half of the values that exceeded the criteria during 2021 monitoring came from the reference zone.

Mercury

The median concentration of mercury in the sediment in 2021 (0.052 mg/kg) met all the applicable quality criteria, although it was higher than the 2010 baseline (0.01 mg/kg). It was similar to the level measured in 2015 (0.05 mg/kg), before mining operations began, and lower than in 2017, 2018 (0.19 mg/kg) or 2019 (0.06 mg/kg).

It should be noted that the maximum concentration of mercury measured in fall 2010 (0.16 mg/kg) in the reference zone (Lake F2607) was already higher than the REC standard for sediment quality (ECCC and MDDEP, 2007).

The maximum concentration of mercury in the sediment in 2021 (0.22 mg/kg) was comparable to the 2010 baseline study, and, as with subsequent monitoring from 2015 through 2020, was expected to exceed the REC standards (Table 3.16).

Chrome

The median concentration of chromium in the sediment in 2021 (29 mg/kg) was higher than the 2010 baseline study and similar to the concentrations detected in 2017 through 2020 (Table 3.10).

The maximum concentration of chromium in 2021 (53 mg/kg) was significantly lower than the baseline conditions (210 mg/kg), which already exceeded the REC and CES standards.

Lead

With regards to lead contained in the sediment in the study zone in 2021, the median concentration (7.4 mg/kg) was higher than that of previous monitoring campaigns and the 2010 baseline study (5 mg/kg). It remained well below the sediment quality standards (ECCC and MDDEP, 2007) (Table 3.19).

It should be noted that the lead concentrations measured at the reference stations (AQH2-5) were similar to the concentrations measured in sediment at the stations located near domestic and mining effluents (AQR63-64 and AQR65-69).

In 2021, the highest concentration of lead (48 mg/kg) was measured in the reference zone (AQD3).

#### 3.6.5.3 Conclusion

In conclusion, the results of the 2021 monitoring indicate that the granulometric composition of the sediment has remained stable over time, in both the reference zone and the exposed areas.

Overall, in 2021, the concentrations of various metals in the sediment varied greatly from station to station. The stations with the highest concentrations were located both in the reference zone and in the vicinity of the mining and domestic effluent discharge points in Lake Lagopede.

The analysis of metal concentrations in the sediment sampled in 2021 shows no difference between the stations located upstream and downstream of the mining effluent diffuser. Therefore, no spatial or temporal trends regarding the potential effect of mining and domestic effluent on the quality of sediment in Lake Lagopede could be established for 2021.

### 3.6.6 Comparison of Monitoring Results

SWY has compiled data on water and sediment quality in the study area from the 2010 baseline study to today, for both reference zones and exposed areas (near the mine/airstrip areas).

The analysis of water and sediment quality data collected during the first three years of operation (2017 to 2019) compared to historical data (2010 to 2015) did not irrefutably demonstrate any improvement or deterioration of surface water or sediment quality over time (Tetra Tech, 2020b).

SWY plans to continue analyzing this data for the next three-year monitoring period (2020 to 2022) to determine if any spatial or temporal trends can be identified based on the results of water and sediment quality monitoring activities.

### 3.6.7 Depollution Attestation Requirements

The municipal depollution attestation (MDA) is a legal document regulating the operation of wastewater treatment plants. The MELCC issued Stornoway a depollution attestation (Authorization no. 201910002) for the Renard mine project on November 15th, 2019.

Table 3.19 Overall descriptive statistics of sediment quality in streams and lakes based on sampling between 2015 and 2021 and the 2010 baseline study

| Parameters | Unit | Sediment quality criteria* REL | TEL | OEL | PEL | FEL | Summer 2010 LDR | Number of values | %<LDR | Exceeds criteria | Minimum | Median | Maximum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Conventional parameters** | | **exceeds criteria** | exceeds criteria | *exceeds criteria* | exceeds criteria | **exceeds criteria** | | | | | | | |
| Total Kjeldahl nitrogen | mg/kg N | – | – | – | – | – | – | – | – | – | – | – | – |
| Total organic carbon | % g/g | – | – | – | – | – | – | 25 | 0% | – | 0.33 | 1.3 | 39 |
| Nitrates | mg/kg N | – | – | – | – | – | – | – | – | – | – | – | – |
| Nitrites | mg/kg N | – | – | – | – | – | – | – | – | – | – | – | – |
| Total Phosphorus | mg/kg | – | – | – | – | – | 20 | 25 | 0% | – | 150 | 360 | 920 |
| Volatile materials (at 550°C) | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Sulfates | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Total sulphur | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Total sulphur | % g/g | – | – | – | – | – | 0 | 25 | 0% | – | 0.07 | 0.14 | 0.46 |
| pH | pH | – | – | – | – | – | – | 23 | 0% | – | 3.9 | 4.9 | 5.64 |
| Humidity | % | – | – | – | – | – | – | – | – | – | – | – | – |
| Total solids | % | – | – | – | – | – | – | – | – | – | – | – | – |
| Oxidation-reduction potential | mV | – | – | – | – | – | – | – | – | – | – | – | – |
| **Metals and Metalloids** | | | | | | | | | | | | | |
| Aluminum | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Antimony | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Silver | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Arsenic | mg/kg | 4.1 | 5.9 | 7.6 | 17 | 23 | 0.5 | 25 | 56% | 0% | <0,5 | <0,5 | 3.55 |
| Barium | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Boron | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Beryllium | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Cadmium | mg/kg | 0.33 | 0.6 | 1.7 | 3.5 | 12 | 0.2 | 25 | 88% | 8% | <0,2 | <0,2 | **0.5** |
| Calcium | mg/kg | – | – | – | – | – | – | – | – | – | – | – | |
| Chrome total | mg/kg | 25 | 37 | 57 | 90 | 120 | 1 | 25 | 0% | 36% | 3 | 17 | ***210*** |
| Cobalt | mg/kg | – | – | – | – | – | 1 | 25 | 32% | 0% | <1 | 1 | 23 |
| Copper | mg/kg | 22 | 36 | 63 | 200 | 700 | 1 | 25 | 0% | 8% | 1 | 6 | **25.5** |
| Iron | mg/kg | – | – | – | – | – | 10 | 25 | 0% | 0% | 820 | 3700 | 30000 |
| Magnesium | mg/kg | – | – | – | – | – | 10 | 25 | 0% | 0% | 170 | 810 | 8850 |
| Manganese | mg/kg | – | – | – | – | – | 1 | 25 | 0% | 0% | 6 | 26 | 490 |
| Mercury | mg/kg | 0.094 | 0.17 | 0.25 | 0.49 | 0.87 | 0 | 25 | 44% | 16% | <0,01 | 0.01 | **0.16** |
| Molybdenum | mg/kg | – | – | – | – | – | 1 | 25 | 36% | 0% | <1 | 1 | 6 |
| Nickel | mg/kg | – | – | 47 | – | – | 0.5 | 25 | 0% | 12% | 2 | 9.7 | *81* |
| Lead | mg/kg | 25 | 35 | 52 | 91 | 150 | 1 | 25 | 0% | 0% | 2 | 5 | 22 |
| Potassium | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Selenium | mg/kg | – | – | – | – | – | 0.5 | 25 | 84% | 0% | <0,5 | <0,5 | 1.1 |
| Silicon | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Sodium | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Strontium | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Thallium | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Uranium | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Vanadium | mg/kg | – | – | – | – | – | – | – | – | – | – | – | – |
| Zinc | mg/kg | 80 | 120 | 170 | 310 | 770 | 5 | 25 | 12% | 0% | <5 | 9 | 55 |
| **Organic compounds** | | | | | | | | | | | | | |
| Hydrocarbures pétroliers ($C_{10}$-$C_{50}$) | mg/kg | – | – | – | – | – | 100 | 25 | 84% | – | <100 | <100 | 190 |
| Volatile materials (at 550°C) | % g/g | – | – | – | – | – | – | 25 | – | – | 0.7 | 4.1 | 87 |
| **Granulometric distribution** | | | | | | | | | | | | | |
| Clay | % | – | – | – | – | – | 0.1 | 25 | 0% | – | 1.1 | 6.8 | 67 |
| Silt | % | – | – | – | – | – | 0.1 | 25 | 0% | – | 0.9 | 7.4 | 56 |
| Sand | % | – | – | – | – | – | 0.1 | 25 | 0% | – | 4.6 | 67.5 | 94 |
| Gravel | % | – | – | – | – | – | 0.1 | 25 | 4% | – | <0,1 | 4.5 | 35 |

| Parameters | 2017 to 2020 Monitoring LDR | Number of values | <LDR | Exceeds criteria | Exposed zone Minimum | Median | Maximum | Reference zone Minimum | Median | Maximum |
|---|---|---|---|---|---|---|---|---|---|---|
| **Conventional parameters** | | | | | | | | | | |
| Total Kjeldahl nitrogen | 50 à 1800 | 68 | 6 | – | <50 | 3465 | 13000 | <50 | 1805 | 13000 |
| Total organic carbon | 0.05 à 1 | 68 | 4 | – | 0.24 | 10.31 | 66.36 | 0.06 | 8.16 | 66.36 |
| Nitrates | 0.2 | 68 | 34 | – | <0,2 | 0.5 | 14.6 | <0,2 | 0.45 | 14.6 |
| Nitrites | 0.2 à 1 | 68 | 62 | – | <0,20 | 0.1 | 0.9 | <0,20 | 0.1 | 1 |
| Total Phosphorus | 10 à 200 | 57 | 16 | – | <10 | 599 | 2120 | <10 | 252 | 2120 |
| Volatile materials (at 550°C) | 2000 | 57 | 0 | – | 2250 | 24000 | 95000 | 2250 | 24500 | 95000 |
| Sulfates | 1 | 55 | 0 | – | 10 | 370 | 1500 | 10 | 240 | 1500 |
| Total sulphur (mg/kg) | 0.01 à 100 | 68 | 12 | – | <0,010 | 750 | 2827 | <0,010 | 613.5 | 3040 |
| Total sulphur (% g/g) | – | – | – | – | | | | | | |
| pH | – | 57 | 0 | – | 5.27 | 5.84 | 6.95 | 4.95 | 5.83 | 6.95 |
| Humidity | 0.1 | 57 | 0 | – | 2.8 | 83.8 | 92 | | | |
| Total solids | 0.2 | 11 | 0 | – | 8.7 | 18 | 92 | 8.7 | 65 | 92 |
| Oxidation-reduction potential | 5 | 38 | 0 | – | 40 | 84 | 252 | 40 | 158 | 371 |
| **Metals and Metalloids** | | | | | | | | | | |
| Aluminum | 10 à 20 | 69 | 0 | – | 410 | 9580 | 26000 | 290 | 7710 | 26000 |
| Antimony | 0.1 à 5 | 69 | 69 | – | <0,10 | <0,5 | <5 | <0,10 | <0,5 | <5 |
| Silver | 0.5 | 57 | 55 | – | <0,5 | <0,5 | 0.6 | <0,5 | <0,5 | 0.6 |
| Arsenic | 0.2 à 5 | 69 | 21 | 2 | <0,2 | 0.65 | 2.7 | <0,2 | 0.6 | ***8.7*** |
| Barium | 1 à 5 | 69 | 1 | – | 7 | 47 | 150 | <5,0 | 40 | 150 |
| Boron | 5 | 69 | 32 | – | <5,0 | 6.65 | 86 | <5,0 | 6 | 86 |
| Beryllium | 0.08 à 1 | 69 | 61 | – | <0,080 | 0.5 | 0.85 | <0,080 | <0,5 | 0.85 |
| Cadmium | 0.1 à 0.5 | 69 | 28 | 13 | <0,1 | 0.16 | 0.49 | <0,10 | 0.1 | **0.5** |
| Calcium | 20 à 30 | 69 | 0 | – | 476 | 2110 | 12000 | 74 | 1800 | 12000 |
| Chrome total | 1 à 2 | 69 | 2 | 39 | <2,0 | **28.5** | **50** | <2,0 | **27** | **50** |
| Cobalt | 0.1 à 2 | 69 | 2 | – | 0.52 | 7.2 | 37 | <1 | 5 | 37 |
| Copper | 1 à 2 | 69 | 1 | 4 | 1 | 13.5 | 23 | <2,0 | 9 | **23** |
| Iron | 10 à 100 | 69 | 0 | – | 1650 | 13000 | 72600 | 620 | 10200 | 72600 |
| Magnesium | 5 à 10 | 69 | 0 | – | 613 | 1270 | 3430 | 260 | 1260 | 3430 |
| Manganese | 1 à 2 | 69 | 0 | – | 25 | 92 | 699 | 6.9 | 71 | 699 |
| Mercury | 0.01 à 0.02 | 69 | 16 | 24 | <0,01 | 0.085 | ***1.*** | <0,01 | 0.06 | ***1.4*** |
| Molybdenum | 0.5 à 1 | 69 | 21 | – | <0,50 | 3 | 6.7 | <0,50 | 2 | 6.7 |
| Nickel | 0.5 à 1 | 69 | 1 | – | 2.4 | 13.4 | 27 | <1,0 | 12 | 27 |
| Lead | 1 à 5 | 69 | 4 | 3 | <1,0 | 5 | **44** | <1 | 4.1 | **44** |
| Potassium | 20 à 40 | 69 | 0 | – | 140 | 557 | 1720 | 140 | 554 | 1720 |
| Selenium | 0.5 à 1 | 69 | 52 | – | <0,5 | <0,5 | 1.3 | <0,5 | <0,5 | 1.3 |
| Silicon | 10 à 20 | 58 | 0 | – | 122 | 788 | 1710 | 19 | 720 | 1710 |
| Sodium | 10 à 40 | 69 | 1 | – | 15 | 109 | 391 | 15 | 83 | 391 |
| Strontium | 1 à 10 | 68 | 21 | – | 2.8 | 18 | 110 | 1.9 | 13 | 110 |
| Thallium | 0.5 à 5 | 33 | 23 | – | <0,50 | 1.9 | <5 | <0,50 | 1.95 | <5 |
| Uranium | 0.1 à 10 | 69 | 59 | – | <0,10 | <10 | <10 | <0,10 | <10 | <10 |
| Vanadium | 5 | 32 | 3 | – | <5 | 17 | 53 | <5 | 16.5 | 53 |
| Zinc | 2 à 10 | 69 | 1 | 0 | 3 | 34 | 59 | 2 | 24 | 59 |
| **Organic compounds** | | | | | | | | | | |
| Hydrocarbures pétroliers ($C_{10}$-$C_{50}$) | 50 à 730 | 69 | 44 | – | <50 | 50 | 402 | <50 | <100 | 447 |
| Volatile materials (at 550°C) | 0.2 | 11 | 0 | – | 0.76 | 11 | 94 | 0.24 | 5.8 | 94 |
| **Granulometric distribution** | | | | | | | | | | |
| Clay | – | 67 | – | – | 0.14 | 5 | 18.64 | 0.0925 | 0 | 4.6525 |
| Silt | – | 67 | – | – | 0.825 | 45.56125 | 80.48 | 4.48 | 32.495 | 65.1075 |
| Sand | – | 67 | – | – | 11.64 | 31.3475 | 85.815 | 12.7675 | 41.705 | 83.9525 |
| Gravel | – | 67 | – | – | 0 | 0.21375 | 56.5275 | 4 | 6.99625 | 68.7925 |

| Parameters | Fall 2021 LDR | Number of values | %<LDR | Exceeds criteria | Exposed zone Minimum | Median | Maximum | Reference zone Minimum | Median | Maximum |
|---|---|---|---|---|---|---|---|---|---|---|
| **Conventional parameters** | | | | | | | | | | |
| Total Kjeldahl nitrogen | 50 à 250 | 19 | 5% | – | <50 | 5300 | 12000 | 250 | 2750 | 5700 |
| Total organic carbon | 0.5 à 1.3 | 19 | 21% | – | <0,50 | 8 | 19 | <0,50 | 7.1 | 20 |
| Nitrates | 1 | 19 | 84% | – | <1,0 | <1,0 | 1.6 | <1,0 | <1 | 1.9 |
| Nitrites | 0.2 | 19 | 100% | – | <0,20 | <0,20 | <0,20 | <0,20 | <0,2 | <0,20 |
| Total Phosphorus | 10 | 19 | 0% | – | 83 | 630 | 1900 | 190 | 515 | 1100 |
| Volatile materials (at 550°C) | – | – | – | – | – | – | – | – | – | – |
| Sulfates | – | – | – | – | – | – | – | – | – | – |
| Total sulphur (mg/kg) | 0.5 à 5.2 | 19 | 42% | – | <0,50 | <4,4 | 5.6 | 0.51 | 1.68 | 6.4 |
| Total sulphur (% g/g) | – | – | – | – | – | – | – | – | – | – |
| pH | – | – | – | – | – | – | – | – | – | – |
| Humidity | – | – | – | – | – | – | – | – | – | – |
| Total solids | 0.2 | 19 | 0% | – | 10 | 20 | 79 | 16 | 28 | 76 |
| Oxidation-reduction potential | – | – | – | – | – | – | – | – | – | – |
| **Metals and Metalloids** | | | | | | | | | | |
| Aluminum | 10 | 19 | 0% | – | 1900 | 6400 | 27000 | 1900 | 7600 | 13000 |
| Antimony | 0.1 | 19 | 84% | – | <0,10 | <0,10 | 0.14 | <0,10 | <0,10 | 0.16 |
| Silver | – | – | – | – | – | – | – | – | – | |
| Arsenic | 1 | 19 | 37% | 5.3% | <1,0 | 1.3 | 2.6 | <1,0 | 1.9 | ***12*** |
| Barium | 1 | 19 | 0% | – | 9 | 46 | 76 | 8.7 | 43.5 | 63 |
| Boron | 5 | 19 | 100% | – | <5,0 | <5,0 | <5,0 | <5,0 | <5,0 | <5,0 |
| Beryllium | 0.08 | 19 | 11% | – | <0,080 | 0.3 | 0.88 | <0,080 | 0.225 | 0.47 |
| Cadmium | 0.1 | 19 | 32% | 31.6% | <0,10 | 0.27 | **0.48** | <0,10 | 0.195 | **0.42** |
| Calcium | 30 | 19 | 0% | – | 500 | 2300 | 3800 | 740 | 2100 | 2800 |
| Chrome total | 2 | 19 | 0% | 52.6% | 6.5 | 20 | **53** | 8.5 | **34** | **44** |
| Cobalt | 0.1 | 19 | 0% | – | 1 | 5.2 | 26 | 1.2 | 4.8 | 20 |
| Copper | 1 | 19 | 0% | 5.3% | 2.4 | 9 | **23** | 1.9 | 8 | 13 |
| Iron | 10 | 19 | 0% | – | 2600 | 9800 | 70000 | 3500 | 19000 | 27000 |
| Magnesium | 5 | 19 | 0% | – | 650 | 1200 | 2500 | 1100 | 2100 | 2800 |
| Manganese | 1 | 19 | 0% | – | 21 | 80 | 770 | 31 | 73 | 530 |
| Mercury | 0.02 | 19 | 26% | 26.3% | <0,020 | 0.069 | **0.22** | <0,020 | 0.041 | **0.13** |
| Molybdenum | 0.5 | 19 | 16% | – | <0,50 | 2.2 | 7 | <0,50 | 2.1 | 3.9 |
| Nickel | 0.5 | 19 | 0% | – | 4.3 | 11 | 25 | 5.3 | 15.5 | 21 |
| Lead | 1 | 19 | 0% | 5.3% | 1.6 | 7.1 | 25 | 1.2 | 12 | **48** |
| Potassium | 20 | 19 | 0% | – | 230 | 610 | 1300 | 400 | 740 | 1300 |
| Selenium | 1 | 19 | 95% | – | <1,0 | <1,0 | 1 | <1,0 | <1,0 | <1,0 |
| Silicon | – | – | – | – | – | – | – | – | – | – |
| Sodium | 10 | 19 | 0% | – | 23 | 67 | 360 | 24 | 54.5 | 98 |
| Strontium | 1 | 19 | 0% | – | 2 | 19 | 44 | 1.8 | 13 | 20 |
| Thallium | 0.5 | 19 | 0% | – | 0.53 | 1.7 | 4.7 | 1.2 | 2.4 | 4.5 |
| Uranium | 0.1 | 19 | 0% | – | 0.18 | 0.52 | 0.89 | 0.17 | 0.5 | 0.69 |
| Vanadium | – | – | – | – | – | – | – | – | – | – |
| Zinc | 2 | 19 | 0% | 0.0% | 6 | 30 | 66 | 6.6 | 24.5 | 41 |
| **Organic compounds** | | | | | | | | | | |
| Hydrocarbures pétroliers ($C_{10}$-$C_{50}$) | 100 | 19 | 68% | – | <100 | <100 | 340 | <100 | <100 | 150 |
| Volatile materials (at 550°C) | – | – | – | – | – | – | – | – | – | – |
| **Granulometric distribution** | | | | | | | | | | |
| Clay | – | 19 | – | – | 0 | 24 | 48.5 | 1 | 22 | 30 |
| Silt | – | 19 | – | – | 0.6 | 43 | 69.5 | 2.3 | 14.3 | 84.2 |
| Sand | – | 19 | – | – | 1.9 | 16.7 | 86.6 | 2.7 | 56.75 | 87.4 |
| Gravel | – | 19 | – | – | 0 | 0 | 32.9 | 0 | 2.6 | 11.2 |

[redacted]

REL Rare effect level
TEL Threshold effect level
OEL Occasional effect level
PEL Probable effect level
FEL Frequent effect level

**Legend:**

| | |
|---|---|
| **bold** | Result exceeds REL |
| crosshatched | Result exceeds TEL |
| *italicized* | Result exceeds OEL |
| underlined | Result exceeds PEL |
| (boxed) | Result exceeds FEL |

* Source : EC et MDDEP, 2007. Critères pour l'évaluation de la qualité des sédiments au Québec et cadres d'application : prévention, dragage et restauration. 30 pages + annexes

Overall, the depollution attestation requires that all equipment, systems, existing facilities or facilities required under the environmental authorization be maintained in good operating conditions at all times.

Conditions 4.1 and 4.2 of the depollution attestation specifically address the monitoring of surface water quality. The results of the monitoring required by the attestation will be provided in 2022.

### 3.6.8 2022 Monitoring

The current water and sediment quality monitoring activities as required under the Global CA (MDEFPP, 2012) will continue in 2022. The results of the 2022 monitoring campaigns will be compared to the trends observed during monitoring from 2015 to 2021, as well as the baseline conditions, thus qualifying SWY to comment on the evolution of the parameters and any changes from the baseline conditions (2010). In addition, at the end of the three-year period from 2020-2022, a new phase will begin in the comparison of monitoring results with an aim to tracking water and sediment quality over time and noting any possible changes in their quality as well as detecting spatial and/or temporal trends in the different parameters being analyzed.

##### *3.6.8.1.1 Phosphorus*

2022 monitoring activities will track the evolution of the number of samples with phosphorus concentrations that exceed the applicable criteria, both at the reference station and the exposed station. The maximum historical concentrations reached for this parameter, especially during the summer period, will also be monitored (Tetra Tech, 2020b).

##### *3.6.8.1.2 pH*

Since pH is also an indicator of mine effluent accumulation at the bottom of Lake Lagopede, particularly when a thermocline is present, it will continue to be measured in 2022 as required by the ESMP.

This will provide more in-depth information regarding the effect of the temporary increase in pH measured on a seasonal basis in recent year. Special attention will be paid to the pH measured in surface water at stations located near the diffuser (AQR65-69) in order to document the potential effects of the thermocline and therefore the accumulation of mining effluent at the deepest point in Lake Lagopede on water quality.

##### *3.6.8.1.3 Ammoniacal nitrogen*

In 2022, SWY wishes to monitor certain areas with particularly high levels of ammoniacal nitrogen throughout the year.

The Renard mine will also continue its efforts in 2022 to manage ammoniacal nitrogen at the source (more information in section 4). 2022 monitoring will also be used to continue evaluating the effectiveness of mine water treatment at the MWWTP.

##### *3.6.8.1.4 Metals*

The 2022 follow-up will help confirm whether the concentrations of certain metals remain comparable to those of the 2010 baseline.

### 3.6.9 Monthly Temperature and Conductivity Monitoring at the Mine Effluent Outfall

Lake Lagopede is a dimictic lake, which means that its water mixes twice a year, in spring and fall. This hydrological property ensures the mixing of the different levels of the water column, including the level at the bottom of Lake Lagopede, where treated mine effluent is discharged.

The effluent discharge objectives (EDOs) for mine effluent were determined based on these assumptions in order to protect the ecosystem even during low-flow periods.

Since the treated mine water discharged into the lake is warmer and richer in ions, temperature and conductivity are both good indicators for monitoring final mine effluent. Monthly monitoring of water conductivity and temperature began in September 2015 and will continue in 2022.

#### 3.6.9.1 Monitoring objectives

This monitoring consists of measuring the temperature and conductivity at every metre of the water column on a monthly basis. Temperature measurements illustrate any potential thermal stratification and hence the presence of a thermocline.

Also, since it has been established that the conductivity of mine effluent is higher than the low conductivity water in the receiving environment, monitoring conductivity helps to detect any potential accumulation of mine effluent below the thermocline and to define the dispersion plume of the mine effluent.

### 3.6.9.2 Monitoring frequency

Monthly data collection began as soon as mining effluent started being discharged in April 2016. This data collection continued in 2019 for the three years following the start of the production phase in which mine effluent is generated, as required by the ESPS (Norda Stelo, 2019a), and will continue in 2022 as a monitoring indicator for mine effluent.

### 3.6.9.3 Sampling stations

Monthly temperature and conductivity monitoring was carried out at three stations. The first two, AQR71 and AQR70, are located respectively 300 m upstream and 300 m downstream of the treated mine effluent discharge point. The third station, AQR69, is located in the deepest area of Lake Lagopede's north basin (Photo 3.18).

The monthly temperature and conductivity profiles for this station in 2021 are shown in Figures 3.9 and 3.10. The annual temperature profiles are created using a line of thermographs that were installed in two deep areas of Lake Lagopede in summer 2016. One of these areas is located near the effluent and the AQR69 station. Figure 3.9 shows the annual temperature profiles measured in this area from January to October 2021.

**Photo 3.20 Measuring a vertical water quality profile (October 2021)**

### 3.6.9.4 2021 Results

#### *3.6.9.4.1 Temperature*

According to the monthly temperature profile for the AQR69 station (Figure 3.11), the temperature at the surface varied only slightly between January and April 2021 (from 0.1°C to 0.3°C), due to the presence of ice cover on the lake. It increased noticeably in May (9.1°C) after the ice melt observed on May 13th, 2021.

After that, the temperature continued to rise until it reached 18.6°C in July 2021. The first thermocline, approximately 6.5 m below the surface, appeared in May, and the second, 16 m below the surface, appeared in July. These two layers remained in place until September. By October, only the bottom thermocline remained, and by November, the mixing was complete and both thermoclines had disappeared.

Figure 3.9 illustrates the annual temperature profile by depth (from 1 to 20 m deep) at the AQR69 station. According to this profile, the spring mixing period, which was less clearly defined and shorter than the fall mixing period, took place from April to May 2021. It occurred earlier and lasted longer than in 2020, when it took place over approximately ten days in June.

#### *3.6.9.4.2 Conductivity*

According to the monthly profile for station AQR69 in winter (Figure 3.10), conductivity remained relatively low beneath the ice cover. Starting in January, a chemocline (chemical stratification) started to form approximately 5 m below the surface, gradually increasing conductivity in deeper water. From April to June, the spring flooding tended to even out the conductivity of the whole water column, but a certain chemocline remained in place at around 5 m below the surface. Between the September and October monitoring campaigns, the chemocline moved from 7 m to approximately 9 m, indicating a mixing of water at the surface, but not farther below. This second chemocline remained in place during monitoring in November and December.

#### *3.6.9.4.3 Temperature-conductivity correlation*

Contrary to what was observed in previous years, there was a disconnect between temperature and conductivity in November 2021. While the water column reached a uniform temperature, signalling a complete mixing of the water column, it showed low conductivity at the surface and high conductivity at the bottom.

In Lake Lagopede, the summer and winter thermoclines alternate with seasonal mixing of the water column, affecting the conductivity level of the water at station AQR69.

Since 2017, in Lake Lagopede, the conductivity recorded at station AQR69 downstream of the final mine effluent has followed a similar seasonal variation pattern from one year to the next: it increases gradually from early spring until late summer, when it peaks. Then it gradually decreases and stabilizes in fall (November), remaining low throughout the winter.

### 3.6.10 Conclusion

The correlation of surface water and sediment quality results with monthly and temperature and conductivity values recorded at station AQR69 in 2021 indicate that, as in 2018, 2019 and 2020:

- The trophic state in Lake Lagopede is comparable that observed during the 2010 baseline study;
- Phosphorus and total suspended solids (TSS) levels in the lakes and streams are low and identical to those in the 2010 baseline study;
- Water and sediment quality are comparable between the reference areas and the areas exposed to mining and domestic effluents, across all sectors. Most of them are also comparable to the the 2010 baseline conditions, the conditions before the beginning of the production phase (2015), and the results since the start of the production phase, from 2015 to 2020;
- The 2021 water and sediment quality monitoring results generally comply with applicable Canadian and provincial criteria in winter and summer;
- The parameters for which concentrations exceeded the applicable criteria already exceeded applicable criteria in the 2010 baseline conditions;
- Concentrations exceeding the relevant criteria were noted at both reference and exposed stations, indicating that there is no clear spatial trend for the 2021 monitoring campaign;
- Natural phenomena (thermoclines) in Lake Lagopede limit the dispersion of the plume around the discharge point;
- Mining effluent accumulates below the winter and summer thermoclines, which is consistent with the predictions of the theoretical plume dispersion models (2011 and 2017);
- The difference in the concentrations of certain parameters such as nitrite between the mine effluent and the receiving environment demonstrates the dimictic quality (biannual mixing) of Lake Lagopède. This allows the effluent to be dispersed throughout the water column in spring and fall.

Sporadic trends identified in 2021 will be monitored during the 2022 follow-up. 2020 monitoring will also follow Environment Canada's new recommendations for measuring chlorophyll *a* in the receiving environment, as well as nitrate and nitrite measurements in effluent.

## 3.7 Vegetation and Wetlands

The overall objective of monitoring vegetation and wetlands is to track vegetation restoration activities, changes to the vegetation in areas that have been restored, and implementation of the mitigation and compensation measures specified in the Global Certificate of Authorization (Global CA), in order to preserve plant biodiversity.

The specific objectives of these monitoring activities are as follows:

- To monitor the application of vegetation mitigation, compensation and restoration measures;
- To track revegetation (monitoring of plant regrowth in revegetated areas);
- To implement the wetlands compensation measures set out in the Wetlands Compensation Plan (WCP), in accordance with the Global CA;
- To monitor wetlands along the mine access road.

## 3.7.1 Application of Vegetation Mitigation, Compensation and Restoration Measures

### 3.7.1.1 Revegetation – Mine Site

The gradual revegetation of areas at risk of erosion and areas where mining activity has ceased began in 2016.

Several areas that were used during the exploratory phase of the Renard mine project were revegetated in 2016, such as the former Lagopede camp, which was dismantled in 2015, material storage areas, the former heliport, etc.

Since 2017, about 32,000 m² have been revegetated on the mine site. The variables listed in Table 3.17 are inspected or measured as part of the revegetation monitoring completed in June 2021 (Photo 3.21).

An average growth of 14 cm was observed in the herb and shrub layers in plots that were seeded in summer 2019. The areas that have been revegetated are shown by the year in which they were planted or seeded, and by sector, on Map 3.6.

**Table 3.20 Agronomic monitoring variables and methodology**

| Variables | |
|---|---|
| **Herbaceous Species** | |
| Percentage of plant cover | Visual inspection |
| Percentage of live and dead plants and spatial distribution | Visual inspection |
| Plant height (average in cm) | Measurement |
| Presence of outside disturbances and signs of disease | Visual inspection |
| **Visual inspection Arborescent Species** | |
| Percentage of plant cover | Visual inspection |
| Number of live and dead plants and spatial distribution | Visual inspection |
| Height of plants | Measurement |
| Root collar diameter | Measurement |
| Crown width | Measurement |
| Signs of disease | Visual inspection |

**Photo 3.21 Monitoring regrowth at parcels that were seeded (June 2021)**

## 3.7.2 Plantation Performance by Restored Area

### 3.7.2.1 Objective

The purpose of monitoring plantation performance in areas that have been seeded is to assess regrowth and the long-term success of revegetation on the mine site. It allows Stornoway to confirm the achievement of restoration goals for each sector, thus ensuring successful revegetation on all sites undergoing restoration.

### 3.7.2.2 Schedule

Plant regrowth will be monitored for five years. In the first year (2017), monitoring was carried out twice:

- In spring, after the snow melted, when spring shoots were just starting to appear;
- In summer (August) when the growing season was well under way.

Since 2018, monitoring has been carried out just once a year in late June in order to get a more representative assessment of the beginning of the growing season at the Renard mine site, and in line with recommendations from a specialized consultant. In addition, according to the Environment Canada site, the growing season starts after 10 days with an average daily temperature above 5°C, which corresponds to the end of May at the Renard mine site.

In 2021, the revegetation monitoring campaign took place from June 17th to 19th.

#### 3.7.2.3 Methodology

The number and the locations of the monitoring sites are specified on the map showing the revegetated sectors in 2016, 2017, 2018 and 2019 (Map 3.6). Markings were made on the ground to designate the permanent sample plots (SP), each one measuring 100 m² (a circle with a radius of 5.64 m), where the variables listed in Table 3.20 were measured and recorded.

#### 3.7.2.4 2021 Results

##### *3.7.2.4.1 Growth*

Revegetation monitoring was conducted on all plants showing signs of regrowth, especially Speckled Alder (Photo 3.22).

Plant regrowth is generally continuing. The average percentage of total cover across all species was 45%, an increase of 4% from summer 2020 and 41% from summer 2017.

The monitoring of the revegetation campaign in 2021 confirmed the success of the plantations and the gradual regeneration of vegetation observed at the various sites (Photos 3.24 and 3.25) after seeding every summer since 2017.

In 2022, the monitoring will include visits to the sites that were reseeded in summer 2019, in particular the two areas that were seeded by hand, namely the area near the MWWTP beach and the area south of the Swallow-Fournier garage, which was reseeded in 2018.

**Photo 3.22 Plant regrowth monitoring - Station VGR1-03 (June 2021)**

**Photo 3.23 Plant regrowth monitoring - Station VGR2-02 (June 2019)**

**Photo 3.24 Plant regrowth monitoring - Station VGR2-02 (June 2021)**

### 3.7.3 Wetlands Compensation Program

Even after reducing and optimizing the footprint of the Renard Diamond Project, the construction of the mining site still resulted in an unavoidable loss of wetlands (17.1 ha).

Consequently, in 2014, Stornoway offered MELCC its support in the development and implementation of a scientific research project to determine the social and biophysical criteria for measuring the ecological value of boreal fens and bogs in the Eeyou Istchee James-Bay region.

A project to conduct research into and acquire knowledge of the region's fens and bogs was therefore proposed and approved as a wetlands compensation measure for Stornoway's Renard diamond mine project in accordance with the requirements of the *Act Respecting Compensation Measures for the Carrying out of Projects Affecting Wetlands or Bodies of Water.*

This knowledge acquisition project has two components: the first component is focused on fens and bogs, and the second on northern biodiversity. A decision support tool will be proposed based on the results of the two research projects in order to determine the most appropriate ecological services and locations for compensation.

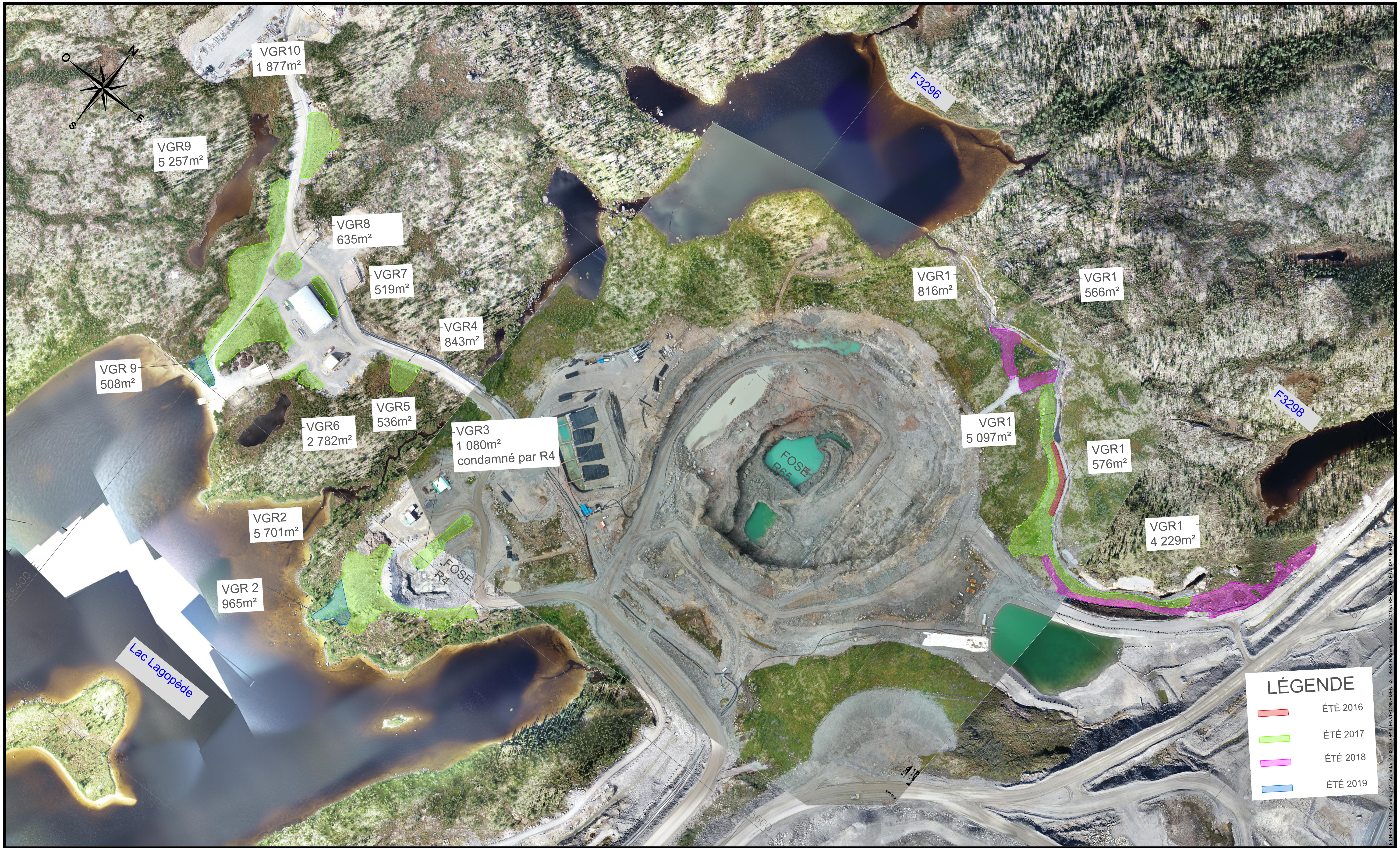
The new knowledge and tools gathered and developed via the project will help guide and improve the analysis of compensation measures for northern environments proposed in the future.

#### 3.7.3.1 Monitoring of the first component – fens and bogs

The first component consists of acquiring knowledge of the hydrological and biogeochemical functions of fens and bogs in a context of climate change.

Very little is known about these functions in the boreal region, but they are of paramount importance in the development of northern Quebec for both social and cultural reasons (land use by the Cree Nation), and economic reasons (infrastructure flooding and road erosion). Monitoring of the first component - fens and bogs

- Holocene ecohydrological dynamics (geological era that began 10,000 years ago and continues today); and




| NO. | DATE | REVISIONS / EMISSIONS | PAR. | APP. |
|---|---|---|---|---|
| 02 | 200323 | AJOUT DE DEUX ZONES DE REVÉGÉTALISATION (2019) | YD | |

DESSINÉ PAR: Y.DUGUAY
DATE: 2018-08-20
APPROUVÉ PAR: INGÉNIEUR
DATE: AAAA-MM-JJ
ÉCHELLE: 1:4 000
IMPRIMÉ: 2020-03-23
SCEAU

PROJET: MINE RENARD

TITRE: AIRE DE REVÉGÉTALISATION
SITE MINIER
VUE DE PLAN

Carte / Map
3.6
stornoway

NUMÉRO DE DESSIN:
SUR - AP - ENV - 000 - VEG - 01 - 02
SECTEUR DISCIPLINE DÉTAIL NIVEAU TRAVAIL SÉQUENCE RÉVISION

- The carbon balance of oligotrophic bogs (nutrient-poor bogs) in north-central Quebec.

This first component began in 2016, and its main objectives are as follows:

- To recreate the paleohydrological and paleoecological conditions that influenced the accumulation of peat and carbon during the Holocene period;
- To recreate the regional vegetation and climatic variations (temperature and precipitation) of the Holocene period;
- To document the recent hydrological dynamics of the water table in the peatlands drainage basin;
- To simulate the impact of climate forcing (temperatures and precipitation) on ecohydrological functions of peatlands over the past 5,500 years.

All field research associated with the project initiated by the University of Quebec in Montreal (UQAM) in 2016 is complete. No new fieldwork has been conducted for this component since 2019. Analysis and writing began during the fall and winter of 2020-2021. The preliminary conclusions of the study indicate that the peat bogs of the James Bay area generally seem to be well equipped to face the coming climate change, although they will need to be able to adapt. The study will be completed in 2022.

#### 3.7.3.2 Monitoring the second component – northern biodiversity

The second component covers SWY's participation in in the implementation of the CRSNG-UQAT Industrial Research Chair on Northern Biodiversity in a Mining Context, announced in April 2018 in collaboration with the University of Quebec in Abitibi-Temiscaingue (UQAT).

The mission of the Chair is to increase knowledge creation and dissemination regarding northern biodiversity in order to be able to develop strategies to reduce the impacts of development throughout the mine life cycle on northern biodiversity in the context of cumulative impacts including climate change.

This component aims to incorporate traditional knowledge in compensation measures. It provides a framework for better integration of the needs of the indigenous communities that use the land into planning for future compensation projects in northern and boreal regions. To that end, two studies were proposed as part of the Chair's work.

**The first study** aims to describe the diversity of vertebrate communities in small wetlands in Northern Quebec (UQAT).

Following the fieldwork conducted at 50 different ponds in late May 2019, a second fieldwork session lasting a total of 22 days was undertaken by two teams of UQAT students who visited the mine site in June and July 2019.

Their goal was to conduct a second visit of some 50 ponds, evenly distributed by type (beaver ponds and peatland ponds) along the north-south gradient. Part of the surveys were conducted at the Renard mine on May 30 to June 2, June 6 to 17, and July 12 to 23, 2019. The data collected includes a number of sightings of vertebrates in the various ponds, which is promising.

##### *3.7.3.2.1 2021 Results*

No further field work is planned for 2021. Analysis of the preliminary results for 2021 indicate a total of 96 species grouped by requirements in terms of ecological succession: species associated with both primary and secondary succession, generalist species, and wetland species. The beaver ponds are home to a wider variety and a different composition of species as compared to the peatlands, primarily due to the species associated with primary succession.

The results of monitoring activities in 2021 also demonstrate that bird population models were determined primarily by beavers and red squirrels, which affect bird communities by altering the habitat and directly preying on nests. This information contributes to a greater understanding of bird communities, which will in turn help determine the top conservation priorities for the wetlands in the region.

**The second study** aims to analyze and model the dynamics of typical lichen and plant communities in the wetlands of northwestern Quebec. Two field campaigns were undertaken in 2019, including 15 sites on the Renard mine site (Photo 3.25).

During visits to the fens and bogs in 2019, temperature and humidity readings were taken using instruments that were installed at various mine sites for a period of 12 months. Water and peat samples were also collected for physical-chemical analysis. As this component is now complete, no further field work was planned for 2021.

**Photo 3.25 Peatlands being studied in Eeyou Istchee James Bay**

The students are currently working to identify the samples collected and analyze the environmental factors associated with the development of fens and bogs.

***3.7.3.2.2 2021 Results***

Analysis of the results continued into 2021. It was focused primarily on gaining a better understanding of the different species of lichen that are present in the different types of peatlands, as well as of the relative importance of the various peat bogs. The monitoring activities carried out in 2022 will help SWY make more informed decisions on land use in the future.

## 3.7.4 Wetland Monitoring (Route 167 North)

When Route 167 North was extended in 2012-2014, the construction impacted 18.4 ha of wetlands in the road's path (Roche, 2013a). An agreement was reached with the MELCC that if there was insufficient natural revegetation in the 2016 growing season, the area would be revegetated with native species.

#### 3.7.4.1 Background information

The sowing and corrective measures taken in the past are described in previous environmental monitoring reports (Stornoway, 2020).

#### 3.7.4.2 2021 Monitoring

The seeds planted in these wetlands in 2017 were monitored for regrowth in the barrow pits (Photo 3.26a) and in the peat bogs (Photo 3.26b) located along Route 167 North on June 19th, 2021.

During this monitoring campaign, all sites showed a survival rate of 100% for the herb layer, and 89% for the shrub layer. Revegetation monitoring demonstrates that the seeding that took place in summer 2017 and summer 2019 was a success. Just two sites showed a survival rate of less than 70% for the shrub layer.

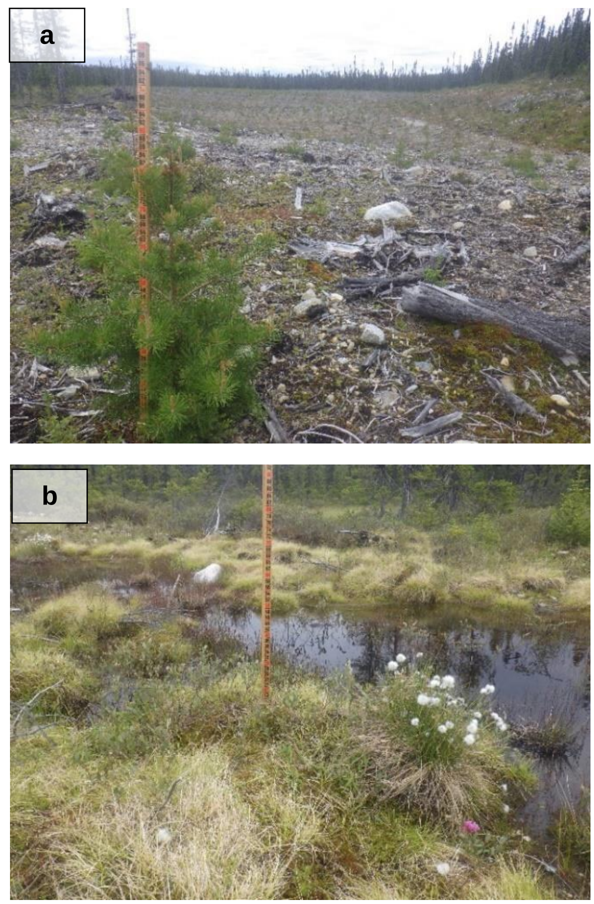



**Photo 3.26 Wetlands seeded along Route 167 North in 2021 (a) and in the peatlands in 2021 (b)**

## 3.8 Fish and Benthic Communities (EEM)

The Renard Diamond Mine environmental monitoring program calls for various components of the Lake Lagopede ecosystem to be monitored, in particular its fish populations. Since June 1st, 2018, the Renard mine has been subject to the new *Metal and Diamond Mining Effluent Regulations* (MDMER).

However, as early as 2016, SWY had already committed to monitoring fish communities in compliance with the requirements of the previous regulation (MMER) and various recommendations set out in the *Metal Mining Environmental Effects Monitoring (EEM) Technical Guidance Document* (Environment Canada, 2012). The current MDMER calls for essentially the same monitoring activities as the previous regulations, with a few small modifications.

The main objective of the monitoring remains the same, which is to assess the impact of the treated mine effluent discharged into Lake Lagopede on fish and fish habitat, along with the potential use of fishing resources.

### 3.8.1 Study Plan

In order to implement the required monitoring activities, a study design plan for the first cycle of biological monitoring was prepared in 2018 and submitted to the authorization officer for approval in February 2019, six months prior to the first sampling campaign (Norda Stelo, 2019b) and no more than twelve months after the date on which the Renard mine became subject to the regulation (June 1st, 2018).

The study plan provides all the necessary indications regarding the methodology to be used to assess the impact on fish, evaluate the potential use of habitats by fish, and study benthic invertebrate communities. Also included in the plan were:

- A summary of previous biological monitoring studies;
- A summary of effluent and water quality monitoring; and
- Information on the environmental characteristics of the site, including the results of the effluent plume delineation study.

An overview of the plan, including the study area and the selected sentinel species, is provided in the sections below.

In March 2019, Environment Canada evaluated the study design plan for the EEM at the Renard mine and made recommendations.

#### 3.8.1.1 Schedule

The first sampling campaign for the first cycle of the EEM was initially scheduled for fall 2019, but later postponed to fall 2020.

However, due to the COVID-19 pandemic and the sanitary restrictions the Quebec mining industry was subject to, the Renard mine was no longer able to allow contractors or visitors access to the site. This included the consultant hired by SWY to conduct the EEM survey in early September 2020.

Consequently, SWY contacted Environment Canada via email on July 14th, 2020, to inform the Enforcement officer of the extenuating circumstances due to the pandemic.

SWY made sure to send the new definitive calendar to Environment Canada by mail on April 20th, 2021. This was done in order to complete EEM biological monitoring as early as possible, at the end of summer 2021, i.e. at least two weeks before sampling began, in accordance with the regulatory deadlines.

#### 3.8.1.2 Study area

The fish and benthic community monitoring study applies to Lake Lagopede, the receiving environment where treated mine effluent has been discharged since April 14th, 2016.

The surveys conducted prior to the start of effluent discharge in the control (non-effluent) and exposed (effluent) zones show that the habitats are similar in terms of surface water and sediment quality, water depth and benthic community composition (Norda Stelo, 2015).

The area chosen as the "exposed zone" is located close to the treated mine effluent discharge point and within the effluent dispersion plume. The control area is in the West bay of Lake Lagopede, about 1.7 km upstream from the discharge point and the mine site.

As recommended by Environment and Climate Change Canada in March 2019, the concentration of mine effluent will be estimated both 100 m and 250 m from the diffuser.

## 3.8.2 Fish study

### 3.8.2.1 Sentinel species

The fish study consists of analyzing adult specimens of a fairly sedentary species of fish that has been exposed to effluent for a significant period of time. According to experimental fishing conducted in 2010 and 2011 for the environmental baseline study (Roche, 2011b), white sucker (*Catastomus commersonii*; 58.7%) and northern pike (*Esox lucius*; 22.1%) accounted for over 80% of all fish caught. These two species were selected as sentinel species for monitoring purposes.

A variety of fishing equipment will be used to catch different sizes of individuals from these particular species, as specified in the study plan. Fishing stations will be positioned so as to track the impact of final mine effluent in both control areas, which are not subject to effluent, and exposed areas, which are affected by effluent.

The impact indicators used to determine whether the effluent has had any effect on the fish are growth, reproduction, physical condition and survival. Table 3.18 shows the monitoring indicators measured in the 2021 fish population study.

**Table 3.21 Monitoring indicators measured as part of fish population study**

| Indicator | Accuracy | Required Statistics |
|---|---|---|
| **Age** | 0+[(1)] | Mean, median, standard deviation, standard error, minimum and maximum values in the sampling areas |
| **Total body weight (fresh)** | ±0.1 g[(2)] | |
| **Total length** | ±1 mm | |
| **Weight of gonads (if fish is sexually mature)** | ±0.1 g[(2)] | |
| **Weight of 100 eggs (if fish is sexually mature)** | ±0.001 g | (Minimum recommended subsample size: 100 eggs) mean, median, standard error, minimum and maximum values in the sampling areas |
| **Fecundity (if fish is sexually mature)** | ±1.0% | Total number of eggs per female, mean, median, standard error, minimum and maximum values in the sampling areas |
| **Liver weight** | ±0.1 g[(2)] | Mean, median, standard deviation, standard error, minimum and maximum values in the sampling areas |
| **Anomalies** | N/A | Presence of parasites, lesions, tumours or other anomalies |
| **Sex** | N/A | % of females and males in the sampling areas |

1 10% require independent confirmation.
2 For large species, ±0.001 g for small fish species

### 3.8.3 Analysis of Potential Use of Fish

In biological monitoring studies, such as the study prescribed by the MDMER (Appendix V, Subsection 9c), mercury levels in fish tissue must be analyzed under the following conditions:

- If the annual average total concentration of mercury measured in effluent is equal to or higher than 0.10 µg/l, unless the results of the two previous biological monitoring studies show the mercury has no effect on the fish tissue; or
- If the analytical method detection limit used for mercury, for the analysis of at least two out of four effluent samples for a given calendar year, is equal to or higher than 0.10 µg/l.

According to the mine effluent quality monitoring results from 2019, the concentrations of mercury in final mine effluent remain below 0.10 µg/l, and analytical method detection limits remain below 0.10 µg/L. As indicated in the study plan, the levels of mercury and selenium in fish tissue were not analyzed during the first biological monitoring study because the concentrations measured in the past were all below the thresholds indicated by the Technical Guide.

SWY plans to present the data collected on effluent quality in 2021 in the EEM Cycle 1 Interpretive Report. The validation of this data will make it possible to confirm whether or not the ECC will require analysis of potential use of fish during the second cycle of the EEM.

### 3.8.4 Benthic Invertebrate Community Study

Benthic invertebrate communities are studied primarily for the purpose of assessing fish habitat and benthic communities, which serve as early indicators of any changes caused by the project.

The benthic community study was carried out in parallel with the fish community study, at the end of summer 2021. Note that this is when biological diversity peaks and the development level of the organisms facilitates identification (Norda Stelo, 2019b).

A before-after-control-impact design was selected to detect any potential differences in diversity or number in the bethnic communities between exposed and reference zones.

Both sampling areas are in Lake Lagopede and they contain five stations each. Three subsamples (triple benthos sample) will be randomly collected at each substation.

### 3.8.5 Supporting Environmental Variables

As part of the ESMP, Renard mine is currently monitoring surface water and sediment quality (section 3.5 herein), as well as effluent quality (section 3.13).

In 2021, in addition to being part of the annual environmental monitoring report, the analysis of this monitoring data will be discussed in greater detail in the EEM Cycle 1 Interpretative Report, as it will be used to interpret the biological monitoring results.

### 3.8.6 EEM Cycle One Interpretative Report

As stated in section 12(1) of Appendix 5 of the MDMER, the first interpretative report must be submitted no later than 36 months after the mine becomes subject to the MMER.

Since the Renard mine became subject to the MDMER on June 1st, 2018, the 1st EEM Interpretative Report (Cycle 1) was submitted to the provincial and federal authorities on June 1st, 2021. However, this report does not include any data from the required biological monitoring, due to the postponement of the EEM campaigns to summer 2021, during the pandemic (COVID-19).

SWY will submit an interpretative report to Environment Canada no later than June 1st, 2022 as an addendum, in order to present the analysis of the biological data on fish and benthic communities collected in late summer 2021.

SWY will await Environment Canada's recommendations regarding the frequency of subsequent EEM campaigns (Cycles 3 and 5) in accordance with section 16 of Appendix 5 of the MDMER.

## 3.9 Fish Habitat

Under condition 5.1 of Fisheries and Oceans Canada (DFO) authorization No. 2014-002 (April 9, 2014) pursuant to section 35 of the *Fisheries Act*, the Renard Diamond Project's medium and long-term impacts on fish and fish habitat must be monitored. To meet this requirement, the Environmental Monitoring Program (EMP) includes monitoring fish and fish habitat.

**OBJECTIVE OF MONITORING 3.8**

**Maintaining fish habitat conditions in Lake F3298.**
**Maintaining the free movement of fish in streams south of the mine (from the outlet of Lake F3300 to the tributary of Lake F3301).**
**Maintaining appropriate hydraulic conditions for brook trout (*Salvelinus fontinalis*) incubation and spawning in the tributary of Lake F3301.**
**Maintaining the downstream migration of fish in the diversion channel at the Lake F3298 outlet.**

### 3.9.1 Maintaining Fish Habitat Conditions in Lake F3298

#### 3.9.1.1 Schedule

As described in the ESMP, monitoring to ensure fish habitat conditions are maintained is scheduled for years 1, 3, 5, 10 and 15 after the start-up of mining operations (Map 3.7). The monitoring report for Year 3 (2020) was submitted to DFO on March 15, 2021 (SWY, 2021a). At present, the analysis of this report and potential DFO recommendations are unavailable.

The next follow-up is scheduled for Year 10, in 2025.

#### 3.9.1.2 Experimental fishing

No monitoring was planned in 2021. As a reminder, the median length and weight of individuals caught by Alaska net during the 2018 and 2020 monitoring generally increased since the baseline environmental study (Roche, 2011b), reaching a maximum in 2018. Therefore, the caught fish were generally longer and heavier during the last monitoring in 2020 than in 2011 (Figure 3.9).

Note that in 2016, fishing was performed using Alaska nets and bait traps, a small hoop net that makes it possible to catch smaller, lighter individuals: the median length was 139 mm and the median weight was 23 g.

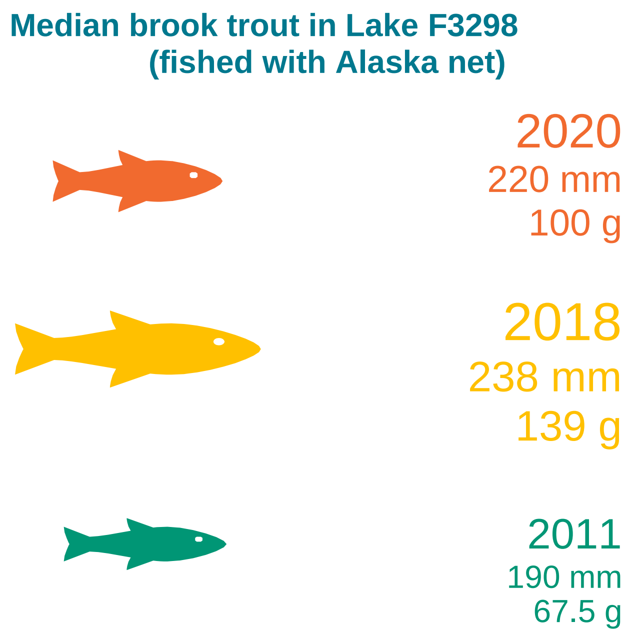



**Figure 3.15 Change in physical parameters of brook trout monitored in Lake F3298 since 2011**

#### 3.9.1.3 2025 monitoring

Stations ST1 and ST2 defined in 2018 will again be subject to water quality surveys and experimental fishing in 2025. This next monitoring phase will determine whether the condition of the fish population of Lake F3298 remains stable. It will also determine whether the physical-chemical parameters of the water and the habitat conditions in Lake F3298 have changed.

### 3.9.2 Maintaining Free Movement of Fish in the Outlets of Lakes F3300, F2607 and F3301

#### 3.9.2.1 Schedule

As described in the ESMP, the next phase in monitoring the free movement of fish in the outlets of Lakes F3300 and F2607 will occur in Year 10, in 2025.

With regard to the tributary of Lake F3301, since the hydraulic conditions observed during the 2018 and 2020 follow-ups did not make it possible to determine whether or not brook trout use this area, the use of the spawning grounds by brook trout will be reassessed during the 2022 monitoring.

#### 3.9.2.2 2021 monitoring

No monitoring was planned in 2021. The next monitoring for the outlets of Lakes F3300, F2607 and F3301 is planned for 2025 and will confirm:

- The position of a few natural obstacles that were noted during the 2020 monitoring; most were already present in 2010, prior to the implementation of the Renard project (Roche, 2011b).
- Whether the obstacles identified by DFO as impassable remained passable during the spring and fall floods, as determined in 2020.

### 3.9.3 Maintaining Brook Trout Spawning Grounds in the Tributary to Lake F3301

#### 3.9.3.1 Schedule

As described in the ESMP, monitoring to ensure that the fish habitat is maintained and used by brook trout was undertaken in Years 1 (2016), 3 (2018) and 5 (2020) following the development of the fish habitat completed in 2015.

#### 3.9.3.2 2020 monitoring

The 2020 monitoring report was submitted in March 2021. The results of the 2020 monitoring are available in the 2020 annual environmental and social monitoring report (Stornoway, 2021c).

The next monitoring of natural spawning conditions for brook trout in the tributary of Lake F3301 will occur in 2025 (Year 10). SWY is currently awaiting recommendations from DFO and Environment Canada regarding adjustments to be made to the monitoring period, and more specifically if it should be conducted later in the fall to better target the brook trout spawning period.

### 3.9.4 Diversion Channel – Outlet of Lake F3298

To safely develop and operate pit R65, the outlet of Lake F3298 (Stream 170), located north of the sedimentation pond, had to be diverted (Map 3.7). To prevent stream water from being influenced by mining operations or draining into the network of peripheral ditches, a section of the stream was diverted in 2015 toward Lake F3295.

#### 3.9.4.1 Visual monitoring

A visual survey of the water flow was undertaken throughout the year to ensure the migration of fish in the diversion channel. The stream was visited during the spring thaw, during the fish migration period, and after heavy spring rains to observe water levels in the restructured stream and confirm the presence of water flow (Photo 3.27).

As observed since 2018, water flow in the diverted section of the stream was light in 2021, varying significantly with precipitation. These observations indicate that fish movement is assured during migration but is not continuous throughout the summer.

Moreover, the fish are free to move downstream when the water level is high. Recall that Stream R170 is fed by a lake located in a small drainage basin. Therefore, its flow rate is heavily influenced by precipitation, which in turn influences the periods when fish movement is possible in the stream, especially during the migration period (Photo 3.28).

#### 3.9.4.2 Diversion channel

To improve understanding of flow in Stream 170, a V-graded weir (or V-notch) was installed in July 2020 to measure flow on a weekly basis throughout the year (photo 3.28). These flow data can be used to calculate the flows based on the measured water levels of Stream 170 and thus produce a rating curve to better understand the turnover time of lake F3298 (more details in section 3.4.1.4).

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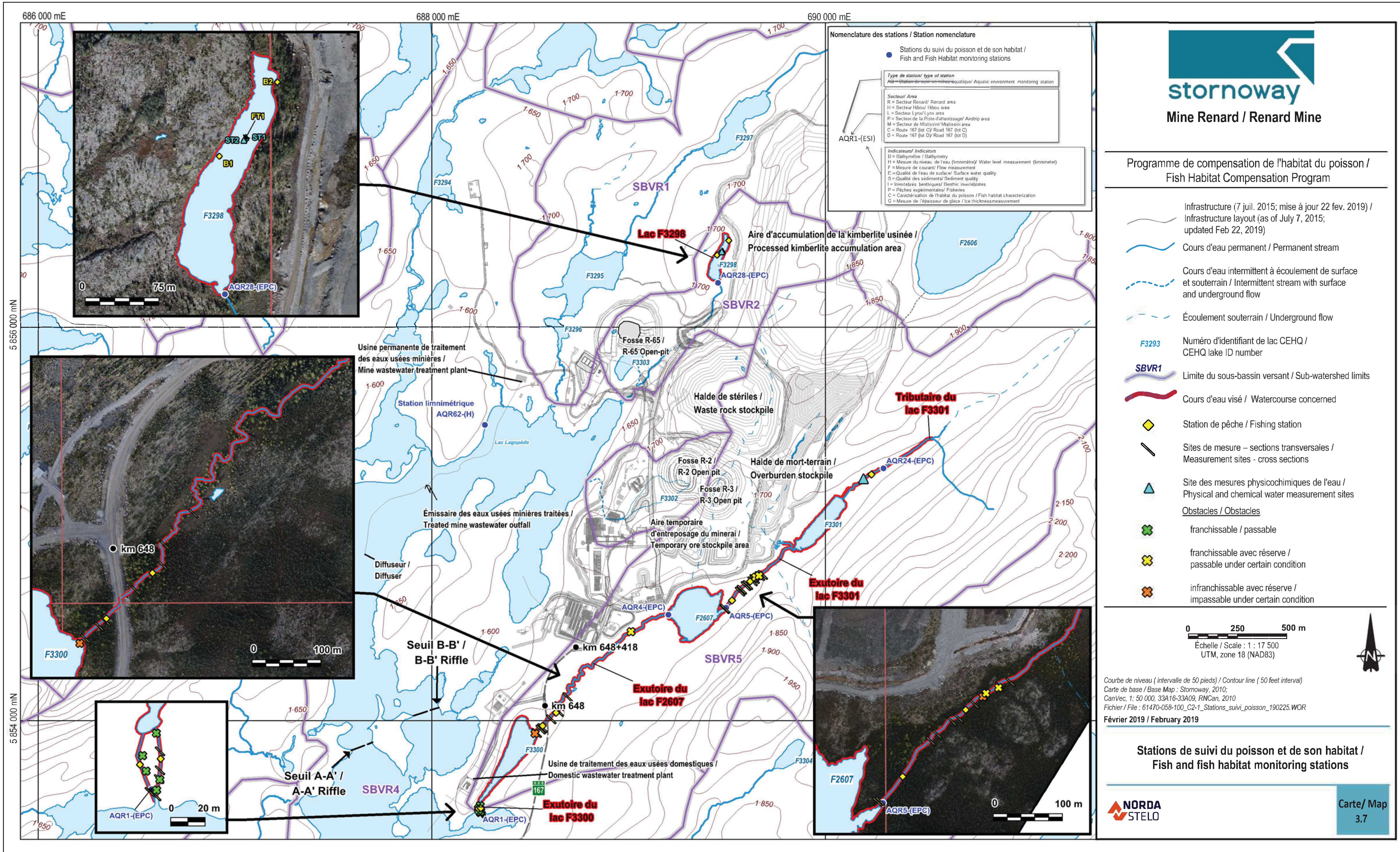
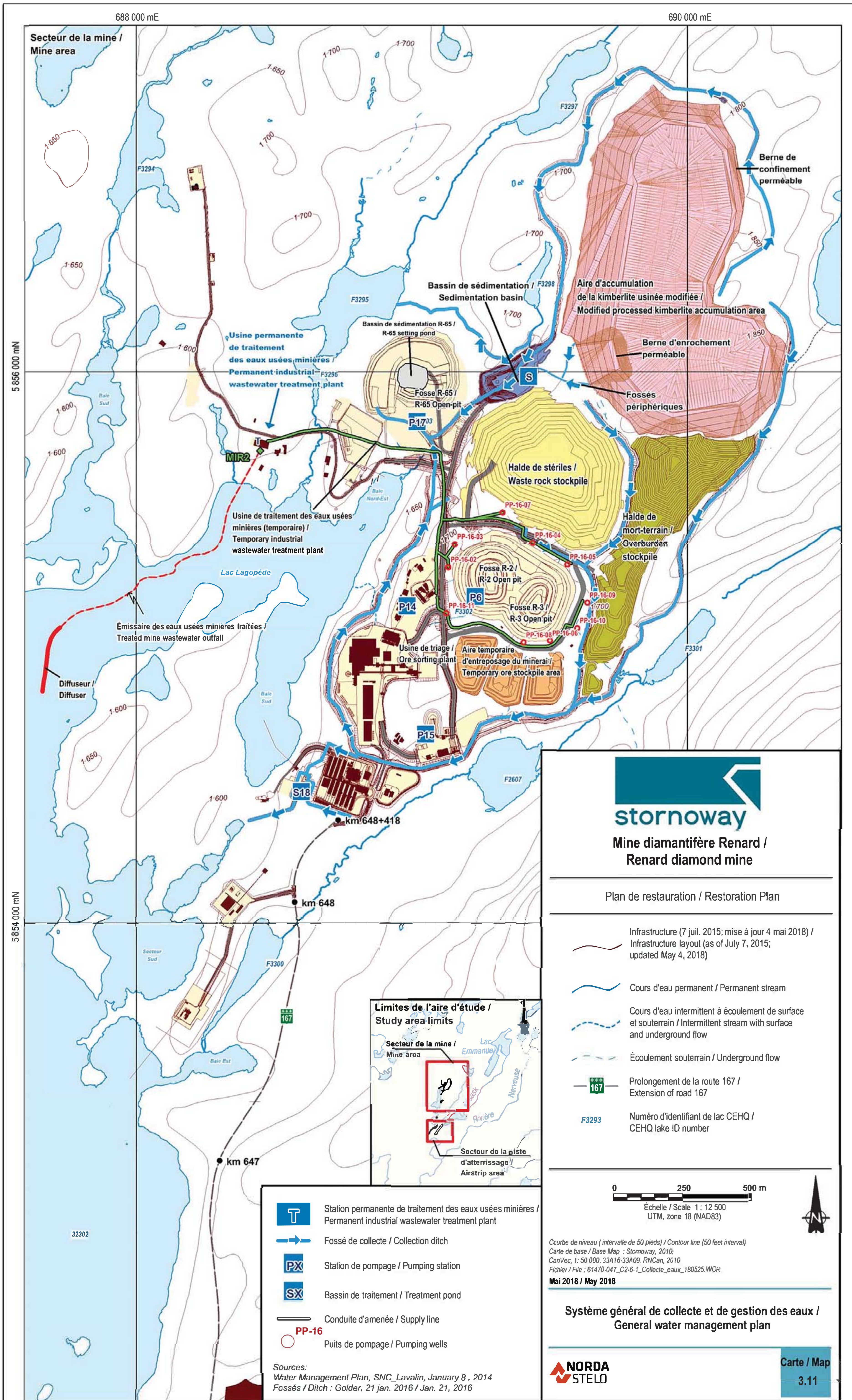
**Photo 3.27 Lake F3298 outlet – View from downstream to upstream (April 2021)**

**Photo 3.28 Graduated V-shaped weir in the outlet of Lake F3298**



stornoway
Mine Renard / Renard Mine
Programme de compensation de l'habitat du poisson / Fish Habitat Compensation Program
Infrastructure (7 juil. 2015; mise à jour 22 fev. 2019) / Infrastructure layout (as of July 7, 2015; updated Feb 22, 2019)
Cours d'eau permanent / Permanent stream
Cours d'eau intermittent à écoulement de surface et souterrain / Intermittent stream with surface and underground flow
Écoulement souterrain / Underground flow
F3293
Numéro d'identifiant de lac CEHQ / CEHQ lake ID number
SBVR1
Limite du sous-bassin versant / Sub-watershed limits
Cours d'eau visé / Watercourse concerned
Station de pêche / Fishing station
Sites de mesure – sections transversales / Measurement sites - cross sections
Site des mesures physicochimiques de l'eau / Physical and chemical water measurement sites
Obstacles / Obstacles
franchissable / passable
franchissable avec réserve / passable under certain condition
infranchissable avec réserve / impassable under certain condition
0
250
500 m
Échelle / Scale : 1 : 17 500
UTM, zone 18 (NAD83)
Courbe de niveau ( intervalle de 50 pieds) / Contour line ( 50 feet interval)
Carte de base / Base Map : Stornoway, 2010;
CanVec, 1: 50 000, 33A16-33A09, RNCan, 2010
Fichier / File : 61470-058-100_C2-1_Stations_suivi_poisson_190225.WOR
Février 2019 / February 2019
Stations de suivi du poisson et de son habitat / Fish and fish habitat monitoring stations
NORDA STELO
Carte/ Map 3.7
Nomenclature des stations / Station nomenclature
Stations du suivi du poisson et de son habitat / Fish and Fish Habitat monitoring stations
AQR1-(ESI)
Type de station/ type of station
AQ = Station de suivi en milieu aquatique/ Aquatic environment monitoring station
Secteur/ Area
R = Secteur Renard/ Renard area
H = Secteur Hibou/ Hibou area
L = Secteur Lynx/ Lynx area
P = Secteur de la Piste d'atterrissage/ Airstrip area
M = Secteur de Mistissini/ Mistissini area
C = Route 167 (lot C)/ Road 167 (lot C)
D = Route 167 (lot D)/ Road 167 (lot D)
Indicateurs/ Indicators
B = Bathymétrie / Bathymetry
H = Mesure du niveau de l'eau (limnimètre)/ Water level measurement (limnimeter)
F = Mesure de courant/ Flow measurement
E = Qualité de l'eau de surface/ Surface water quality
S = Qualité des sédiments/ Sediment quality
I = Invertebrés benthiques/ Benthic invertebrates
P = Pêches expérimentales/ Fisheries
C = Caractérisation de l'habitat du poisson / Fish habitat characterization
G = Mesure de l'épaisseur de glace / Ice thicknessmeasurement
686 000 mE
688 000 mE
690 000 mE
5 856 000 mN
5 854 000 mN
B2
FT1
ST2
ST1
B1
F3298
0
75 m
AQR28-(EPC)
Lac F3298
Aire d'accumulation de la kimberlite usinée / Processed kimberlite accumulation area
F3298
AQR28-(EPC)
SBVR1
SBVR2
F3297
F3294
F3295
F3296
F2606
Fosse R-65 / R-65 Open-pit
F3303
Usine permanente de traitement des eaux usées minières / Mine wastewater treatment plant
Station limnimétrique AQR62-(H)
Lac Lagopède
Halde de stériles / Waste rock stockpile
Fosse R-2 / R-2 Open pit
Fosse R-3 / R-3 Open pit
F3302
Halde de mort-terrain / Overburden stockpile
Aire temporaire d'entreposage du minerai / Temporary ore stockpile area
Émissaire des eaux usées minières traitées / Treated mine wastewater outfall
Diffuseur / Diffuser
Tributaire du lac F3301
AQR24-(EPC)
F3301
Exutoire du lac F3301
AQR4-(EPC)
F2607
AQR5-(EPC)
SBVR5
km 648
F3300
0
100 m
km 648+418
Seuil B-B' / B-B' Riffle
Exutoire du lac F2607
km 648
F3300
Usine de traitement des eaux usées domestiques / Domestic wastewater treatment plant
167
Seuil A-A' / A-A' Riffle
SBVR4
F3304
Exutoire du lac F3300
AQR1-(EPC)
AQR1-(EPC)
0
20 m
F2607
AQR5-(EPC)
0
100 m



688 000 mE
690 000 mE
5 856 000 mN
5 854 000 mN
Secteur de la mine / Mine area
Berne de confinement perméable
Aire d'accumulation de la kimberlite usinée modifiée / Modified processed kimberlite accumulation area
Bassin de sédimentation / Sedimentation basin
Bassin de sédimentation R-65 / R-65 setting pond
Berne d'enrochement perméable
Fossés périphériques
Usine permanente de traitement des eaux usées minières / Permanent industrial wastewater treatment plant
Fosse R-65 / R-65 Open-pit
Halde de stériles / Waste rock stockpile
Usine de traitement des eaux usées minières (temporaire) / Temporary industrial wastewater treatment plant
Halde de mort-terrain / Overburden stockpile
Fosse R-2 / R-2 Open pit
Fosse R-3 / R-3 Open pit
Lac Lagopède
Émissaire des eaux usées minières traitées / Treated mine wastewater outfall
Usine de triage / Ore sorting plant
Aire temporaire d'entreposage du minerai / Temporary ore stockpile area
Diffuseur / Diffuser
MIR2
P17
P14
P6
P15
S18
S
km 648+418
km 648
km 647
Limites de l'aire d'étude / Study area limits
Secteur de la mine / Mine area
Secteur de la piste d'atterrissage / Airstrip area
stornoway
Mine diamantifère Renard / Renard diamond mine
Plan de restauration / Restoration Plan
Infrastructure (7 juil. 2015; mise à jour 4 mai 2018) / Infrastructure layout (as of July 7, 2015; updated May 4, 2018)
Cours d'eau permanent / Permanent stream
Cours d'eau intermittent à écoulement de surface et souterrain / Intermittent stream with surface and underground flow
Écoulement souterrain / Underground flow
Prolongement de la route 167 / Extension of road 167
F3293 Numéro d'identifiant de lac CEHQ / CEHQ lake ID number
Station permanente de traitement des eaux usées minières / Permanent industrial wastewater treatment plant
Fossé de collecte / Collection ditch
Station de pompage / Pumping station
Bassin de traitement / Treatment pond
Conduite d'amenée / Supply line
PP-16 Puits de pompage / Pumping wells
Sources:
Water Management Plan, SNC_Lavalin, January 8 , 2014
Fossés / Ditch : Golder, 21 jan. 2016 / Jan. 21, 2016
0 250 500 m
Échelle / Scale 1 : 12 500
UTM, zone 18 (NAD83)
Courbe de niveau ( intervalle de 50 pieds) / Contour line (50 feet interval)
Carte de base / Base Map : Stornoway, 2010;
CanVec, 1: 50 000, 33A16-33A09. RNCan, 2010
Fichier / File : 61470-047_C2-6-1_Collecte_eaux_180525.WOR
Mai 2018 / May 2018
Système général de collecte et de gestion des eaux / General water management plan
NORDA STELO
Carte / Map 3.11

## 3.10 Fish Habitat Compensation

**OBJECTIVE OF MONITORING 3.9**

**To compensate for the damage and loss of fish habitat caused by the activities of the Renard project and the construction of Route 167 North.**

To do so, two distinct fish habitat compensation programs (FHCP) were approved by DFO (DFO, 2014).

First, a compensation program was developed to offset habitat losses that occurred as a result of the construction of Route 167 North. Fish habitats totalling nearly 1,012 m² were created in 2014, and monitoring studies were completed in 2017.

DFO determined that the compensation program put in place by SWY for Route 167 North achieved the objectives set and hence declared monitoring to be complete. See section 3.10 for more information.

Second, the Renard Diamond Mine FHCP involves five operations in two geographically distinct areas, the Renard Mine area and the Mistissini area.

The operations associated with the Renard Mine and required by DFO entail:

- Developing 600 m² of brook trout or speckled trout (*Salvelinus fontinalis*) habitat in four streams (2015);
- Expanding a lake trout (*Salvelinus namaycush*) spawning ground in Lake Lagopède by an additional 300 m² (2016).

The operations associated with the Mistissini area entailed:

- Developing a 600 m² walleye (*Sander vitreus*) spawning ground in Lake Mistassini (2019);
- Developing a 100 m² habitat for brook trout in a tributary to Lake Mistassini (2019);
- Developing fish habitat in a diversion channel on the former Icon-Sullivan mine site for a target gain of 15,000 m².

### 3.10.1 Monitoring the Integrity and Use of Brook Trout Habitats at the Site

**First FHCP Intervention**

**Brook trout habitat development work in the Renard Mine area performed in July 2015**

**Four streams targeted by the FHCP: outlets of Lakes F3293, F3294, F2604 and F3301.**

Riffle-, pool- and spawning ground-type development improved the quality of brook trout habitat and promoted access to it by creating feeding, shelter and spawning habitats that meet the species' needs. A total of 21 riffle sections, three gravel boxes, one 50-m channel and over 530 m² of spawning grounds were developed.

#### 3.10.1.1 2016 to 2020 monitoring

Previous monitoring on brook trout habitat developments are described in the Annual Environmental and Social Monitoring Reports for the years 2018 (Stornoway, 2019c), 2019 (Stornoway, 2020) and 2020 (Stornoway, 2021). In 2019, DFO concluded that the habitats were being used well by the fish and that they allowed for free movement in the four streams.

#### 3.10.1.2 2021 monitoring – corrective work

SWY is working to ensure that the compensation program objectives are maintained and that the area of developed brook trout spawning habitat is improved.

DFO provided its comments in an email dated December 12, 2019, recommending *"first of all (...) to make the suggested corrections to the F1-AV spawning ground in the outlet of Lake F3301 (...) to ensure that the water flow conditions seen in the restructured streams make it possible to maintain the gravel put in place in the spawning grounds even after excavating the streambed."*

The corrective work should have been performed in the summer of 2020, but it was postponed until summer 2021 due to the COVID-19 pandemic.

Therefore, the two brook trout spawning grounds were visited in July 2021. At both spawning grounds, new gravel was added to increase the thickness of the spawning ground substrate and new areas were developed by depositing gravel in areas suitable for the species' reproduction.

For spawning ground F1-AV in the outlet of Lake F3293 (Photo 3.29), an increase of 18.94 m$^2$ in surface area was estimated in July 2021. For spawning ground F1-AV in the outlet of Lake F3301, the estimated surface area increase was around 1.45 m$^2$ (Photo 3.30) before adding the gravel during the work in July 2021.

**Photo 3.29 Expansion of spawning ground F1-AV in the outlet of Lake F3293**

**Photo 3.30 Addition of gravel to spawning ground F1-AV in the outlet of Lake F3301**

In total, the addition of gravel in favourable areas of the stream increased the total surface area by 20.39 m$^2$ over both spawning grounds (Table 3.22), while improving the thickness of the current spawning substrate.

**Table 3.22 Changes in surface area of the targeted spawning grounds after work**

| Year | Surface area (m$^2$) Lake F3293 F1-AV | Surface area (m$^2$) Lake F3301 F1-AV |
|---|---|---|
| 2015 | 16 | 11 |
| 2016 | 32 | 13 |
| 2018 | 21 | 9 |
| 2020 | 21.06 | 2.55 |
| 2021 | 40 | 4 |

#### 3.10.1.3 2022 monitoring

Monitoring will be carried out in 2022 to ensure the effectiveness of the corrective work requested by DFO and to validate the conditions for free movement of fish. This follow-up will also make it possible to determine whether the developments have remained stable and whether the expansion of the spawning grounds is still appropriate for brook trout reproduction.

In light of the results of the 2022 monitoring and subject to the recommendations from DFO, additional corrective work and/or new developments could be conducted in these streams.

Note that new potential areas were explored in July 2021 in order to increase the size of the spawning grounds in the future. However, a more detailed characterization of these sites is needed to ensure that they are appropriate for brook trout spawn. SWY will await DFO's recommendations in this regard.

### 3.10.2 Monitoring Lake Trout Spawning Ground in Lake Lagopede

**Second FHCP Intervention**

**2016 expansion of an existing lake trout spawning ground in Lake Lagopede (Renard area)**

Expanding this spawning ground involved increasing the spawning area by more than 450 m$^2$, or 150 m$^2$ more than what DFO required (Map 3.9) (Stornoway, 2017b).

As noted in Authorization No. 2014-002 issued by DFO (DFO, 2014), monitoring of the developed spawning area should be performed just before and after the periods when the spawning ground is used by the fish, and in years 1, 2, 3 and 5 after the expansion work and every two years thereafter during the operation phase.

#### 3.10.2.1 2017–2020 Monitoring

The first monitoring (Year 1) of this expansion was performed in the fall of 2017, the second (Year 2) was performed in summer 2018, and the third (Year 3) was performed in fall 2019. Monitoring took place in 2020 only for the surface water quality at the spawning grounds.

The monitoring history for the lake trout spawning grounds in Lake Lagopede for 2017–2020 is presented in the Annual Environmental and Social Monitoring Report for the year 2020 (Stornoway, 2021c).

##### *3.10.2.1.1 Water Quality at the spawning ground 2017–2020*

The results for the 2017–2020 monitoring of the physical-chemical surface water quality parameters at the development are comparable to the results of the spawning ground baseline (2015–2016). In addition, they are within the variability of the species' preferred habitat, allowing the lake trout to complete its reproductive activities (spawning, incubation, hatching and rearing).

##### *3.10.2.1.2 DFO recommendations for 2019 monitoring*

In a December 30, 2020 email, DFO provided its recommendations to SWY after analyzing the 2019 monitoring report submitted on March 15, 2020. The ministry
*"believes that:*

- *the objectives are generally nearing completion;*
- *the development shows no signs of instability or erosion, and the characteristics of the lake trout spawning ground (area, depth, substrate, substrate cleanliness, exposure angle, etc.) seem to be suitable for lake trout reproduction;*
- *the spawning ground is used by lake trout for reproduction;*
- *the water quality conditions measured in 2019 above the developed spawning ground appear adequate and should allow lake trout to complete their reproductive activities (incubation, hatching and rearing)."*

As planned, SWY also provided DFO with additional information about the water level noted by the Lake Lagopede water level station on September 23, 2018 (483.24 m). On that date, the spawning ground surface area was calculated at between 0.5 and 5 m deep.

#### 3.10.2.2 2021 Monitoring

As noted in Authorization No. 2014-002 (DFO, 2014), as well as in the ESMP, the 2021 monitoring corresponds to Year 5 of monitoring the integrity and use of the developed areas and the physical-chemical surface water quality parameters at the lake trout spawning ground. This fourth follow-up will be the subject of a report submitted to DFO in March 2022.

##### *3.10.2.2.1 Sampling*

The water was sampled near the bottom at three stations close to the developed spawning ground before and after spawning (September 6 and November 1, 2021), and during the winter after spawning (January 12, 2022). The three sampling stations were the same as the ones used for baseline (Norda Stelo, 2016b): AQR68-1, AQR68-2 and AQR68-3 (Map 3.9).

The surface water quality data were compared:

- To provincial criteria and the ministry's Canadian recommendations for surface water quality (MELCC, 2017; CCME, 2013); and
- To the baseline results of the spawning ground and the Lake Lagopede surface water quality monitoring results.

##### *3.10.2.2.2 Water quality in the spawning ground 2021*

In general, in 2021, the results of the water quality monitoring in the lake trout spawning ground in Lake Lagopede were similar to the ones obtained during the baseline performed on the spawning ground in 2015–2016. The results were also comparable to the ones obtained during the first three follow-ups (2017, 2018 and 2019).

Most of the parameters meet provincial and federal surface water quality criteria. As was the case during baseline, the BES documented aluminum content that was naturally higher than some aquatic life protection criteria in Lake Lagopede and lakes and streams in the region (Roche, 2011b). Indeed, during water sampling campaigns in the spawning ground for the 2021 monitoring, the aluminum concentrations were higher than the various MELCC and CCME criteria.

The values of the physical-chemical characteristics of the water quality were within the variability range of the lake trout's preferred habitat. As a result, the surface water quality observed in the spawning ground for the 2021 monitoring does not hinder lake trout reproduction activities (spawning, incubating, hatching and raising).

#### *3.10.2.2.3 Development integrity*

Visual inspections of the developments were performed on February 26, July 27 and November 1, 2021. These visits made it possible to monitor changes in the water level at the spawning ground (February 26 and July 27), along with the quality of the spawning substrate. In winter (February 26), a layer of ice on Lake Lagopede, approximately 50 cm thick, covered the spawning ground (Photo 3.31). In the summer low-flow period (July 27), the water covered the spawning ground at a height of 5.5 cm.

**Photo 3.31 Inspection of water level over spawning ground (February 26, 2021)**

During the fall flood (November 1), the lake trout spawning ground was fully submerged, with the exception of a few larger stones that were partly out of the water (Photo 3.32). During the visual inspection of the spawning ground on November 1, 2021, no changes to the integrity of the developed spawning ground were observed.

**Photo 3.32 Observation of the spawning ground substrate (November 1, 2021)**

The spawning ground is still made up of coarse, randomly piled rocks and the spaces between them are not filled with fine residue (Photo 3.33). The spawning ground is made up of numerous crevices into which eggs can be deposited, incubated and protected from predators. Based on these criteria, the spawning ground is still a suitable environment for lake trout (Marsden et al., 1995).

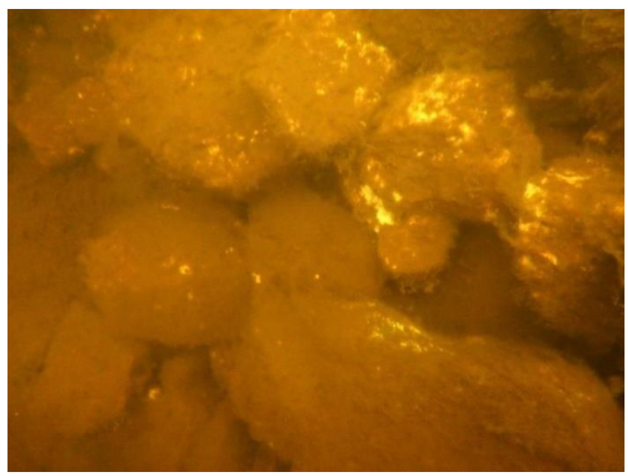
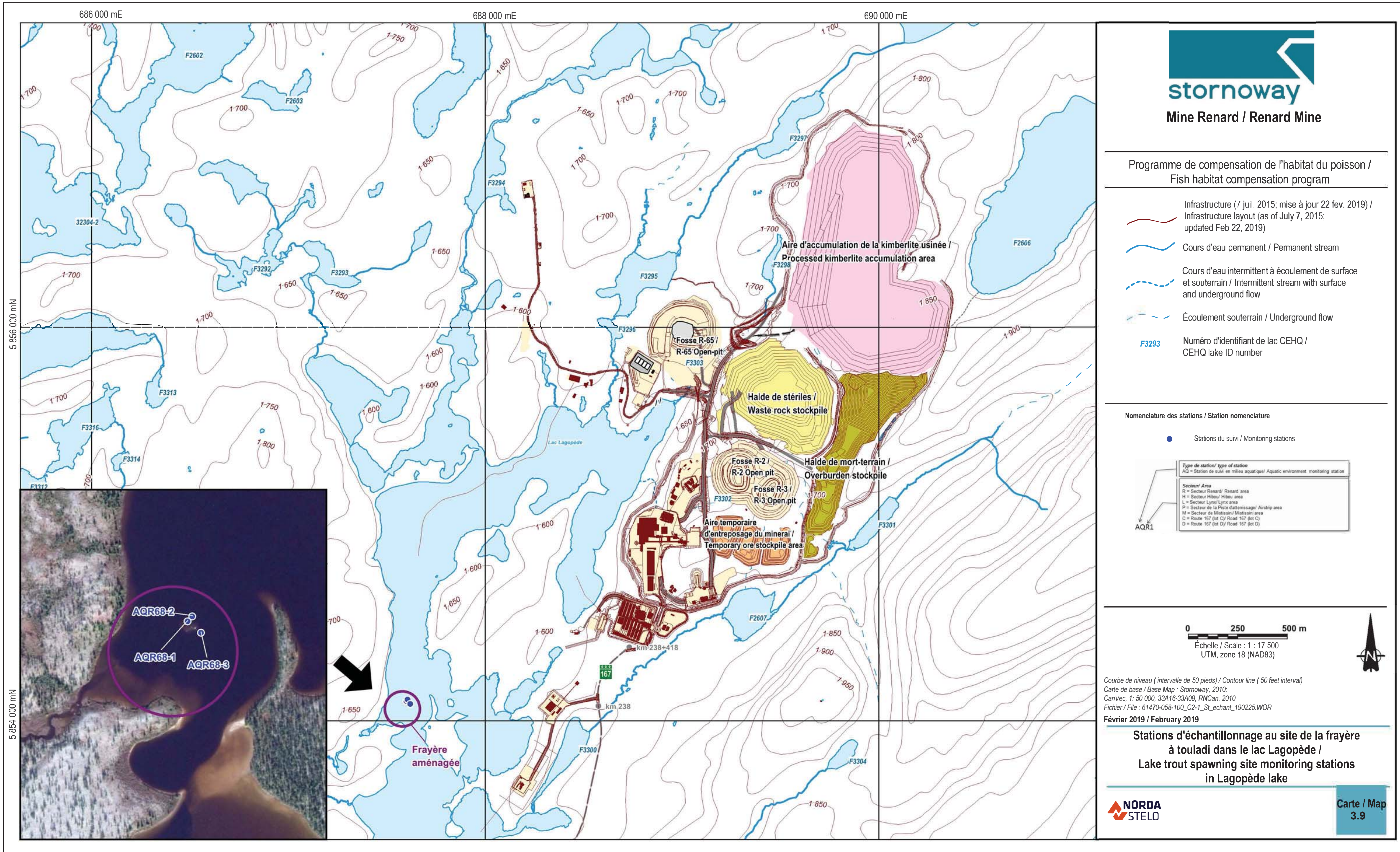


**Photo 3.33 Spawning ground surface (November 1, 2021)**

#### *3.10.2.2.4 Use of the spawning ground*

To monitor the use of the spawning ground, the methodology used in the 2019 monitoring was used again: water temperature and wind speed monitoring, along with angling campaigns.



686 000 mE
688 000 mE
690 000 mE
5 856 000 mN
5 854 000 mN
stornoway
Mine Renard / Renard Mine
Programme de compensation de l'habitat du poisson /
Fish habitat compensation program
Infrastructure (7 juil. 2015; mise à jour 22 fev. 2019) /
Infrastructure layout (as of July 7, 2015;
updated Feb 22, 2019)
Cours d'eau permanent / Permanent stream
Cours d'eau intermittent à écoulement de surface et souterrain / Intermittent stream with surface and underground flow
Écoulement souterrain / Underground flow
F3293
Numéro d'identifiant de lac CEHQ / CEHQ lake ID number
Nomenclature des stations / Station nomenclature
Stations du suivi / Monitoring stations
Type de station/ type of station
AQ = Station de suivi en milieu aquatique/ Aquatic environment monitoring station
Secteur/ Area
R = Secteur Renard/ Renard area
H = Secteur Hibou/ Hibou area
L = Secteur Lynx/ Lynx area
P = Secteur de la Piste d'atterrissage/ Airstrip area
M = Secteur de Mistissini/ Mistissini area
C = Route 167 (lot C)/ Road 167 (lot C)
D = Route 167 (lot D)/ Road 167 (lot D)
AQR1
0
250
500 m
Échelle / Scale : 1 : 17 500
UTM, zone 18 (NAD83)
N
Courbe de niveau ( intervalle de 50 pieds) / Contour line ( 50 feet interval)
Carte de base / Base Map : Stornoway, 2010;
CanVec, 1: 50 000, 33A16-33A09, RNCan, 2010
Fichier / File : 61470-058-100_C2-1_St_echant_190225.WOR
Février 2019 / February 2019
Stations d'échantillonnage au site de la frayère à touladi dans le lac Lagopède /
Lake trout spawning site monitoring stations in Lagopède lake
NORDA STELO
Carte / Map
3.9
Aire d'accumulation de la kimberlite usinée /
Processed kimberlite accumulation area
Fosse R-65 /
R-65 Open-pit
Halde de stériles /
Waste rock stockpile
Fosse R-2 /
R-2 Open pit
Fosse R-3 /
R-3 Open pit
Halde de mort-terrain /
Overburden stockpile
Aire temporaire d'entreposage du minerai /
Temporary ore stockpile area
Lac Lagopède
km 238+418
167
km 238
Frayère aménagée
AQR68-2
AQR68-1
AQR68-3
F2602
F2603
32304-2
F3292
F3293
F3294
F3295
F3296
F3297
F3298
F3303
F3302
F3301
F2606
F2607
F3300
F3304
F3313
F3316
F3314
F3312

Water temperature and wind speed were checked regularly as soon as the fishing campaigns opened on September 11, 2021, in order to detect when lake trout spawning was likely to begin.

Angling is the best way to catch individuals around the spawning ground to optimize the observation of signs of spawning. SWY filed an application for a SEG permit so that more specimens could be caught in 2021 and over a longer sampling period.

The 2021 fishing results are presented in Table 3.20.

A total of 31 lake trout were caught near the spawning ground between September 11 and October 30, 2021. The total median length of the caught lake trout was 55.5 cm and their median weight was 1,280 g, which is lower than the 2010 baseline results and higher than the results of the lake trout spawning ground impact study (2011) and monitoring (2019) (Figure 3.16).

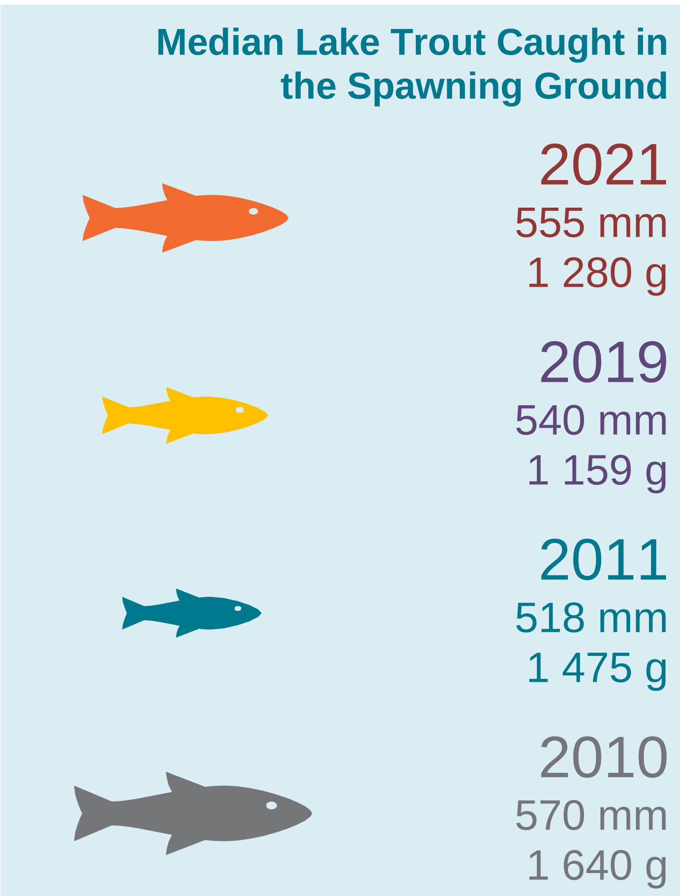



**Figure 3.16 Changes in the physical parameters of lake trout in Lake Lagopede since 2010**

Five males and one females were sexed through observation of milt and eggs. Signs of spawning in the males were observed starting on October 6, 2021 (Photo 3.34) and October 10, 2021 for the females (Photo 3.35).

**Photo 3.34 Observation of milt on a male lake trout (October 7, 2021)**

**Photo 3.35 Observation of eggs on a female lake trout (October 10, 2021)**

#### *3.10.2.2.5 Conclusion*

The 2021 monitoring of the lake trout spawning ground in Lake Lagopede documents, for the fifth year in a row, that the physical integrity of the spawning ground and its use by the species are maintained. It also integrates the fifth monitoring of the surface water quality at the spawning ground.

Table 3.23 Fishing efforts and species caught during the lake trout spawning ground monitoring in fall 2021

| Fishing date | Specimen number | Total length (cm) | Fork length (cm) | Weight (g) | Fulton's K factor | Sex | Maturity |
|---|---|---|---|---|---|---|---|
| 2021-09-11 | 1 | 50 | 49 | 1 080 | 0.86 | Indeterminate | Indeterminate |
| 2021-09-11 | 2 | 62 | 60 | 2 240 | 0.94 | Indeterminate | Indeterminate |
| 2021-09-14 | 3 | 49 | 48 | 1000 | 0.86 | Indeterminate | Indeterminate |
| 2021-10-01 | 4 | 55 | 53 | 1 200 | 0.72 | Indeterminate | Indeterminate |
| 2021-10-01 | 5 | 32 | 31 | 510 | 1.56 | Indeterminate | Indeterminate |
| 2021-10-01 | 6 | 47 | 45 | 980 | 0.94 | Indeterminate | Indeterminate |
| 2021-10-06 | 7 | 58 | 56 | 1 609 | 0.82 | Indeterminate | Indeterminate |
| 2021-10-06 | 8 | 54 | 53 | 1 045 | 0.66 | M | Mature |
| 2021-10-06 | 9 | 57 | 55 | 1 320 | 0.71 | Indeterminate | Indeterminate |
| 2021-10-06 | 10 | 48 | 46 | 810 | 0.73 | M | Mature |
| 2021-10-06 | 11 | 61 | 59 | 2 420 | 1.07 | Indeterminate | Indeterminate |
| 2021-10-07 | 12 | 53 | 50 | 980 | 0.68 | Indeterminate | Indeterminate |
| 2021-10-07 | 13 | 64 | 63 | 2 600 | 0.99 | Indeterminate | Indeterminate |
| 2021-10-07 | 14 | 54 | 52 | 1 100 | 0.70 | M | Mature |
| 2021-10-07 | 15 | 38 | 37 | 700 | 1.28 | Indeterminate | Indeterminate |
| 2021-10-07 | 16 | 48 | 46 | 900 | 0.81 | M | Mature |
| 2021-10-07 | 17 | 56 | 54 | 1 200 | 0.70 | Indeterminate | Indeterminate |
| 2021-10-08 | 18 | 58 | 56 | 1 710 | 0.88 | Indeterminate | Indeterminate |
| 2021-10-08 | 19 | 50 | 49 | 890 | 0.71 | M | Mature |
| 2021-10-08 | 20 | 62 | 60 | 2 520 | 1.06 | Indeterminate | Indeterminate |
| 2021-10-09 | 21 | 46 | 45 | 825 | 0.85 | Indeterminate | Indeterminate |
| 2021-10-09 | 22 | 62 | 60 | 2 500 | 1.05 | Indeterminate | Indeterminate |
| 2021-10-09 | 23 | 58 | 56 | 1 810 | 0.93 | Indeterminate | Indeterminate |
| 2021-10-10 | 24 | 49 | 48 | 1 280 | 1.09 | F | Mature |
| 2021-10-10 | 25 | 52 | 51 | 1 300 | 0.92 | Indeterminate | Indeterminate |
| 2021-10-10 | 26 | 60 | 60 | 2 100 | 0.97 | Indeterminate | Indeterminate |
| 2021-10-10 | 27 | 57 | 56 | 1 430 | 0.77 | Indeterminate | Indeterminate |
| 2021-10-10 | 28 | 59 | 58 | 1 750 | 0.85 | Indeterminate | Indeterminate |
| 2021-10-26 | 29 | n/a | n/a | n/a | n/a | Indeterminate | Indeterminate |
| 2021-10-28 | 30 | 57 | 56 | 1 210 | 0.65 | Indeterminate | Indeterminate |
| 2021-10-28 | 31 | 62 | 61 | 1 700 | 0.71 | Indeterminate | Indeterminate |
| **Average** | **n/a** | **54** | **52** | **1 424** | **0.88** | **n/a** | **n/a** |

n/a: not applicable

Monitoring the integrity of the lake trout spawning ground did not detect any irregularities in the developments done in 2016. The habitat is still suitable for the lake trout to deposit their gametes and for the protection of the eggs from freezing and predators over most of its surface. In the winter, a part of the spawning ground is caught in ice.

With regard to the use of the lake trout spawning ground, angling campaigns that took place in fall 2021 caught several mature gravid or milting individuals around the spawning ground.

These observations indicate that the lake trout spawning ground developed in Lake Lagopede is still a site that is actively used by the species for spawning. SWY will await potential recommendations from DFO following the submission of the 2021 monitoring report, particularly for water level measurements around the spawning ground.

**2023 Monitoring**

The next water quality, development integrity and spawning ground use monitoring is scheduled for 2023. The monitoring will be conducted through a visual inspection of the spawning ground in fall 2023 in order to monitor changes in the quality of the spawning ground substrate.

### 3.10.3 Development of Walleye Spawning Ground near Mistissini

**Third FHCP Intervention**

**Development of a 600 m$^2$ Walleye Spawning Ground in Lake Mistassini**

#### 3.10.3.1 Historical background

The detailed design, construction and monitoring of the development are detailed in the section
3.10.3 of the annual environmental monitoring reports from 2019 (Stornoway, 2020) and 2020 (Stornoway, 2021b).

The 636 m$^2$ area consists of natural round stones as a spawning substrate and rocks laid out on the spawning ground to provide fish with shelter.

#### 3.10.3.2 2020 monitoring

A visual inspection of the integrity of the walleye spawning ground was conducted in August and September 2020. At that time, access to the spawning ground site was still not authorized by the municipality of Mistissini. A report was submitted to DFO on January 17, 2021.

As a reminder, although its physical integrity remains, it turns out that the walleye spawning ground occasionally dries up for a few weeks per year due to an erroneous estimate of the water level of the lake during the construction of the development (Norda Stelo, 2020a). Remedial work recommended by Norda Stelo in 2020 aims to lower the level of the spawning ground so that it would remain submerged throughout the year.

#### 3.10.3.3 2021 monitoring

In 2021, access to the community of Mistissini was limited due to the pandemic (COVID-19). In addition, at the end of 2021, DFO's analysis and recommendations regarding the 2020 monitoring report and corrective work on the walleye spawning ground were not yet available. As such, it could not be performed in 2021 and was postponed until 2022.

Only the monitoring of the Mistissini walleye spawning ground integrity and use could be done from May 18–26, 2021.

In an email dated February 3, 2022, DFO mentioned that *"it would seem that the monitoring performed in 2021 was performed outside of that temperature window. (...)"* The temperature taken on May 26, 2021 was 13.3 °C. However, over the walleye distribution area, the spawning of the species can occur between 2.2 and 15.6 °C (Priegel, 1970 and Hokanson, 1977; in Raabe, 2006), even though it usually occurs between 6 and 11 °C (Scott & Crossman, 1973). This indicates that the monitoring may have taken place during the walleye spawning period, even though no signs of spawning and no walleye were observed.

##### *3.10.3.3.1 Development Integrity*

The visual inspection and monitoring of the spawning ground integrity were performed on May 18 and 19, 2021. At the spawning site, several physical-chemical parameters and certain characteristics of the spawning ground were measured on May 26, 2021.

During the visit, the spawning ground was partially above water (Photo 3.36). The parts above water created an internal pool in the spawning ground where the lake current could not move about freely.

**Photo 3.36 Observation of the spawning ground conditions (May 18, 2021)**

The 2021 monitoring showed that the integrity of the spawning ground is not suitable for the conditions sought by walleye for their reproduction. Therefore, the conclusions of the 2021 monitoring are identical to those of the 2020 monitoring, and the conclusions of the July 20, 2020 technical note remain valid.

#### *3.10.3.3.2 Use of the spawning ground*

SWY applied for a SEG permit for scientific purposes in order to conduct angling sessions (direct observation of signs of spawning by reproducers) and set egg traps (direct observation of eggs in the spawning ground). This methodology aims to confirm whether the walleye are using the spawning ground. The angling took place on May 18 and 19, 2021, while the egg traps were set on May 19 and hauled up on May 26, 2021. During these activities, no walleye were caught and no eggs were gathered. Therefore, the 2021 monitoring indicates that the walleye spawning ground as developed is not yet being used by the species for its reproductive activities.

### 3.10.3.4 Analysis of monitoring and DFO recommendations

SWY also received recommendations from DFO by email on February 3, 2022. DFO concluded that *"the visual inspections in 2020 and the monitoring performed in 2021 have demonstrated that the developments do not provide suitable reproductive habitats and shelter for walleye."*

The minister also understands that *"corrective work will be done in summer 2022, outside of the restriction period for walleye, in order to lower the level of the spawning ground and thus ensure a minimum water depth of 0.5 m throughout the spawning ground."*

### 3.10.3.5 2022 monitoring – corrective Work

In 2022, SWY plans to perform the corrective work described in the July 2020 technical note from an external consultant. As recommended by DFO, *"it will entail:*

- *performing the said work during a low-flow period;*
- *reprofiling the developed substrate using an excavator by removing and/or moving the stones to the northern and southern boundaries of the spawning ground rather than in the centre of the channel so as not to further prevent navigation;*
- *lowering the level of the spawning ground and ensuring a minimum water depth of 0.5 m throughout during the critical period for walleye (spawning and egg incubation);*
- *removing residual stones from the area where the temporary jetty had been installed;*
- *revegetating the newly disturbed shoreline while ensuring its stability using rocks or posts."*

DFO pointed out that *"during the corrective work, it will be important to avoid compacting the substrate of the spawning ground and reducing the thickness of the spawning ground substrate to less than the required minimum of around 50 cm thickness (FFQ, 1996). For most of its surface area, the elevation of the spawning ground should be below the lake's water level range."*

### 3.10.3.6 2023 monitoring

The report on the corrective work is expected in early winter 2023. DFO asks that *"following this corrective work, three follow-ups"* should be performed *"in 2023, i.e. one visit during the winter low-flow period (winter 2023), one during the summer low-flow period (summer 2023), as well as one in spring 2023 to monitor the use and integrity of the developments."*

During the next spring monitoring in 2023, SWY will monitor the integrity of the developments and the use of the spawning ground by walleye.

For this, DFO recommends that SWY perform *"temperature measurements in the observation area to determine the start of the period conducive to* *observing reproducers, i.e. as soon as the water temperature reaches 5.6 °C, as walleye are known to spawn in the spring when water temperature varies between 5.6 and 11 °C (Scott and Crossman, 1974; Fondation de la faune du Québec, 1996).”*

In its recommendations dated February 3, 2022, DFO also confirmed that egg traps should be placed during the spawning period, as long as they *“are removed regularly; just one removal one week after they are placed seems insufficient because the eggs that may be in the egg traps will be vulnerable to predation and unfertilized eggs degrade quickly.”*

Angling sessions will also make it possible to confirm direct observations of potential signs of spawning on collected individual reproducers.

#### 3.10.3.7 Access to the mistissini area

It is important to point out that performing the corrective work and the upcoming monitoring, including fishing, is still conditional upon the city of Mistissini authorizing SWY to access the site.

Thus, it is possible that potential travel restrictions to the region may come into effect in Quebec once again for health reasons (COVID-19) and make it impossible to access Mistissini. SWY will be sure to communicate regularly with the Environment Committee and the authorities in this regard.

### 3.10.4 Development of Brook Trout Habitat in a Lake Mistassini Tributary

**Fourth FHCP Intervention**

**Development of brook trout habitat in an unnamed tributary of Lake Mistassini (Mistissini area):**

**Facilitate the free upstream movement of fish.**
**Restore over 2 000 m$^2$ of habitat to the fish.**
**Take advantage of the pond downstream from the existing culverts.**

#### 3.10.4.1 Construction

The development approved by DFO in June 2018 and built in August 2019 involved rebuilding a stream crossing on a forest road south of Lake Mistassini (Stornoway, 2021c). An area of 43 m$^2$ of spawning substrate favourable to brook trout was also created, while preserving excellent nursery and feeding habitats near the spawning grounds (Map 3.10). A report detailing the work done was submitted to DFO on April 22, 2020 (Tetra Tech, 2020c).

#### 3.10.4.2 Schedule

The effectiveness of the compensation measures for brook trout must be monitored in accordance with condition 4.1 of authorization No. 2014-002 (DFO, 2014). The monitoring is required four times over a 10-year period after the work in August 2019, in years 1, 3, 5 and 10.

#### 3.10.4.3 2020 monitoring

As planned, SWY conducted the first monitoring of the development in order to confirm free movement of fish and the integrity and use of the site by brook trout. The monitoring was conducted on September 25, 2020, in early fall and during a low precipitation period, using electrofishing and visual observations.

The hydrological conditions of the Lake Mistassini tributary were comparable to those observed during summer low water conditions, and lower than the hydrological conditions observed in 2019 during the work. The water level seen in the tributary in 2020 remained more or less the same as in 2019, with, however, a lower flow that reflected the low precipitation period during which the 2020 monitoring took place.

##### *3.10.4.3.1 Free movement of fish*

The free movement of fish was confirmed in 2020. The visual observations noted that no obstacles or rock displacements blocked the free movement of fish in the spawning areas or in the new culverts.

##### *3.10.4.3.2 Development integrity*

As expected in the first year, gravel deposited evenly on the streambed in some of the spawning areas developed in 2019 has shifted partially downstream and to the edge of the banks under the natural action of recent floods. This is due to the large variations in flow velocity between the flow channel and the stream banks.

The relocation of gravel has resulted in a decrease of 3 $m^2$ of the total area developed in 2019 (43 $m^2$, now 40 $m^2$). The distribution of the substrate in this tributary of Lake Mistassini would therefore be susceptible to natural changes in substrate scavenging due to flow conditions.

#### *3.10.4.3.3 Use of the spawning ground*

Non-lethal electrical fishing was carried out to catch and measure the individuals frequenting the spawning grounds and riffles of the tributary. During the visit on September 25, 2020, one brook trout specimen was caught, indicating that the habitat is still accessible and used by the species.

A monitoring report was submitted to DFO on March 14, 2021 (Stornoway, 2021c). SWY made the following recommendations for validation with the ministry:

- Monitoring during the brook trout spawning period from the end of August to the third week of September in order to improve the probability of catching specimens;
- Measure the flow of the tributary of Lake Mistassini in order to follow its evolution during the next monitoring;
- Reassess the physical characteristics (substrate, water depth, gravel thickness, etc.) of the developed sites;
- Validate the stability, accessibility and condition of the developed sites, which will make it possible to identify any corrective measures that may be required;
- Increase the fishing effort over a few days rather than a single day in order to confirm the use of the developments by the spawners; and
- Validate the potential of the developed sites for brook trout spawning.

At present, the analysis of this report and potential DFO recommendations are unavailable.

### 3.10.4.4 2021 monitoring

A simple visual monitoring of the developed stream was performed on May 19, 2021, during the spring flood. The hydrological conditions of the Lake Mistassini tributary were comparable to those observed in 2019 during the work.

#### *3.10.4.4.1 Development integrity*

The overall condition of the developments observed during the visit was comparable to the 2020 monitoring, although some gravel seems to have moved. All three constructed weirs remained stable, strong, and watertight in the first year after construction (photo 3.37).

**Photo 3.37 Spawning ground upstream from the culverts**

#### *3.10.4.4.2 Free movement of the fish*

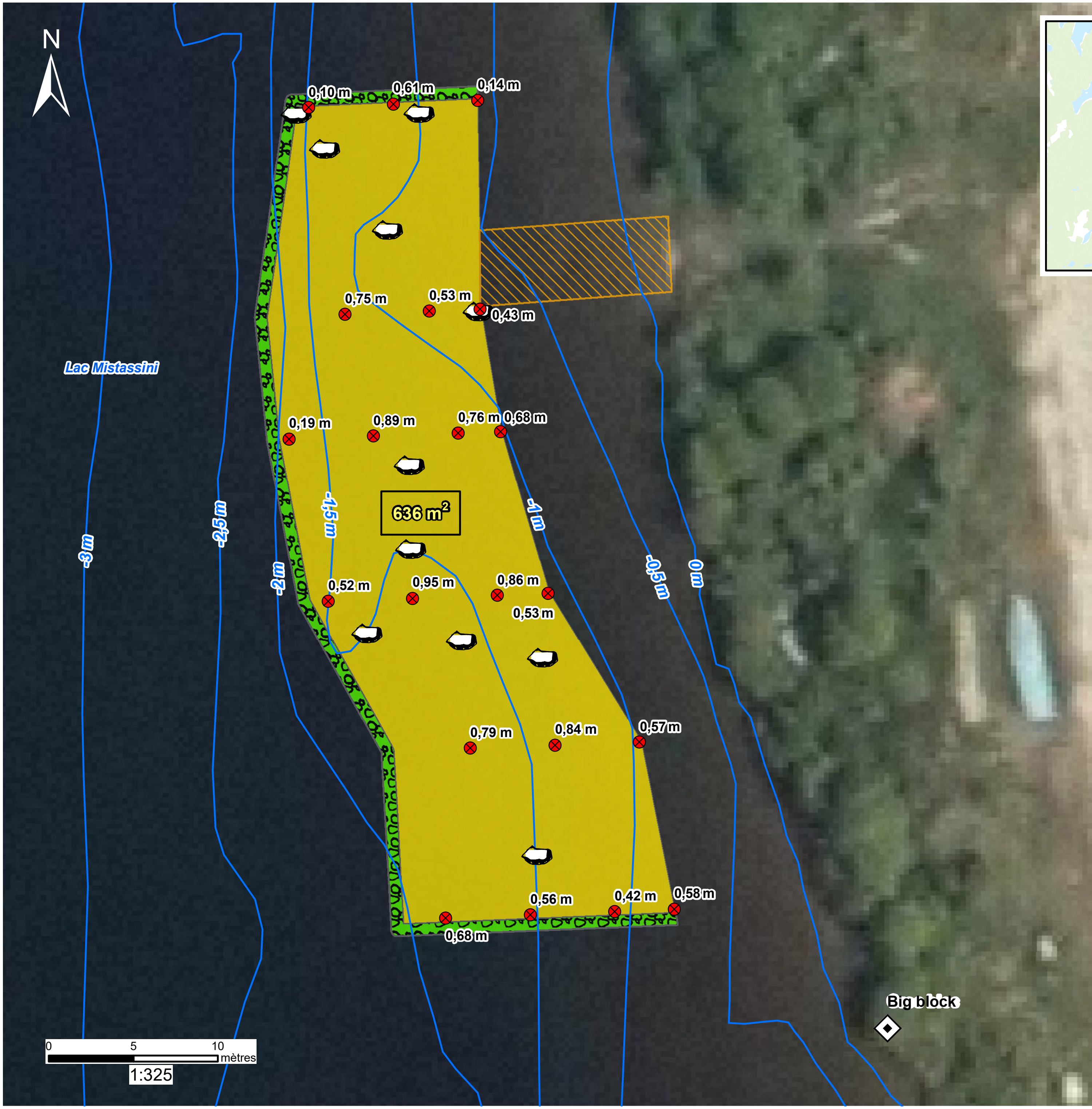
In 2021, no obstacles or rock displacements blocked the free movement of fish in the spawning ground or in the new culverts.

### 3.10.4.5 2022 monitoring

The second monitoring (Year 3) of the spawning ground is scheduled for 2022 and will confirm the integrity and use of the spawning ground by brook trout. In so doing, the ministry will verify the conclusions of the 2020 monitoring report, i.e.:

- Monitor during the brook trout spawning period (late August to late September);
- Measure the flow of the Lake Mistassini tributary;
- Reassess the physical characteristics of the developed sites;
- Check the stability, accessibility and condition of the developed sites;
- Increase the fishing effort to last a few days;
- Validate the potential of the developed sites for brook trout spawning.

SWY will await DFO's analysis before conducting the 2022 monitoring and will take into account any recommendations made by the ministry for the next stage of the monitoring.




stornoway

## Legend

**Layout**

- Spawning substrat (80-250 mm)
- Protection stones (500-1000 mm)
- Remains of the jetty
- Shelter stone (500-1000 mm)

**Autres**

- Station de mesure de l'épaisseur du substrat de fraie
- Big block

**Bathymetry before work (2016)**

- Isobath (interval 0,5 m)

Report TQC - Walleye spawning ground

**Development of a walleye spawning ground in Lake Mistassini**

déc. 2019

Système de coordonnées: NAD 1983 MTM 8

Bathymétrie: Adapté de Norda Stello, 2016
Image satellitaire: Service d'imagerie du gouvernement du Québec, 2010-2013.

TETRA TECH

**Carte 3.10**

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### 3.10.5 Baseline for the Diversion Channel on the Former Icon-Sullivan Mine Site (Waconichi River)

**Fifth FHCP Intervention**

**Located near an old mine site (copper mine) operated in the ’60s and ’70s.**
**The mine site may still have an influence on the water quality and sediments in the diversion channel.**

As required by DFO (DFO, 2014), the initial physical-chemical characterization of the spawning grounds to be developed was completed before the development work began.

This requirement was completed in two phases: an initial characterization in 2012 and an additional characterization in 2016. In general, the 2016 surface water and sediment quality results are comparable with the 2012 data and comply with Canadian and provincial criteria for the protection of aquatic life.

The presence of existing spawning grounds as well as surface water and sediment quality data indicate that the physical-chemical properties at the site to be developed as fish habitat will not pose any problem for walleye growth and reproduction.

According to the last available update, some discussions are still underway concerning the feasibility of this project as well as the stability, and therefore physical safety, of the former mine site (SNC Lavalin, January 2017). As such, this development was still not achieved in 2021, and SWY has not received any recommendations from DFO or notices from any other ministry.

## 3.11 Segments C and D on Route 167 Extension (Mine Access Road)

As part of the extension and construction of Route 167 North, SWY committed to applying compensation measures along the stretch of road under its responsibility, i.e., six sites beyond km 553 for a total of 1,011.9 m$^2$ of fish habitat as compensation. This work was completed in summer 2014.

### 3.11.1 Monitoring Free Movement of Fish at Stream Crossings

All stream crossings along Route 167 where free movement of fish is required were monitored in September 2014 (Norda Stelo, 2015). The 2014 monitoring results confirmed the free movement of fish at all the crossings.

All related monitoring was completed in summer 2017. The fish habitat development work undertaken does not in any way hinder the free movement of fish, and the presence of various fish species was reported in the relevant streams (SWY, 2018b).

### 3.11.2 Monitoring of Fish Habitat Compensation Measures

In compliance with authorization No. 2013-011 issued on April 12, 2013 by DFO (DFO, 2013), this monitoring was undertaken to measure the effectiveness of the fish habitat compensation project and to ensure that areas developed remained stable and recreated fish feeding, rearing and spawning habitats in addition to ensuring the free movement of fish.

The developed fish habitats were monitored first in September 2015, and then for the second and last time in September 2017. The last monitoring confirmed that the fish habitats created along the mine access road connecting Route 167 North and the Renard Mine had remained stable in recent years. The rebuilt sections of the streams still allow for the free movement of fish upstream and downstream (Stornoway, 2018b).

### 3.11.3 End of Monitoring

In May 2018, DFO issued a notice to the effect that the fish habitat development work and the monitoring of the free movement of fish through certain culverts on Route 167 North met the objectives set out in DFO’s Fisheries Protection Program in accordance with authorization 2013-011 issued on April 12, 2013.

The DFO letter is attached in Appendix IV. As stated, "DFO thereby considers the project to be complete," which brings to an end to the monitoring of the developments along Route 167 North. Therefore, no further monitoring is required.

## 3.12 Terrestrial Wildlife and Birds

Terrestrial wildlife and birds are monitored to achieve the following specific objectives:

- Determine how the moose population is affected by the presence and operation of the mine and the airstrip;
- Document the presence of woodland caribou in the mine and airstrip study area and along Route 167;
- Document the presence of nests of migratory and at-risk bird species in the work areas and ensure they are protected;
- Assess the effectiveness of mitigation measures in minimizing the number of road accidents involving big game;
- Monitor waterfowl nest boxes installed around Lake Lagopede and neighbouring small lakes to maintain the number of breeding pairs in the mine area;
- Make employees and contractors aware of the impacts of poaching and disturbing wildlife; and
- Assess the effectiveness of mitigation measures in preventing animal intrusion on the mine site as well as all forms of poaching.

### 3.12.1 Large Wildlife Monitoring

To measure changes observed in the large wildlife population distribution since the construction phase, the opening of the mine access road and the beginning of mine operations, aerial surveys of big game specific to the mine site and mine access road were conducted in March 2010, 2015, 2017 and 2019.

These aerial surveys focused on large wildlife (moose, caribou, grey wolf and black bears). This is one of the rare large wildlife surveys performed at this scale and over such a long period of time (Norda Stelo, 2019d). The inventories cover different study areas presented in the last large wildlife monitoring report (Norda Stelo, 2019d) and SWY's annual environmental monitoring report (Stornoway, 2020).

#### 3.12.1.1 Schedule

As scheduled as part of the ESMP, the fourth monitoring phase was undertaken in March 2021. The results of the 2021 monitoring and various inventories conducted since 2011 are presented in the large wildlife monitoring report, published in October 2021 (Norda Stelo, 2021b).

#### 3.12.1.2 Moose and caribou

##### *3.12.1.2.1 Moose*

In 2021, two female moose were observed in the control zone north of the mine. These observations support the trend observed since 2017 indicating a reduction of the population within the monitoring zone.

It is important to note that moose are present in lower densities in the James Bay area than in southern Quebec due to the lower productivity of the natural habitat (CRRNTBJ, 2010 and Maltais et al., 1993). These results are consistent with the BES and the first monitoring in 2015, when no moose were observed (Roche, 2011b; Norda Stelo, 2015b).

The theories raised to explain the lack of moose in the survey zone include movement to avoid areas ravaged by the recent forest fires of 2018, hunting by users of the area, poaching and illness. However, only the first theory was corroborated by tallymen consulted for the large wildlife monitoring in March 2021. They confirmed the presence of moose northwest of the mine, outside of the large wildlife monitoring area.

##### *3.12.1.2.2 Migratory caribou*

Like in the 2011, 2015, 2017 and 2019 monitoring, no caribou were observed in the mine survey areas, the airstrip or the control zone in 2021.

In Quebec, the size of the migratory caribou herd in the Renard Mine study area, the Leaf River herd, decreased from around 600 000 individuals in 2002 to 187 000 in 2019. In order to protect the species, the MFFP announced the closure of sport hunting of migratory caribou for an indeterminate period starting on February 1, 2018.

Despite a declining population, groups of caribou were observed near Route 167 North in 2019 and 2020. In addition, telemetric data confirm the presence of a group of caribou near the road in 2021. Given these observations, the telemetric data and the results of interviews with users of the area, the increased use of the territory by woodland caribou can be confirmed.

#### 3.12.1.3 Temiscamie woodland caribou herd

The presence of four woodland caribou herds was confirmed in the Northern Quebec region by the MFFP in the 2000s, specifically the Temiscamie herd, whose range crosses the Renard Mine study area and the mine access road (Route 167 North).

In January 2018, SWY signed a partnership agreement with the MFFP to share telemetric data on the location of caribou within a 100-km radius of the Renard Mine site.

This information, in conjunction with the sightings from aerial surveys, were again used to confirm the presence of woodland caribou in the large wildlife survey area, more specifically the mine access road study area (Norda Stelo, 2019d).

Data from radio collars confirms the presence of woodland caribou in the general Renard Mine study zone. In addition, increased visitation is noted within a 30-km radius to the west of the mine. For the first time since the start of this monitoring, some caribou were recorded near the large wildlife monitoring study zone. This monitoring confirmed that the caribou range is gradually shifting northward.

##### *3.12.1.3.1 Revegetation work at the renard mine*

As part of the large wildlife monitoring and the analysis of the annual environmental monitoring report, ECCC recommended that SWY compare the revegetation work undertaken to date with the biophysical characteristics of the critical habitat for woodland caribou.

Progressive revegetation of areas where there is no longer any mining activity and areas exposed to erosion officially began in 2016 and is ongoing. Between 2016 and 2020, the total area restored on the mine site was around 32 000 $m^2$, with an observed survival rate ranging from 82% to 100%.

The biophysical characteristics of the critical habitat for woodland caribou are grouped by the type of habitat used by the species in each season and according to their life cycle activities. Given the location of the Renard Mine, woodland caribou will favour habitats such as:

- Dense jack pine and black spruce forests including firs and larches;
- Open forests of conifers and feather moss in poorly drained areas and highlands with mature conifers and lichens;
- Forests of black spruce, jack pine and balsam fir with an abundance of lichens;
- Ponds and wetlands;
- Mountains or hilly ground at an altitude of 300 m;
- Former burned areas (over 40 years earlier).

Since woodland caribou prefer mature forest stands, it is much too early in the revegetation process for the restored sites to interest the species. However, the natural integrity of the current wetlands and water environments was maintained as much as possible by limiting their modification. In addition, their development is being monitored through two research projects led by UQAM and UQAT.

Native species used for planting (black spruce and jack pine), mostly in disused borrow pits, are a wise choice for the long-term recreation of habitats for birthing, rutting and overwintering for woodland caribou. One factor to keep in mind for future monitoring is seedling density, in order to create stands that are dense enough to be of interest to woodland caribou.

Lastly, the revegetation technique of natural regeneration ensures homogeneity with the natural environments of the landscape. Knowing that these habitats are increasingly being used by woodland caribou, this restoration method is promising in the long term.

#### 3.12.1.4 Wolf and fox

The grey wolf is a species that can travel long distances to track its prey. This predator is generally found in the same environments as the prey they eat. In the winter, these prey mainly include cervids such as caribou and, preferably, moose.

The 2017 and 2019 monitoring indicated an increase in the wolf population near the mine site, the airstrip, the TLS and Route 167, whereas there were few individuals in the control zone. However, in 2021, no traces of wolves were found.

The species' absence was corroborated by observations from tallymen documented during interviews. They believe that the wolves headed north to follow the caribou, or northeast to follow the moose.

Since 2016, at the TLS, two sentry cameras (hunting cameras) have been permanently installed to capture images of large wildlife visiting the trench landfill site (TLS). In 2021, only two sightings of grey wolves were noted at the TLS in October, using a motion-activated surveillance camera (Photo 3.38).

**Photo 3.38 Wolf photographed at the TLS (October 2021)**

The red fox is ubiquitous around the mining camp and infrastructure. Therefore, it is only rarely recorded in the wildlife sighting log. In 2021, only one sighting of a red fox was documented in the log in June (litter of five kits) (Photo 3.40).

#### 3.12.1.5 Black bear

In 2021, 61 black bear sightings were reported at or near the mine site. This includes observations reported by workers, security officers, road users and the TLS operator. For this purpose, SWY maintained the bear observation log at the TLS by site operators. Just one black bear was photographed at the TLS in spring 2021 (Photo 3.39).

**Photo 3.39 Bear photographed at the TLS (May 2021)**

We recall that black bear monitoring at the TLS makes it possible to respond to the June 3, 2019 request from MFFP and the Environment Committee's recommendations on monitoring the species at the TLS. Figure 3.17 presents changes in the number of bear sightings at the TLS in 2021. Stornoway gathered the comments from the Environment Committee (EC) regarding changes in how often black bears come to the TLS. In this regard, the Environment Committee mentioned that bear visits to the TLS seemed to decrease throughout the summer, due to the availability and maturity of berries in the forest during the summer. It would seem that black bears abandoned the food at the TLS in favour of fresh berries. The data gathered by the TLS operator indicated that starting in late July 2021, the number of bear sightings gradually decreased (Figure 3.17).

**Photo 3.40 Litter of fox kits (June 2021)**

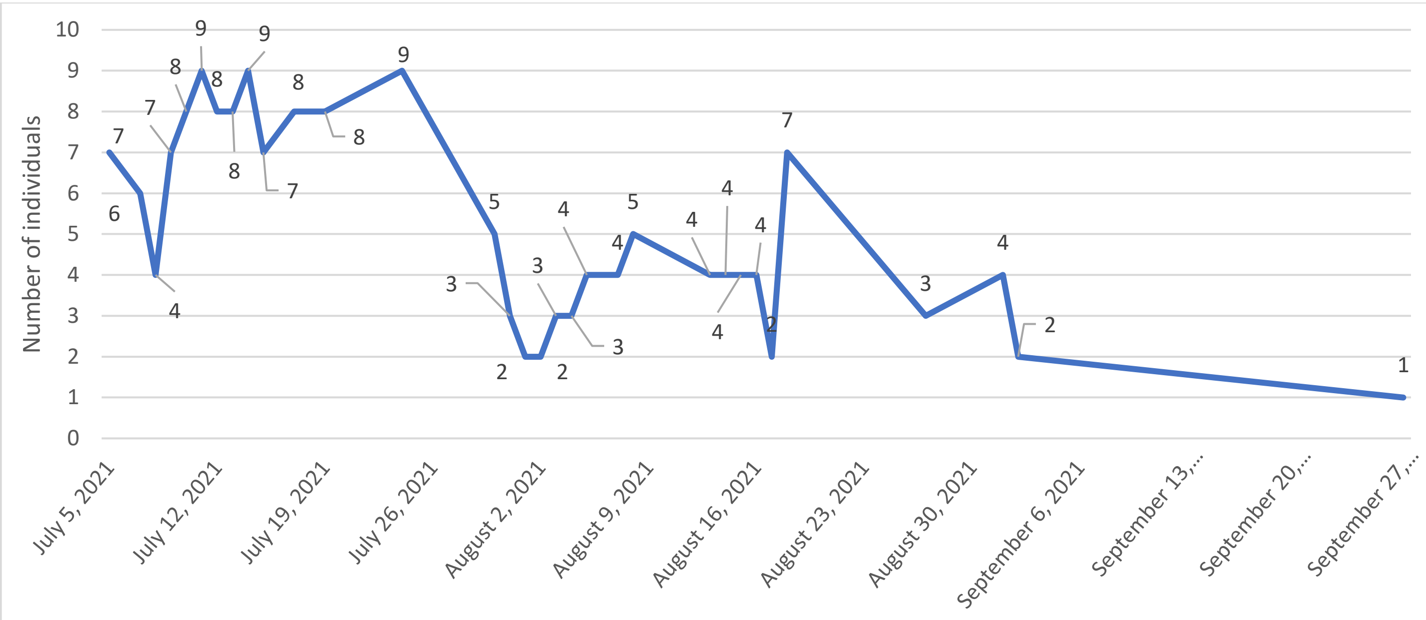



**Figure 3.17 Changes in the number of bear sightings in 2021**

**1.1.1.1 Other observations**

In 2021, a total of 71 sightings were recorded in Renard Mine's wildlife sighting log. Bears, moose, wolves and red foxes were observed, as in previous years. In addition to these species, several others were observed, including otters and beavers, as well as a few birds, such as the olive-sided flycatcher and the common tern.

A few other species observed at the site include hare, marten, stoat, willow ptarmigan, ruffed grouse, common loon and grey jay.

**3.12.1.6 Route 167 North**

To log wildlife sightings along Route 167 North, the gatehouse security guards systematically ask truck drivers whether they sighted any large wildlife along the roadway.

All observations are recorded in a log, which also includes any sightings of large wildlife reported by workers.

Bears and wolves are typically the most frequently sighted species along Route 167 North. In 2021, three bears were reported along the road, but no wolves were sighted.

In addition to these reports, the tracks of three moose were observed in the spring (Photo 3.41), and an otter was seen crossing the road.

**Photo 3.41 Moose tracks (original and highlighted, June 2021)**

***3.12.1.6.1 Incidents on Route 167 North***

Stornoway maintains tight control over all road users who travel as far as the Renard Mine by requiring drivers to apply in advance for authorization to use the road. Road users are informed of safety rules, including speed limits and the firearm prohibition. In addition to keeping road users safe, these measures have reduced road accidents involving large wildlife.

In 2021, 1 716 trucks travelled on Route 167 North and there were no accidents involving animals for that year. Since the opening of Route 167 North in 2014, only two incidents were documented in 2017. No poaching incidents were reported.

## 3.12.2 Black Bear Management

In 2021, SWY continued to deploy significant efforts regarding black bear management on the mine site. Several actions were put in place, such as:

- Applying the Renard Mine procedure in the event of a black bear encounter (HSS-3.6 – *Prevention and Interaction with Wild Animals*), which was put in place in 2014 and is revised annually;
- Monitoring and reinforcing site facilities (electric and buried TLS fencing, waste containers, bear repellents);
- Raising workers' awareness of the presence of black bears on the mine site.

### 3.12.2.1 Management plan

Fully aware that the Renard Mine site is located on black bear habitat, SWY continues to implement the recommendations in its black bear management plan produced in 2019 (Groupe BC2, 2019).

The management plan is designed to strengthen the measures that SWY has put in place since 2014 and hence improve surveillance of the species on the mine site and enhance the safety of Renard Mine workers. The management plan also incorporates recognized practices for managing black bear approach behaviours and visiting of the mine site in the short, medium and long term.

The report provides information on the life cycle and behaviours of black bears from biologists who specialize in the species as well as regional managers and biologists from the Ministère des Forêts, de la Faune et des Parcs (MFFP) and the Wildlife Protection Branch.

This sustainable management tool still generates interest, and its components were again used in 2021, along with Procedure HSS-3.6.

### 3.12.2.2 HSS-3.6 procedure

In 2014, SWY put in place the HHS-3.6 procedure, entitled *Prevention and Interaction with Wild Animals* (Appendix V), covering the prevention, safety and intervention measures to apply in encounters with black bears.

In this procedure, Appendix A provides guidelines for managing encounters with wild animals, specifically black bears, near Renard Mine sites. Incidentally, Appendix A of the procedure was updated during a meeting with the Environment Committee on November 4, 2021 to clarify the list of people from the Swallow family to be contacted when a bear is on the mine site (Appendix V).

In 2021, the few black bears observed within the Renard Mine territory were all scared off and directed off site using the HSS-3.6 procedure.
3.6. Security had to conduct several successive scares for two bears by rigorously following the HSS-3.6 procedure. Thanks to the rigorous application of these measures, no bears were slaughtered in summer 2021.

#### *3.12.2.2.1 TLS fencing*

In 2021, the electrified TLS fence, reinforced in the summer of 2019 (Photo 3.42), was checked regularly, especially from May to October. This corrective measure now limits any attempt to dig under the fence and prevents any access to TLS by black bears. All work resumed in 2021 and will continue from spring 2022 until early fall, before the first snowfall. The entire TLS fence will be reinforced during 2022.

**Photo 3.42 Reinforcing the fence at the TLS**

The reinforcement work will be done by adding and burying additional wire mesh on the outside of the TLS to a depth of two metres and installing rock and fill on top of it.

#### *3.12.2.2.2 Waste containers*

Freezers dedicated to food waste storage and put in place in 2017 proved to be very effective, as a few bears attempted to break into the waste container near the kitchen in July 2021. This helps deter repeated black bear intrusion into the accommodation complex area since no food waste source is available. Food waste is removed from the freezers each day and transferred to the TLS.

In addition to this prevention measure, lids with sliding mesh doors are always in place on the domestic waste bins installed near the kitchen and in the front of the garage and the plant. These lids prevent animals from entering the containers.

Since the lids were installed, the number of foxes and bear intrusion in the mine site has decreased considerably (Photo 3.43). In 2021, these devices were modified by adding a safety latch to ensure appropriate protection during the summer months.

**Photo 3.43 Safety latch – Dryhouse container**

#### *3.12.2.2.3 Bear deterrents*

Several watertight boxes containing an air horn and pepper spray are set up at strategic locations on site (Photo 3.44), providing workers with ready access to these deterrents all over the site, including along sidewalks, and the entry and exit to the pedestrian walkway between the accommodation complex and the dryhouse.

**Photo 3.44 Bear deterrent box at the entrance to the pedestrian walkway (July 2019)**

### 3.12.2.3 Use of M-11 trapline

Despite the fact that bears are drawn to the TLS, which is located on the M-11 trapline and could provide additional hunting opportunities for tallymen, members of the Swallow family are not interested in harvesting bears for consumption. However, during the interviews, Emerson Swallow was interested in taking the slaughtered bears to harvest the skin. Therefore, Procedure HSS-3.6 was updated.

The bear harvest has remained fairly limited since 2012, with only two harvested in 2015–2016 (Norda Stelo, 2019d).

### 3.12.2.4 Awareness campaign

In May 2021, the Environmental Services Department launched an awareness campaign to Renard Mine workers by email to encourage them not to feed wildlife, particularly black bears that come out of hibernation in the spring.

In addition, awareness posters remain posted in common areas such as the camp hallways, cafeteria and administrative offices (Figure 3.18). Awareness sessions with Renard Mine workers were held in various departments throughout the summer.


**Figure 3.18 Awareness poster on display at the Renard camp (May 2019)**

Lastly, health and safety information/awareness emails are sent to all mine personnel regarding the closure of walking trails in the occurrence of bears.

The awareness campaign will resume in spring 2022.

#### 3.12.2.5 Recommendations for 2022 monitoring

SWY's main objective is to eliminate any habit of black bears to access food on the mine site. The June 2019 MFFP visit helped to identify black bear management elements that can be improved in the short and long term. In 2021, SWY continued applying the ministry's recommendations:

- Recording the number of bears sighted daily at the TLS in the wildlife sighting log;
- Increasing the number of devices installed along pedestrian paths.
- Following the procedure of freezing household waste for the summer;
- Making bear deterrents available to workers for all walks around the camp and on the trails.

Other recommendations will be implemented in 2022, such as :

- Continuing to reinforce the TLS fence by adding a specific anchor in the ground;
- Installing a specific electric fence to deter bears; and
- Operating a transport cage made to move bears rather than having to slaughter them. An MFFP training course on capturing and transporting bears is required to operate the cage and is already scheduled for 2022.

### 3.12.3 Bird Monitoring

#### 3.12.3.1 Monitoring of duck nesting boxes

In compliance with the Canadian Environmental Assessment Agency's instructions (CEAA, 2013), approximately ten waterfowl nesting boxes were installed around Lake Lagopede and some small neighbouring lakes. These nesting boxes are intended for the common goldeneye (*Bucephala clangula*), a small black-and-white duck.

They were installed in live or dead trees near marshy areas, quiet bays in Lake Lagopede or shallow lakes around the mine site, all areas that are conducive to the reproduction of common goldeneyes (Map 3.11). The descriptive sheets of the characteristics of the nesting boxes are presented in Appendix VI.

After the waterfowl migrated south, the nesting boxes were visited twice. The first was aimed at checking the nesting boxes and recording whether they had been used (signs of presence and identification of the species involved).

Although the nesting boxes were intended for common goldeneyes, they could well have been used by other species, such as common mergansers, owls or even squirrels. The purpose of the second visit was to clean the boxes, replace the wood chips and make any necessary repairs before the spring.

##### *3.12.3.1.1 2021 monitoring*

All nest boxes were inspected in February and September 2021.

In some cases, a great deal of wood chips were added to the bottom of the nest box. Following the 2021 nesting season, all ten nest boxes were still in good condition.

In 2021, a few of the nest boxes were used. In the winter, nest box AVR10 showed signs of ruffed grouse (Photo 3.45), and unidentified signs of occupation were found in AVR9 (Photo 3.46).

**Photo 3.45 Ruffed grouse feathers (February 2021)**

**Photo 3.46 Unidentified signs of occupation (February 2021)**

During the September visit, only one dead tree swallow was found in AVR10 (Photo 3.47). Although a depression in the centre of the wood chips was observed in the other nest boxes, there were no other signs that could identify the species that used them.

**Photo 3.47 Tree swallow found dead (September 2021)**

#### *3.12.3.1.2 2022 monitoring*

Monitoring of the nesting boxes will continue in 2022. Depending on the results obtained in 2021, some of the nesting boxes will be moved to other areas suitable for goldeneye in the Renard Mine sector.

The most common bird species observed at the mine site are grey jays, ravens and black-capped chickadees in all seasons, tree swallows in summer and bald eagles at the TLS, as well as willow ptarmigan and snowy owls, at times, in the winter. No migratory bird nests or special status species were observed at the mine site in 2021.

### 3.12.3.2 Monitoring of breeding among migratory and special status birds

#### *3.12.3.2.1 Awareness campaign*

Since 2015, users of motorized small craft on the mine site have been made aware of the presence of waterfowl that use Lake Lagopede and are advised to avoid sheltered bays in spring and summer, where common loon are very likely to be nesting. Boat trips on Lake Lagopede are limited to two or three times a month for environmental monitoring purposes.

#### *3.12.3.2.2 TLS*

In August 2020, several sightings of bald eagles (*Haliaeetus leucocephalus*, designated vulnerable; MFFP, 2018) were observed at the TLS, indicating that the species has continued to frequent the area year-to-year since 2015. Juveniles were also observed, suggesting that eagles are nesting in the area.

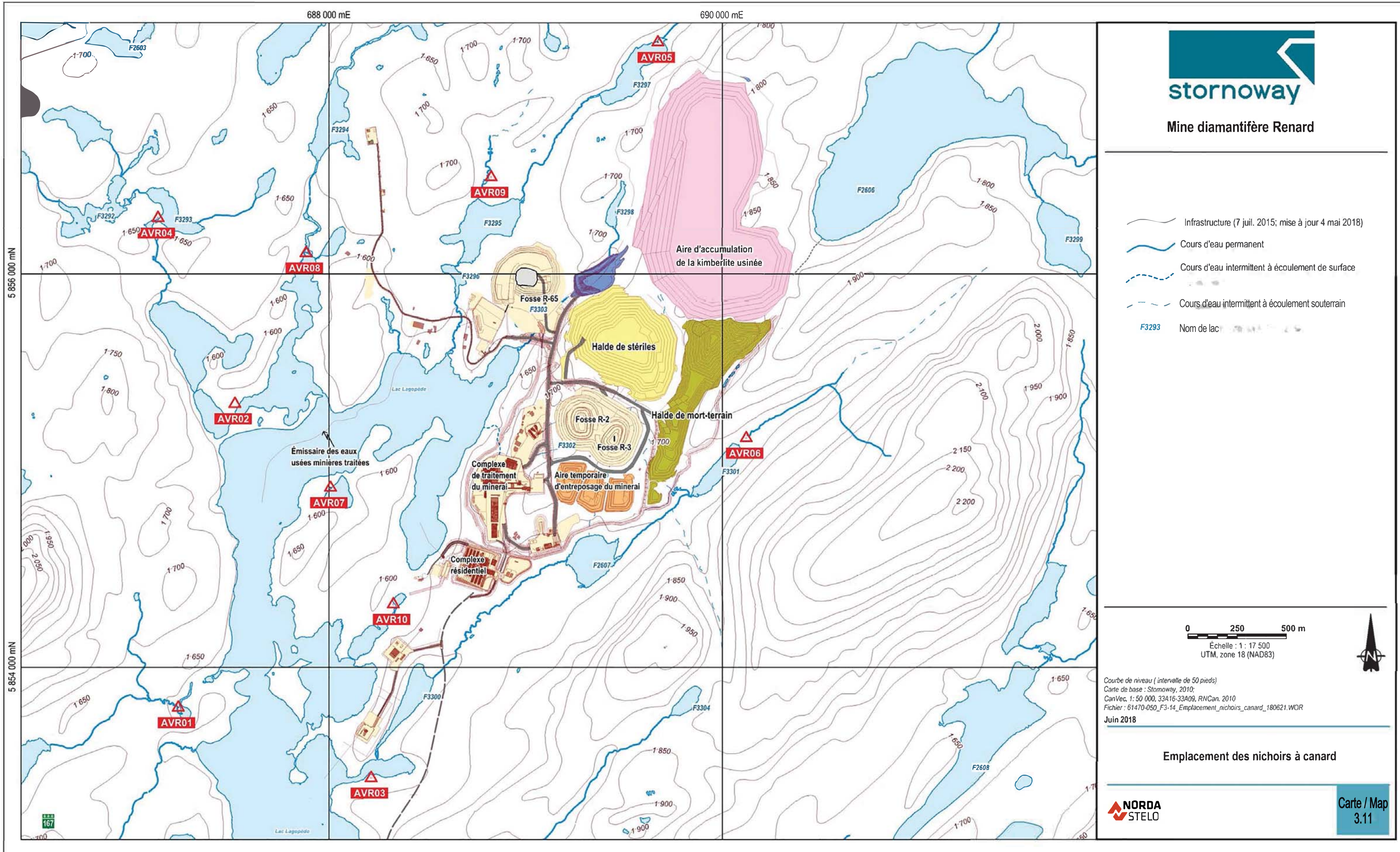
For the moment, despite the large size of bald eagle nests, no such nests have been found either within the TLS enclosure or in trees around the landfill.

Special care is taken every year to determine whether the bald eagle has returned and still nests near the TLS.

## 3.13 Water and Effluent Management

The Renard Mine water management plan can be summarized as follows:

- **designed to prevent and minimize potential impacts on surface water and groundwater quality**
- **integrates management of mine waters (water that may be influenced by construction and operational activities)**
- **includes management of water from zones located hydraulically upstream from the mine**
- **makes it possible to avoid contamination from mining activities**


stornoway
Mine diamantifère Renard
Infrastructure (7 juil. 2015; mise à jour 4 mai 2018)
Cours d'eau permanent
Cours d'eau intermittent à écoulement de surface
Cours d'eau intermittent à écoulement souterrain
F3293 Nom de lac
0 250 500 m
Échelle : 1 : 17 500
UTM, zone 18 (NAD83)
Courbe de niveau ( intervalle de 50 pieds)
Carte de base : Stornoway, 2010;
CanVec, 1: 50 000, 33A16-33A09, RNCan, 2010
Fichier : 61470-050_F3-14_Emplacement_nichoirs_canard_180621.WOR
Juin 2018
Emplacement des nichoirs à canard
NORDA STELO
Carte / Map
3.11
688 000 mE
690 000 mE
5 856 000 mN
5 854 000 mN
AVR01
AVR02
AVR03
AVR04
AVR05
AVR06
AVR07
AVR08
AVR09
AVR10
Aire d'accumulation de la kimberlite usinée
Fosse R-65
Halde de stériles
Halde de mort-terrain
Fosse R-2
Fosse R-3
Complexe de traitement du minerai
Aire temporaire d'entreposage du minerai
Complexe résidentiel
Émissaire des eaux usées minières traitées
Lac Lagopède
F2603
F3292
F3293
F3294
F3295
F3296
F3297
F3298
F3299
F3300
F3301
F3302
F3303
F3304
F2606
F2607
F2608
167

### 3.13.1 Mine Waters

Water that comes into contact with mine facilities is intercepted by a network of perimeter ditches and culverts that channel it into pit R65 (retention and sedimentation basin),

from where it is directed to the mine wastewater treatment plant (MWWTP) (Photo 3.48) for treatment before being discharged into Lake Lagopede (Map 3.12).

**Photo 3.48 Mine wastewater treatment plant (MWWTP)**

#### 3.13.1.1 Facilities maintenance

**SWY ensures the sustainability of the treatment facilities by regularly carrying out preventive maintenance on the operational, mechanical and electrical components of the MWWTP.**

A log is maintained to record observations and facilitate the analysis of situations where action is required to restore the system and preserve long-term effectiveness of the water treatment process.

Since the equipment is 100% redundant, this work could be done while plant operations continued. As a result, the MWWTP achieved a 99% availability rate in 2021. Photo 3.49 illustrates the good water quality at the outlet of the lamellar clarifiers of the MWWTP.

**Photo 3.49 Treated water at the outlet of the lamellar clarifiers**

#### 3.13.1.2 Contingency treatment plant

Since operations in the R65 pit stopped in April 2019 and the pit has been used as a flow equalization basin since then, it is no longer necessary to use the temporary water treatment plant (Geotubes®) at peak flow. Therefore, as in previous years, there was no MIR2C intermediate effluent in 2021.

#### 3.13.1.3 Dewatering water

The source and management of dewatering water from 2018 onwards is described in the 2020 Annual Environmental and Social Monitoring Report (Stornoway, 2021c).

Until March 2020, a pumping system delivered dewatering water (MIR2-B outflow) directly downstream from the MWWTP treatment system.

Since the temporary shutdown of operations at the Renard Mine from March to October 2020, the dedicated pumps for this system were not restarted and there is no longer any MIR2-B intermediate effluent. Henceforth, all water from the underground mine is sent to the MWWTP for treatment.

#### 3.13.1.4 Mine water volume

The network of perimeter ditches is heavily used during certain periods of the year. In 2021, a total of 2 581 817 $m^3$ of water was treated in the MWWTP, approximately 174 785 $m^3$ less than in 2020.

For 2021, a final mine effluent volume (MIR2 station) of 2 196 101 $m^3$ was discharged and includes only the intermediate mine effluent from the MWWTP MIR2-A. Since there is no more than one intermediate effluent, MIR2-A, MELCC confirmed that it is no longer necessary to sample MIR2-A and that only MIR2 needed to be sampled from now on. Thus, the sampling that had been scheduled for MIR2-A was stopped on July 1, 2021.

Figure 3.19 shows the mine wastewater and process water flow chart for 2021, including final and intermediate effluent at the Renard Mine site. Figure 3.20 depicts the operational water balance for 2021 at the mine site.

### 3.13.2 Mine Effluent Quality

The objective of monitoring the quality of the final and intermediate effluents is to ensure compliance at all times with Directive 019 (MDDEP, 2012).

Diamond mines have also been subject to the *Metal and Diamond Mining Effluent Regulations* (MDMER) since June 1, 2018. The parameters for monitoring at the final mine effluent, the discharge point where these regulations apply, have therefore been adjusted to meet these new requirements.

#### 3.13.2.1 Results

Table 3.20 provides a summary of water quality analysis results for each intermediate effluent as well as the final mine effluent. The influent values are also provided for comparison purposes. A symbol corresponding to the relevant standard is attached to each effluent concentration.

In 2021, the concentrations of the analyzed parameters from all the intermediate effluents and the final mine effluent are generally below the requirements of Directive 019. In addition, no lethality (acute toxicity unit <1) was detected in the monthly rainbow trout and daphnia toxicity tests, nor during the quarterly chronic toxicity trials on Ceriodaphnia and algae.

All MDMER standards were also met in 2021. As such, Stornoway informed Environment Canada that the radium analysis rate was reduced to once per quarter, given that the results of the analysis were lower than 0.037 Bq/L over 10 consecutive weeks.

### 3.13.3 Environmental Discharge Objectives

The monitoring of mine effluent quality also helps to confirm whether the results observed for intermediate effluent at the MWWTP reach the Effluent Discharge Objectives (EDOs) established specifically for the Renard project by MELCC (Roche, 2013b).

**DID YOU KNOW?**

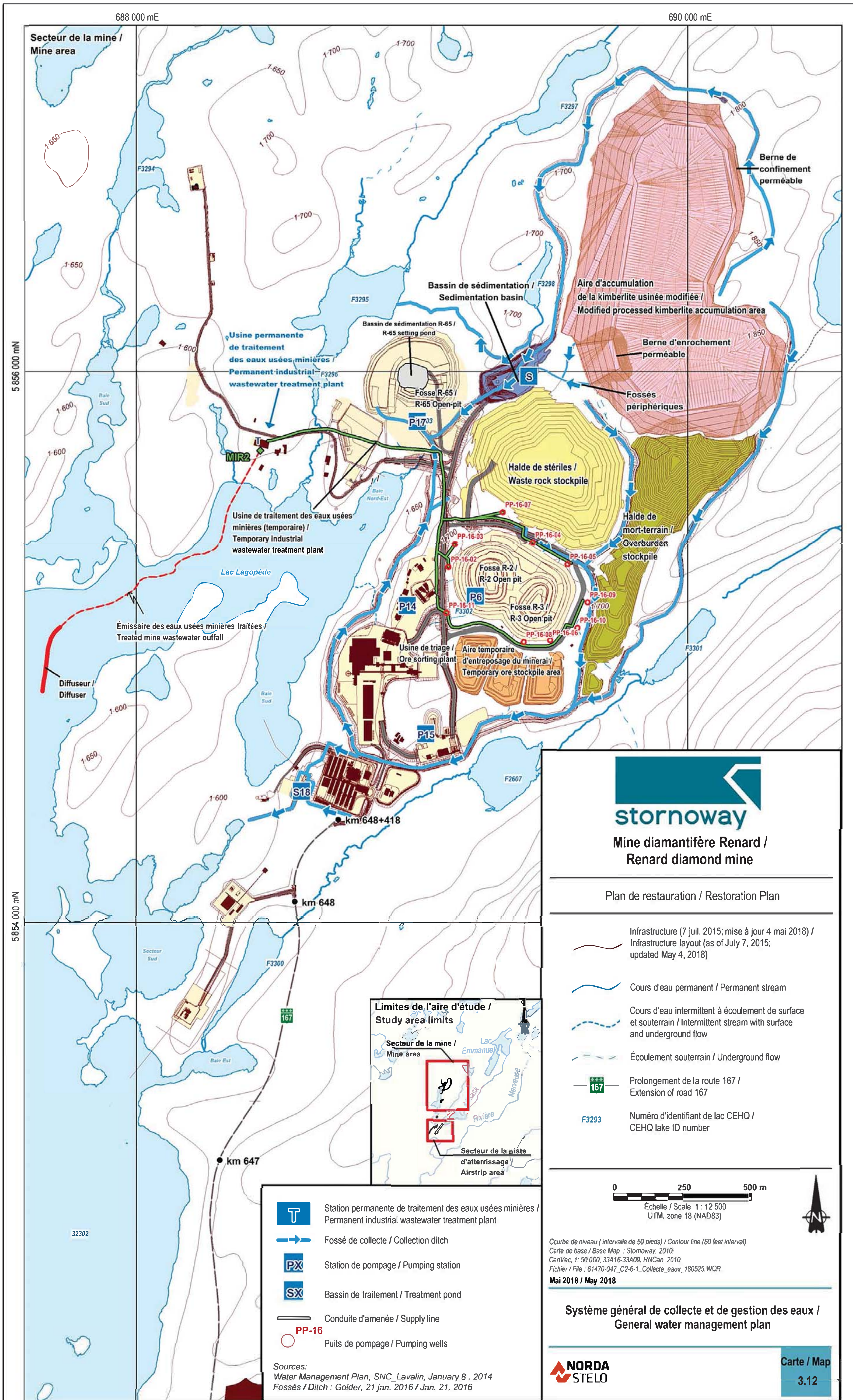
**EDOs are continuous improvement objectives and do not correspond to a standard. They are used to determine concentration and maximum load values for a given contaminant that protect the receiving environment, i.e. Lake Lagopede, without compromising its sustainability and uses.**

Therefore, Stornoway must justify to MELCC the choices and the best applicable technology (when available and existing) implemented at the MWWTP to achieve this. Monitoring the EDOs thus makes it possible to protect the environment by regularly inspecting the quality of the treatment at the MWWTP.

#### 3.13.3.1 2021 Monitoring

The concentrations of almost all the parameters measured at the intermediate effluent of the MWWTP (MIR2-A) and the final effluent (MIR2) respect the EDOs, except for nitrites, before discharge into the receiving environment. Although the mean nitrite concentration (0.34 mg/L) in the MIR2-A and MIR2 effluents are higher than the EDO (0.08 mg/L), the mean nitrite concentration found in the lakes (<0.02 mg/L) and streams (<0.02 mg/L) is the same as that found in the 2010 baseline (<0.02 mg/L) (Table 3.20).

Also, although nitrites are a residual nitrogen compound from, among other things, the explosives used for blasting in the underground mine, it is expected that nitrites will not be found in surface waters because they are quickly transformed into nitrates in the presence of oxygen.



688 000 mE
690 000 mE
5 856 000 mN
5 854 000 mN
Secteur de la mine / Mine area
Usine permanente de traitement des eaux usées minières / Permanent industrial wastewater treatment plant
Bassin de sédimentation R-65 / R-65 setting pond
Fosse R-65 / R-65 Open-pit
Bassin de sédimentation / Sedimentation basin
Aire d'accumulation de la kimberlite usinée modifiée / Modified processed kimberlite accumulation area
Berne de confinement perméable
Berne d'enrochement perméable
Fossés périphériques
Halde de stériles / Waste rock stockpile
Halde de mort-terrain / Overburden stockpile
Usine de traitement des eaux usées minières (temporaire) / Temporary industrial wastewater treatment plant
Lac Lagopède
Émissaire des eaux usées minières traitées / Treated mine wastewater outfall
Diffuseur / Diffuser
Fosse R-2 / R-2 Open pit
Fosse R-3 / R-3 Open pit
Usine de triage / Ore sorting plant
Aire temporaire d'entreposage du minerai / Temporary ore stockpile area
MIR2
P17
P14
P6
P15
S18
S
PP-16-02
PP-16-03
PP-16-04
PP-16-05
PP-16-06
PP-16-07
PP-16-08
PP-16-09
PP-16-10
PP-16-11
F3294
F3295
F3296
F3297
F3298
F3300
F3301
F3302
F2607
32302
Baie Sud
Baie Nord-Est
Baie Est
Secteur Sud
km 648+418
km 648
km 647
167
Limites de l'aire d'étude / Study area limits
Secteur de la mine / Mine area
Lac Emmanuel
Rivière Nemiscau
Secteur de la piste d'atterrissage / Airstrip area
Station permanente de traitement des eaux usées minières / Permanent industrial wastewater treatment plant
Fossé de collecte / Collection ditch
Station de pompage / Pumping station
Bassin de traitement / Treatment pond
Conduite d'amenée / Supply line
PP-16
Puits de pompage / Pumping wells
Sources:
Water Management Plan, SNC_Lavalin, January 8 , 2014
Fossés / Ditch : Golder, 21 jan. 2016 / Jan. 21, 2016
stornoway
Mine diamantifère Renard / Renard diamond mine
Plan de restauration / Restoration Plan
Infrastructure (7 juil. 2015; mise à jour 4 mai 2018) / Infrastructure layout (as of July 7, 2015; updated May 4, 2018)
Cours d'eau permanent / Permanent stream
Cours d'eau intermittent à écoulement de surface et souterrain / Intermittent stream with surface and underground flow
Écoulement souterrain / Underground flow
Prolongement de la route 167 / Extension of road 167
Numéro d'identifiant de lac CEHQ / CEHQ lake ID number
F3293
0 250 500 m
Échelle / Scale 1 : 12 500
UTM, zone 18 (NAD83)
Courbe de niveau ( intervalle de 50 pieds) / Contour line (50 feet interval)
Carte de base / Base Map : Stornoway, 2010;
CanVec, 1: 50 000, 33A16-33A09. RNCan, 2010
Fichier / File : 61470-047_C2-6-1_Collecte_eaux_180525.WOR
Mai 2018 / May 2018
Système général de collecte et de gestion des eaux / General water management plan
NORDA STELO
Carte / Map
3.12

**Table 3.24 Analysis of final and intermediate effluent quality in relation to applicable standards and criteria and EDOs**

| PARAMETERS | UNITS | Mean Influent Concentration | ECCC | MELCC | | Mean Concentration at Final MIR2 Effluent | Mean Concentration at MWWTP Effluent (4) MIR2-A | Mean Concentration of Dewatering Water(5) MIR2-B | Mean Concentration of Geotube Effluent (5) MIR2-C | Monthly Load of Final Effluent (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MDMER (1) √ | Directive 019 (2) ◊ | Effluent Discharge Objectives (EDO)(3) ● | ◊ √ | ◊● | ◊ | ◊ | |
| **Physical-Chemical** | | | | | | | | | | |
| pH | -- | 7.7 | >6 and <9.5 | >6 and <9.5 | >6.5 | 7.0 | 7.0 | | | -- |
| Suspended solids | mg/L | 20.5 | 15 | 15 | 15 | 2.8 | 3.4 | | | 471.0 |
| Conductivity | uS/cm | 762 | -- | -- | -- | 830 | 780 | n/a | n/a | -- |
| Dissolved oxygen | mg/L | -- | -- | -- | -- | 10.9 | 11.6 | | | -- |
| Turbidity | NTU | 28.0 | -- | -- | -- | 0.48 | 0.36 | | | -- |
| **Nutrients and Ions** | | | | | | | | | | |
| Total ammoniacal nitrogen ($NH_3+NH_4$) | mg/L of N | 1.80 (6)<br>1.30 (7) | -- | -- | 5.92 (6)<br>9.42 (7) | 1.18 (6)<br>1.22 (7) | 1.49 (6)<br>1.19 (7) | | | -- |
| Total Kjeldahl Nitrogen (TKN) | mg/L of N | 1.8 | -- | -- | -- | 1.275 | 1.71 | | | -- |
| Nitrates ($NO_3$) | mg/L of N | 11.4 | -- | -- | 14.34 | 11.4 | 12.0 | | | -- |
| Nitrites ($NO_2$) | mg/L of N | 0.40 | -- | -- | 0.08 | 0.34 | 0.34 | n/a | n/a | -- |
| Total Phosphorus | mg/L of P | 0.045 | -- | -- | 0.075 | 0.006 | 0.005 | | | -- |
| Chlorides | mg/L | 101 | -- | -- | 1149 | 96 | 115 | | | -- |
| Fluorides | mg/L | 0.7 | -- | -- | 0.8 | 0.7 | 0.7 | | | -- |
| Sulfates | mg/L | 128 | -- | -- | 2495 | 143 | 135 | | | -- |
| **Total Extractable Metals and Metalloids** | | | | | | | | | | |
| Aluminum | mg/L | 1.080 | -- | -- | 0.132 | 0.006 | 0.007 | | | -- |
| Arsenic | mg/L | 0.0003 | 0.3 | 0.2 | 0.105 | 0.0216 | 0.0004 | | | 3.19 |
| Barium | mg/L | 0.07 | -- | -- | 0.17 | 0.05 | 0.05 | | | -- |
| Cadmium | mg/L | 0.00002 | -- | -- | 0.00022 | 0.000004 | 0.000003 | | | -- |
| Total Chromium | mg/L | 0.0084 | -- | -- | 0.064 | 0.00002 | 0.00002 | | | -- |
| Copper | mg/L | 0.0011 | 0.3 | 0.3 | 0.005 | 0.0005 | 0.0025 | | | 0.09 |
| Iron | mg/L | 1.68 | -- | 3 | 3 | 0.15 | 0.17 | n/a | n/a | 26.6 |
| Manganese | mg/L | 0.03 | -- | -- | 1.28 | 0.02 | 0.01 | | | -- |
| Mercury | mg/L | 0.00001 | -- | -- | -- | 0.000001 | 0.000001 | | | -- |
| Nickel | mg/L | 0.015 | 0.5 | 0.5 | 0.034 | 0.009 | 0.008 | | | 1.6 |
| Lead | mg/L | 0.00100 | 0.1 | 0.2 | 0.00057 | 0.00022 | 0.00022 | | | 0.041 |
| Zinc | mg/L | 0.009 | 0.5 | 0.5 | 0.077 | 0.005 | 0.004 | | | 1.0 |
| **Radioactive Elements** | | | | | | | | | | |
| Radium 226 | mg/L | -- | 0.037 | -- | -- | 0.0025 | -- | n/a | n/a | -- |
| **Organic Compounds** | | | | | | | | | | |
| Hydrocarbons ($C_{10}$-$C_{50}$) | mg/L | 0.07 | -- | 2 | 0.05 | 0.05 | 0.05 | n/a | n/a | -- |
| **Toxicity Testing** | | | | | | | | | | |
| Acute toxicity (rainbow trout) | TUa | -- | -- | <1 | <1 | <1 | <1 | n/a | n/a | -- |
| Acute toxicity (daphnia) | TUa | -- | -- | <1 | <1 | <1 | <1 | | | -- |

(--) Unregulated parameter
(1) Liability as of June 1, 2018, applicable only to final effluent (MIR2)
(2) Applicable to final mine effluent (MIR2) and intermediate effluent (MIR2-A, MIR2-B and MIR2-C)
(3) Applicable only to MWWTP (MIR2-A) effluent
(4) Sampled until June 30, inclusively
(5) Not in operation in 2021
(6) In summer (June 1 to November 30)
(7) In winter (December 1 to May 31)

**With regard to the 2021 mine effluent and surface water quality, there is no clear trend of nitrite input from discharging the mine effluent into the receiving environment.**

**The mean nitrate concentration in lakes and streams in 2021 is slightly lower than in previous monitoring.**

**The mean ammoniacal nitrogen concentration measured for 2021 in the final mine mine effluent (1.14 mg/L in summer and 1.22 mg/L In winter) is well below its EDO.**

In 2021, Stornoway continued to implement the environmental measures for the management of explosives that were put in place in 2018. These measures are intended to prevent and reduce at the source the quantity of explosives that can end up in the water circuit to be treated, and thus reduce the contribution of nitrogen compounds to the mine effluent of the MWWTP.

To do this, SWY makes sure to:

- Apply the internal operational procedure for loading explosives integrated into the ESMS and conducting task observations;
- Continue monitoring the internal standard (15 mg/L) established for ammoniacal nitrogen concentration in mine water from underground operations.

#### 3.13.3.2 EDO Review 2017–2019

To meet condition 2.5 of the mine's Global Certificate of Approval (3214-14-041), SWY submitted its first EDO monitoring report for the MWWTP mine effluent (Norda Stelo, 2021a) to COMEX and MELCC on August 6, 2021. Norda Stelo's conclusions and recommendations for this report were presented in the 2020 Annual Environmental and Social Monitoring Report (Stornoway, 2021c). At present, SWY is still awaiting the ministry's analysis of the report to learn whether the EDOs established for the Renard Mine effluent need to be revised.

### 3.13.4 Water Withdrawals

Under the MELCC's *Regulation respecting the Declaration of Water Withdrawals*, anyone who withdraws 75,000 L/day (75 $m^3$/day) or more is required to report the amount they withdraw annually. Water withdrawals at the Renard mine site are therefore subject to this regulation.

Water withdrawals are attributed to:

- The dewatering of the underground mine and open pits (90.1%);
- The ore processing plant's freshwater requirements (7.7%);
- The production of drinking water for the workers' camp (2.2%);
- The production of emulsion explosives (less than 0.004%); and
- The Renard mine airport's sanitary facilities (less than 0.002%).

Withdrawals are divided into two main categories: surface water and groundwater.

Surface water withdrawals are taken directly from Lake Lagopede and are used to produce drinking water and supplement the ore processing plant.

Groundwater withdrawals, via various pumping stations and wells, are related to underground mine and open pit dewatering activities. In addition, water for explosives and airport sanitary facilities is drawn from artesian wells.

In brief, in 2021, a total volume of 2.42 $Mm^3$ of surface water and groundwater was withdrawn, slightly less than in 2020 (2.66 $Mm^3$). This slight reduction is related to the reduced water withdrawals in the R65 open pit.

As indicated in Directive 019, operators are required to maximize the use of mine wastewater produced at mine sites. This is why SWY makes every effort to minimize the use of freshwater by re-using water produced by the MWWTP and the runoff collected on the mine site. Efforts made in this regard are discussed in the next section (3.12.6).

### 3.13.5 Water Re-Use

The water balance documents water flows measured during the year at the mine site. The mine site water balance was updated in 2021 to include adjustments made to the various flows. A mine wastewater and process water flow diagram is illustrated in Figure 3.19.

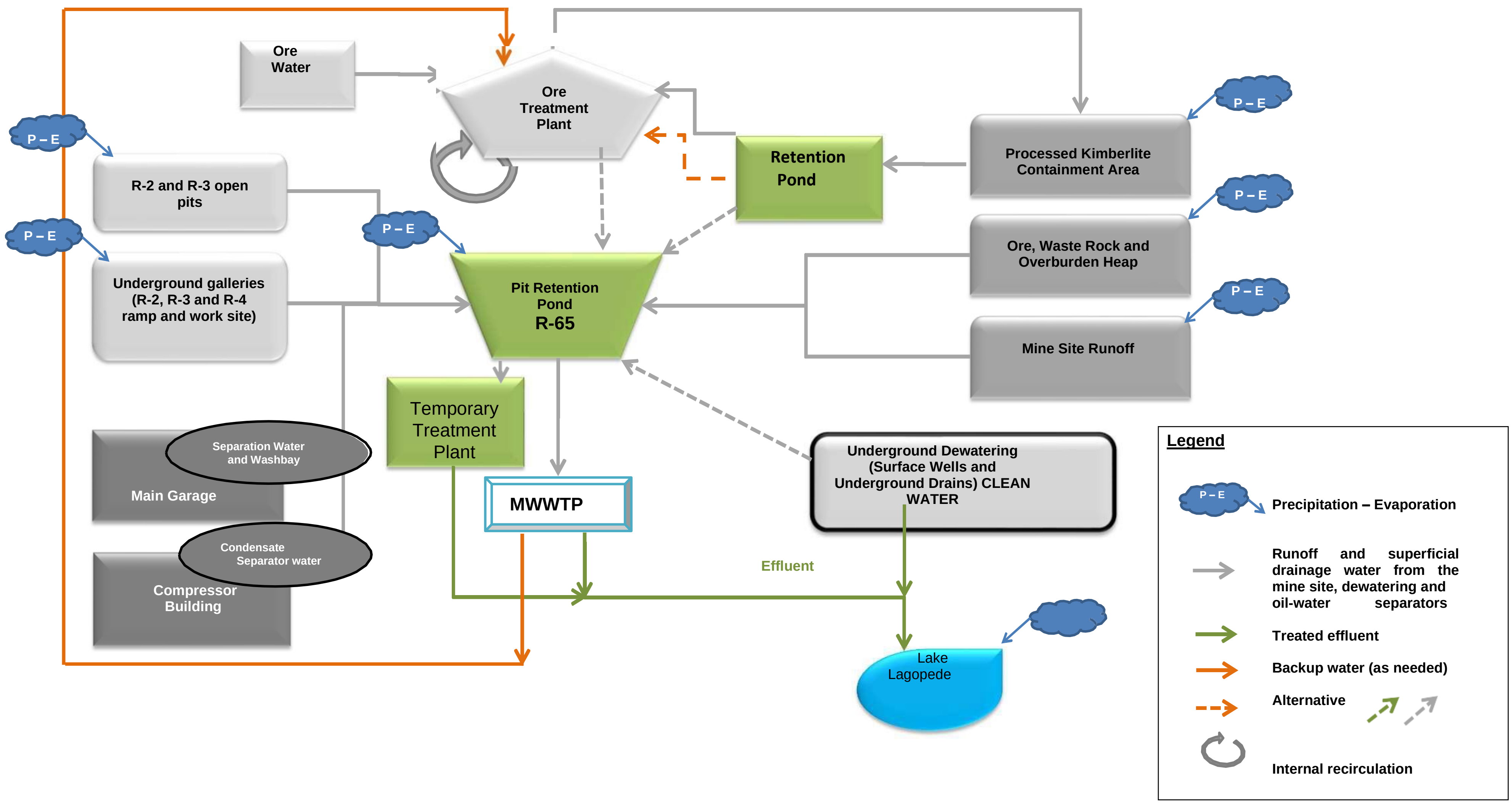
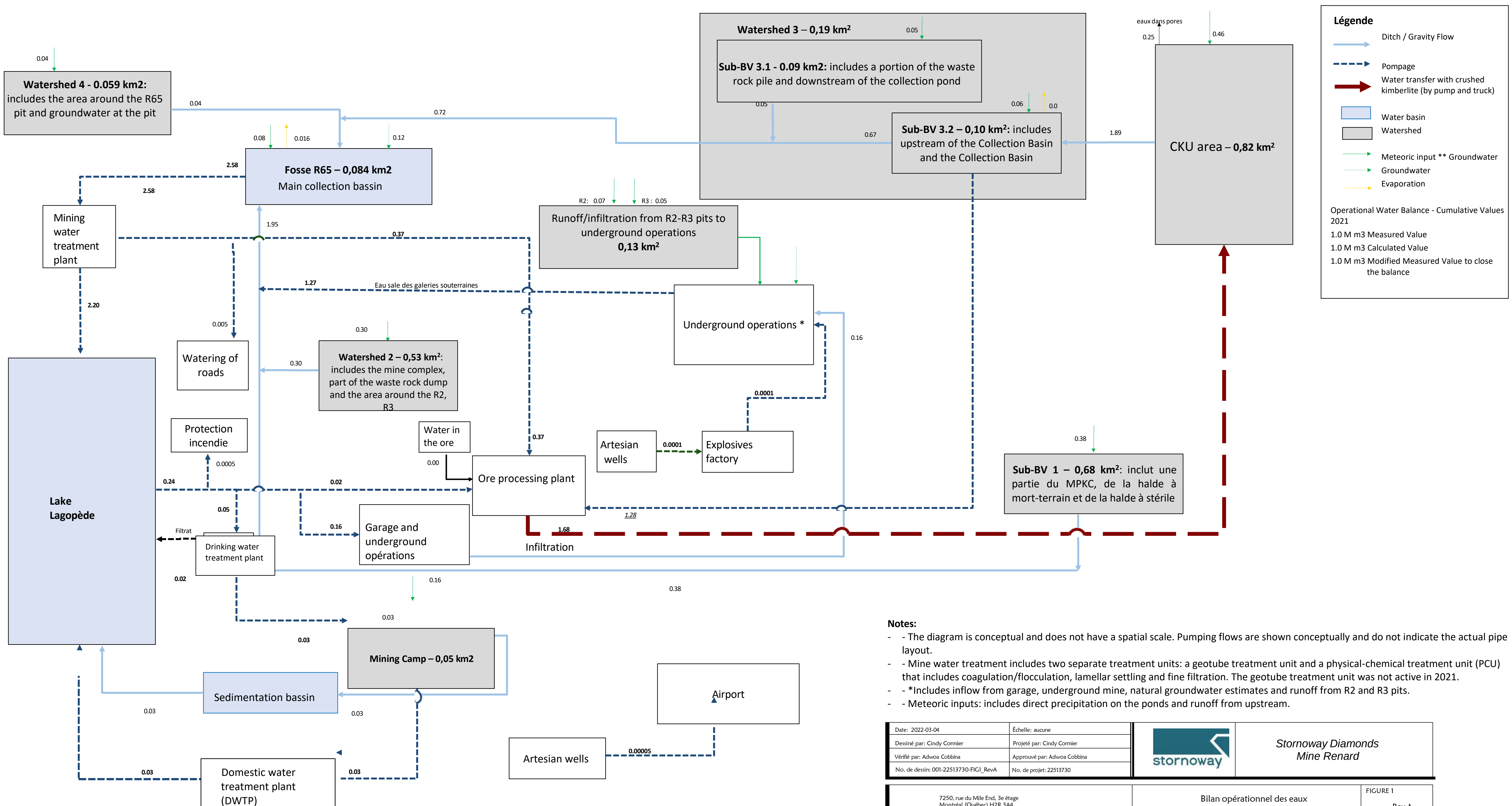



Figure 3.19 Mine wastewater and process water flow diagram




**Notes:**

- - The diagram is conceptual and does not have a spatial scale. Pumping flows are shown conceptually and do not indicate the actual pipe layout.
- - Mine water treatment includes two separate treatment units: a geotube treatment unit and a physical-chemical treatment unit (PCU) that includes coagulation/flocculation, lamellar settling and fine filtration. The geotube treatment unit was not active in 2021.
- - *Includes inflow from garage, underground mine, natural groundwater estimates and runoff from R2 and R3 pits.
- - Meteoric inputs: includes direct precipitation on the ponds and runoff from upstream.

| | | |
|---|---|---|
| Date: 2022-03-04 | Échelle: aucune | *Stornoway Diamonds Mine Renard* |
| Dessiné par: Cindy Cormier | Projeté par: Cindy Cormier | |
| Vérifié par: Adwoa Cobbina | Approuvé par: Adwoa Cobbina | |
| No. de dessin: 001-22513730-FIG1_RevA | No. de projet: 22513730 | |

| | | |
|---|---|---|
| 7250, rue du Mile End, 3e étage<br>Montréal (Québec) H2R 3A4<br>Tel.: (514) 383-0990 Fax: (514) 383-5332 | Bilan opérationnel des eaux<br>Janvier à décembre 2021 | FIGURE 1<br>Rev A |

**Figure 3.20 Operational water balance for the Renard Mine site in 2021**

GOLDER

#### 3.13.5.1 Water flow

The significant flows identified for the Renard Mine are:

- Activities that require water, including ore processing plant operations and the washbay in the mechanical maintenance garage, supply of drinking water for the mine camp, development of the underground mine, and water used in dust control procedures or for the cleaning of the membranes at the DWWTP;
- Freshwater supply drawn from the natural environment, specifically surface water from Lake Lagopede but also water drawn from artesian wells;
- Water that is re-used from pit R65, where runoff from the mine site is collected and then treated as well as water from underground mine dewatering and from the water retention pond near the MPKC facility;
- Runoff;
- Seepage water in ditches and underground galleries;
- Precipitation at the mine site, which includes evaporation from water surfaces and evapotranspiration;
- Final mine effluent, including MWWTP effluent and water from the underground mine;
- Effluent from the domestic wastewater treatment plant.

Overall, in 2021, the various water flows are divided into three major categories, as set out in Directive 019.

The water balance for the Renard mine for 2021 is defined as follows:

- 0.187 $Mm^3$ of freshwater drawn from Lake Lagopede to supply the ore processing plant and the underground mine, and from underground wells to supply the airport and the explosives facility;
- 1.65 $Mm^3$ of reused water for the water supply of the process plant, coming from the water treated by the UTEM as well as from the collection basin (or Reclaim) at the foot of the MPKC:
- 2.2 $Mm^3$ of final mine effluent (MIR2) discharged into Lake Lagopede after treatment (treated water from the MWWTP, including mine site runoff and water from underground operations).

Figure 3.21 illustrates the quantity of freshwater drawn from Lake Lagopede since 2017.

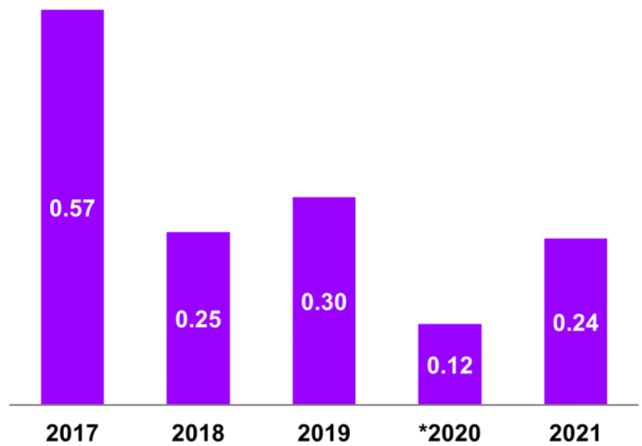



**Figure 3.21 Quantity of freshwater (in $m^3$) drawn from Lake Lagopede since 2017**

#### 3.13.5.2 Water re-use rates

Throughout 2021, SWY maintained and consolidated measures put in place since 2018 to enhance water management on the Renard Mine site.

With the water retention pond located at the foot of the tailings facility (MPKC) in operation, the mine site increased its rate of use of mine wastewater (as compared with freshwater use). For 2021:

- The rate of use of mine wastewater on the Renard mine site was an estimated 90%, slightly more than in 2020 (88%) and 2019 (84%);
- The rate of re-use of mine wastewater was an estimated 99.0% based on total water consumption at the ore processing plant, in relation to the facility's total use.

**In 2021, SWY achieved the highest mine water re-use rate since 2017.**

Figure 3.22 illustrates the changes in mine wastewater use and re-use rates since 2017. These results together confirm the effectiveness of the water management at the ore processing plant.

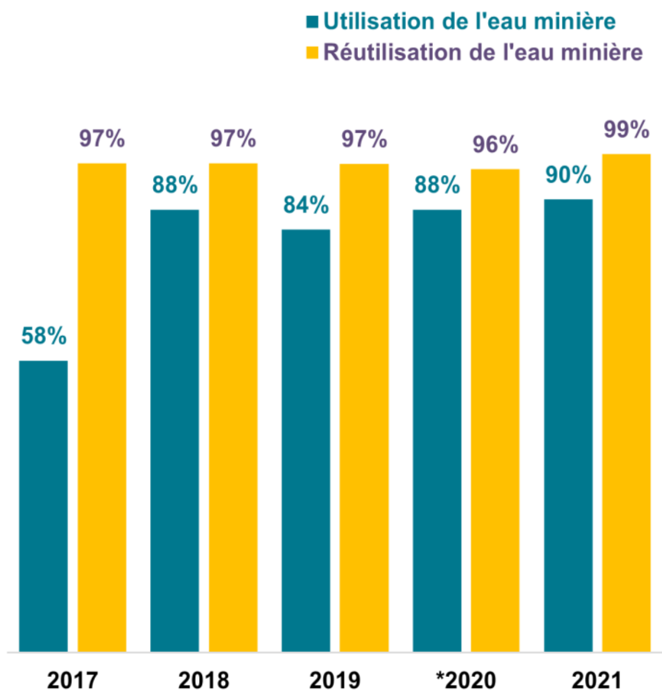



**Figure 3.22 Changes in mine wastewater re-use rate since 2017**

## Success in 2021

**SWY reused the difference between the volume of final mine effluent and the volume of influent from the MWWTP:**

**► to supply the ore processing plant (372 523 m3)**

**► and as a dust suppressant on mine roads (4 533 m3)**

SWY also made efforts in 2021 to reduce its drinking water consumption:

- Ensuring continuous monitoring so that there is no unnecessary consumption by equipment that may be connected to the raw water supply;
- Raising awareness during new employee orientation about the quality of the water distributed and the importance of avoiding waste.

Efforts in this regard will continue in 2022 so as to optimize our water management practices (refer to section 3.5 for more information).

### 3.13.6 Domestic wastewater

SWY obtained an authorization issued on October 10, 2014 by the MDDELCC to install a domestic wastewater treatment plant (DWWTP) in early 2015 (Photo 3.50). This plant is composed of an SMBR bioreactor, an anoxic basin, a membrane clarification system and a sludge management system.

The DWWTP treats and discharges domestic wastewater from the Renard Mine, called "domestic effluent" when discharged into Lake Lagopede.

The objective of domestic wastewater quality monitoring is to ensure compliance with:

- **The federal *Wastewater Systems Effluent Regulations* (WSER; SOR/2012-139), under the *Fisheries Act*;**
- **Effluent discharge objectives (EDOs) established specifically for the Renard project by the MELCC and reviewed in 2020.**


**Photo 3.50 Domestic wastewater treatment plant (DWWTP)**

EDOs are not considered to be standards, but rather *"a maximum concentration and load for a given contaminant designed to protect the receiving environment, primarily by complying with water quality criteria at the end of the effluent mixing zone."*

Monitoring EDOs protects the receiving environment, i.e., Lake Lagopede, by regularly controlling the quality of domestic effluent.

#### 3.13.6.1 Volume treated at the DWWTP

In 2021, the DWWTP achieved a 100% availability rate. The plant treated about 32 099 m³ of domestic wastewater, 30 319 m³ of which was discharged into Lake Lagopede. The difference between these two volumes is essentially due to the volume of sludge that was removed before and after the domestic water treatment.

The volume of domestic effluent discharged in 2021 (30 319 m³) increased by approximately 24% in comparison with 2020 (24 357 m³), while the average unit flow rate sent to the DWWTP in 2021 was 345 litres per person per day, which was much lower than in 2020 (477 L/pers./day). These variations between 2020 and 2021 are mainly explained by a return to normal mine activities, which simply means that there were more workers on the mine site.

Also, some breaks may have occurred in the drinking water distribution network in 2021 and may have resulted in small leaks. A break in the cooling equipment in the ore plant also required the use of drinking water, which was discharged into the MWWTP instead of the DWWTP. These minor incidents explain the difference between the volume of influent received at the DWWTP (32 099 m³) and the volume of drinking water distributed (34 822 m³).

#### 3.13.6.2 Quality of domestic influent and effluent

Test results for domestic effluent in 2021 are provided in Table 3.25. The concentrations of the physical-chemical parameters and nutrients measured in domestic effluent are all within the requirements set out in the WSER. As well, the quality of the treated domestic effluent discharged into Lake Lagopede meets provincial and federal requirements as well as the EDOs.

The criteria for suspended solids (SS), un-ionized ammonia ($NH_3$), and carbonaceous biological oxygen demand after five days ($CBOD_5$) have all been well within established criteria since the DWWTP began operations.

In the case of suspended solids, an average reduction over 98% has been observed between the influent and effluent (Table 3.22), clearly demonstrating the effectiveness of the DWWTP.

Phosphorus and total ammoniacal nitrogen concentrations are generally below allowable limits in both summer and winter, which indicates that the treatment is effective at all times. In addition, no toxicity was observed in the drinking water effluent in toxicity testing on rainbow trout and daphnia.

As for bacteriological indicators, the fecal coliform values were well within regulatory requirements. Domestic influent and effluent analytical results indicated that the domestic wastewater treatment process clearly meets the MELCC's EDOs in terms of both allowable concentrations and loads.

Despite the absence of standards, SWY carries out regular monitoring of the DWWTP's performance in removing total extractable metals. A comparison of influent and effluent concentrations confirms a clear reduction of most metals, thus contributing to the improvement of the effluent quality.

#### 3.13.6.3 Facilities maintenance

To ensure the sustainability of the facilities, preventive maintenance is regularly carried out on operational, mechanical and electrical components of the DWWTP. Observations are logged to facilitate the analysis of situations requiring remedial action to upgrade the system and preserve the long-term efficiency of the treatment process.

As such, SWY will replace the DWWTP membranes in 2022 because they are reaching their end of life. Effluent quality will remain the same following this replacement. Upstream of the domestic wastewater collection and treatment network, an oil-water separator was installed in the camp cafeteria to prevent grease from the kitchen from blocking the system. The trap is inspected on a regular basis and emptied as required.

**Table 3.25 Analysis of domestic wastewater quality in relation to applicable standards and criteria**

| PARAMETERS | UNITS | Mean Influent Concentration SWY | ECCC Wastewater Systems Effluent Regulations | MELCC Effluent Discharge Objectives (EDOs) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Allowed Concentration | Mean Concentration in SWY Effluent | Allowed Load (kg/J) | SWY Load (kg/J) |
| **Physical-Chemical** | | | | | | | |
| pH | mg/L | 7.2 | -- | -- | 7.3 | -- | -- |
| BOD5C | mg/L | 175.0 | ≤ 25 | 25 | 2.3 | -- | -- |
| BOD5 | mg/L | 195.0 | -- | 26 | 1.0 | 4 | 0.08 |
| COD | mg/L | 495.0 | -- | -- | 11.2 | -- | -- |
| SS | mg/L | 201.0 | ≤ 25 | 25 | 3.2 | 8 | 0.2 |
| **Nutrients and Ions** | | | | | | | |
| Un-ionized Ammonia ($NH_3$) | mg/L of N | 0.15 | <1.25 | -- | 0.0014 | -- | -- |
| Ammoniacal Nitrogen ($NH_3$+$NH_4$) | mg/L of N | 46 (1)<br>35 (2) | -- | 12.02 (1)<br>18.82 (2) | 0.06 (1)<br>0.31 (2) | 1.9 (1)<br>3.0 (2) | 0.005 (1)<br>0.03 (2) |
| Total Phosphorus | mg/L of P | 6.60 | -- | 0.1 | 0.03 | -- | -- |
| **Bacteriological** | | | | | | | |
| Fecal coliforms | CFU/100 mL | >60,000 | -- | 10,000 | <10 | -- | -- |
| **Toxicity Testing** | | | | | | | |
| Acute toxicity – Daphnia | TUa | -- | -- | <1 | <1 | -- | -- |
| Acute toxicity – Rainbow trout | TUa | -- | -- | <1 | <1 | -- | -- |
| **Total Extractable Metals and Metalloids** | | | | | | | |
| Aluminum (Al) | mg/L | 1.30 | -- | -- | 0.10 | -- | -- |
| Arsenic (As) | mg/L | <0.001 | -- | -- | <0.001 | -- | -- |
| Barium (Ba) | mg/L | 0.015 | -- | -- | 0.008 | -- | -- |
| Cadmium (Cd) | mg/L | <0.0002 | -- | -- | <0.0002 | -- | -- |
| Chromium (Cr) | mg/L | <0.001 | -- | -- | <0.005 | -- | -- |
| Copper (Cu) | mg/L | 0.037 | -- | -- | 0.002 | -- | -- |
| Iron (Fe) | mg/L | 0.91 | -- | -- | 0.17 | -- | -- |
| Mercury (Hg) | mg/L | <0.0001 | -- | -- | <0.0001 | -- | -- |
| Manganese (Mn) | mg/L | 0.023 | -- | -- | 0.021 | -- | -- |
| Nickel (Ni) | mg/L | 0.008 | -- | -- | 0.011 | -- | -- |
| Lead (Pb) | mg/L | 0.004 | -- | -- | 0.001 | -- | -- |
| Zinc (Zn) | mg/L | 0.12 | -- | -- | 0.05 | -- | -- |

(--) Unregulated parameter

(1) In summer (June 1 to November 30) (2) In winter (December 1 to May 31)

#### 3.13.6.4 Domestic sludge management

Monitoring of post-water-treatment pressed sludge was initiated in 2016

to collect the data required to evaluate the recovery potential of these sludges by verifying compliance with limits for parameters set out in the fertilizing residual materials recycling guide (Guide sur le recyclage des matières résiduelles fertilisantes).

This validation aims to eventually be able to store and use dehydrated sludge in the gradual restoration of the mine site. The characterization work continued in 2021 to track the parameters and confirm that sludge quality remains stable over time.

### 3.13.7 Hydrocarbon Separators

Two certified hydrocarbon separators were installed: one at the airport in 2015 and the other in the mine's mechanical maintenance garage in 2016. They were designed to comply with the 15 mg/L $C_{10}C_{50}$ petroleum hydrocarbon discharge criteria set out in the oil-water separator guide (Guide sur les séparateurs eau-huile; MDDEP, 2008).

**At the Renard Mine, hydrocarbon separators use gravity to intercept non-soluble and non-emulsive oils and petroleum hydrocarbons found in wastewater from the airport and the mechanical maintenance garage.**

A third condensate separator was installed in the second quarter of 2017 in the underground mine fresh air raise (FAR) building (Photo 3.49). It contains two identical units that recover small quantities of oil in the compressed air in the four compressors in the building. The condensate is depressurized in an expansion chamber and the emulsified oil-water mixture is absorbed by a series of oleophilic filters that retain only the oil, and active carbon filters that absorb residual oil from the condensate.

**Photo 3.51 Fresh air rise (FAR) condensate separator**

Regular monthly inspections are conducted for the garage separators, and quarterly inspections for the airstrip and FAR units by a building technician on each hydrocarbon separator and on the condensate separator.

The height of the oil in the separator and oil storage tank, the height of the oil in the storage tank, and the height of the sludge are measured. The technician also records the presence or absence of liquid in the containment tray and indicates whether the oil has been emptied. This information is all logged.

Quarterly monitoring is also undertaken to ensure the quality of the effluent in the separators. A water sample is taken at the outlet to each separator to measure the $C_{10}$-$C_{50}$ concentration and ensure compliance with the 15 mg/L discharge criteria indicated in the Guide (MDDEP, 2008).

#### 3.13.7.1 Airport hydrocarbon separator

The results in 2021 at the outlet to the airport hydrocarbon separator are on average 0.3 mg/L and, as in 2020, no values exceeded the discharge criteria.

#### 3.13.7.2 Garage hydrocarbon separator

SWY voluntarily committed to complying with discharge criteria for the garage hydrocarbon separator. Note that effluent from this separator is not directly discharged into the receiving environment.

It undergoes a number of processing steps, including sedimentation bags in the washbay, before being captured by the mine wastewater collection system. This network then directs the water to pit R-65, where it is retreated and discharged along with the effluent from the mine wastewater treatment plant.

As in 2020, a number of actions were taken throughout 2021 to improve operational management of this equipment and achieve discharge criteria set out in the Guide (MDDEP, 2008).

#### 3.13.7.3 FAR Condensate Separator

The 2021 results at the outlet to the FAR separator on average range from 1.01 mg/L to 2.5 mg/L for each of the separator units, and both units comply with the 15 mg/L discharge criteria at all times.

#### 3.13.7.4 Oil Disposal

Oil collected by all the separators is stored in dedicated containers and transported off site for recovery at authorized centres, in compliance with applicable regulations as indicated in section 2.5. A log of disposal dates and volumes is maintained.

## 3.14 Hydrogeological Regime and Groundwater Quality

which is required by Directive 019 for at-risk facilities.In the Environmental and Social Impact Assessment (Roche, 2011) for the Renard Diamond Project, SWY committed to implementing a groundwater monitoring program, which is required by Directive 019 for at-risk facilities. Groundwater monitoring is also required on the periphery of trench landfill sites (TLSs) under the provisions of Section 65 of the *Regulation respecting the Landfilling and Incineration of Residual Materials* (RLIRM).

The specific objectives of the groundwater monitoring program are to:

- Monitor groundwater levels and quality in the vicinity of at-risk mining facilities, in compliance with Directive 019 (MDDEP, 2012);
- Monitor groundwater levels and quality at the TLS (including the contaminated soil treatment platform) in compliance with the RLIRM;
- Measure the impacts of the drawdown of the water table around the open pits on groundwater quality and level.

### 3.14.1 Sampling Area and Period

To meet these objectives, a network of 39 observation wells (Photo 3.52) is used to cover the entire mine site, the TLS and the airstrip area (Maps 3.13 and 3.14).


**Photo 3.52 Sampling well UWP9-01R (July 31, 2021)**

At least three of these wells were installed around each at-risk facility or sector, with at least one well upstream and two wells downstream.

The wells that were installed or in place prior to 2015 are located in the following five sectors:

- Sector 1
  - Processed kimberlite containment facility area (UWR5): eight wells;
  - Waste rock heap (UWR8): three wells;
  - Pit R65 (UWR4): three wells.
- Sector 2
  - Emulsion storage area in the explosives facility (UWR10): three wells.
- Sector 3
  - Diesel and gasoline storage area (UWR3): three wells;
  - Ore processing plant (UWR1): two wells;

- Garage (UWR2): two wells;
- Temporary ore storage area (UWR9): two wells.

- Sector 4
  - Trench landfill site (TLS) (UWP2): eight wells.
- Sector 5
  - Airstrip area (UWP1): three wells.

Two monitoring campaigns were undertaken in 2021, in Sectors 1, 2, 3 and 5, in the spring high-flow period (June) and in the low-flow period (July–August), while three campaigns took place in Sector 4 (TLS) (an additional campaign in October).

A piezometric water level reading was also performed in all the wells during each campaign (Map 3.15).

### 3.14.2 Regulatory Framework

The groundwater quality criteria used for at-risk facilities are the criteria set out in Directive 019 (MDDEP, 2012), along with some parameters, such as the type of ore, the process, the type of waste, and the activities carried out on the mine site, which were identified as being relevant to the interpretation of the results.

The parameters monitored in the case of the TLS (Sector 4) are those listed in Section 57 of the RLIRM in addition to those specified in Section 66 of the RLIRM, and petroleum hydrocarbons ($C_{10}$-$C_{50}$).

**Photo 3.53 Groundwater sampling at the TLS (June 2021)**

All 2021 analytical results were compared with local geochemical background levels and the resurgence and sewer seepage criteria set out in MELCC's soil protection and contaminated site rehabilitation guide (*Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés*; Beaulieu, 2019).

Local geochemical background levels were determined in the groundwater background levels study (baseline) conducted at the Renard project site (Norda Stelo, 2017d).

Note that even before the start-up of mining operations, groundwater background levels measured at the Renard mine site between 2010 and 2016 were already naturally higher than the MELCC's resurgence water quality criteria. As recommended by government institutions, the resurgence criteria or the background level—whichever is higher—was used to compare the results in tables 3.26 to 3.30 to the criteria.

### 3.14.3 Results

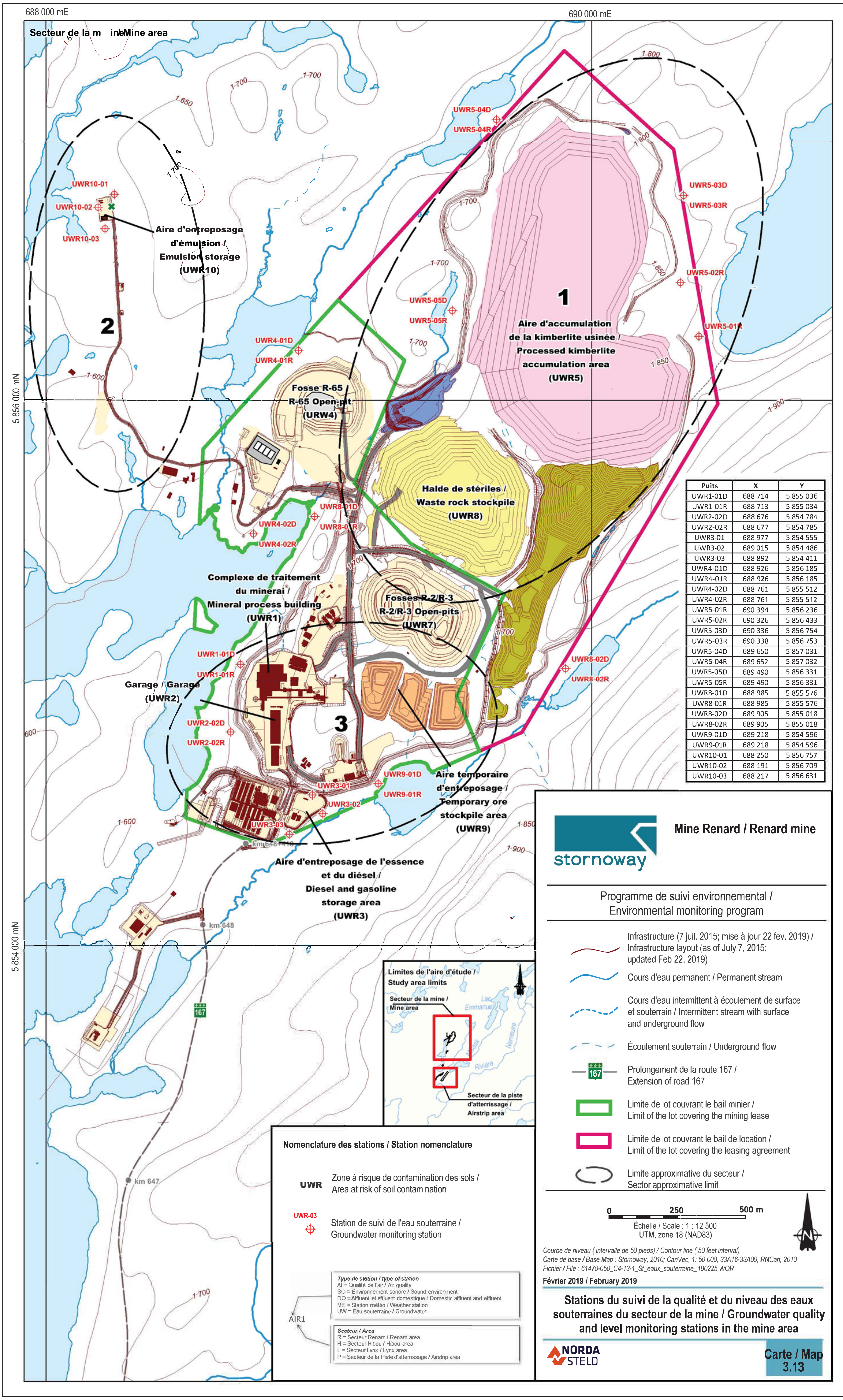
Descriptive statistics for the analytical results for the entire mine site (Sectors 1 to 5) in 2021 are shown in tables 3.26 to 3.30.

Depending on the sector, natural background levels measured in groundwater (Norda Stelo, 2017d) exceed the resurgence criteria prescribed by the MELCC (Beaulieu, 2019) for certain metals, such as copper, nickel, zinc or manganese.

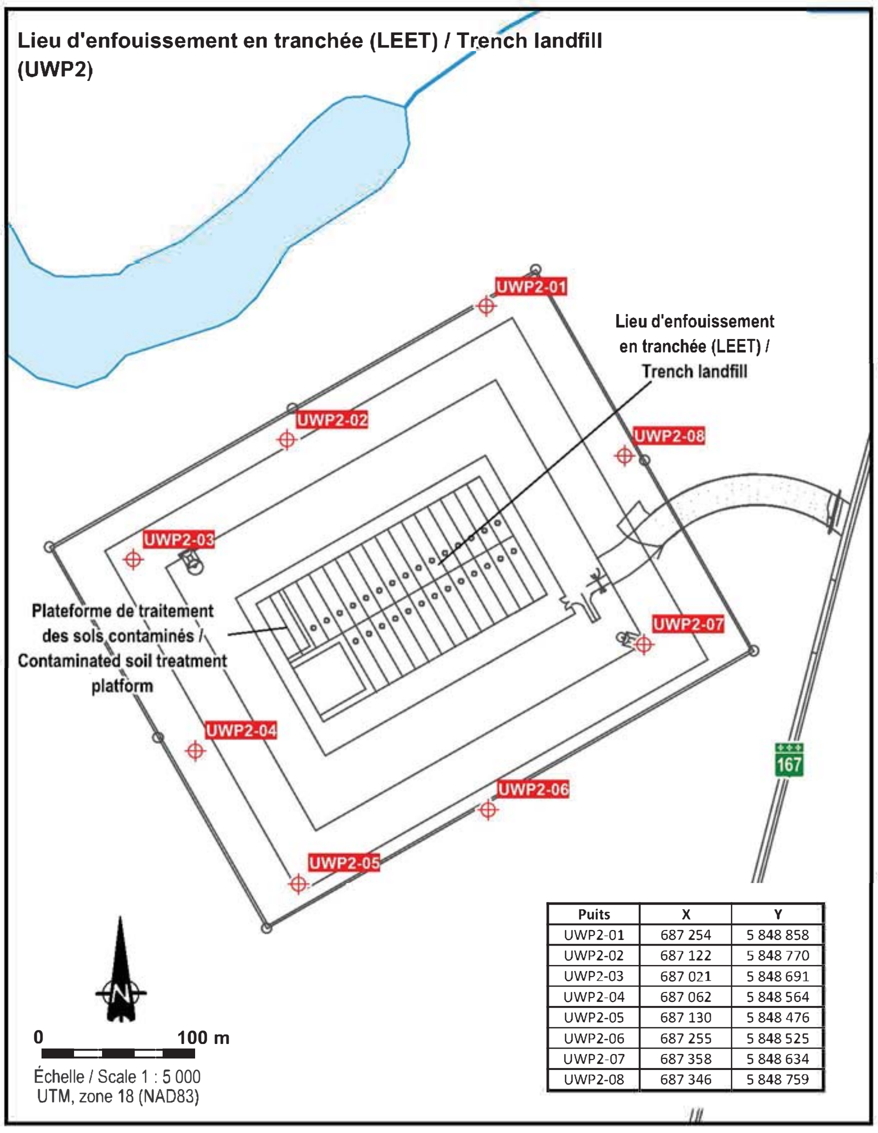
In fact, in 2021, depending on the sector and the type of substrate, the mean concentrations of certain parameters are higher than the local background levels, and therefore the applicable criteria.

#### 3.14.3.1 Sector 1

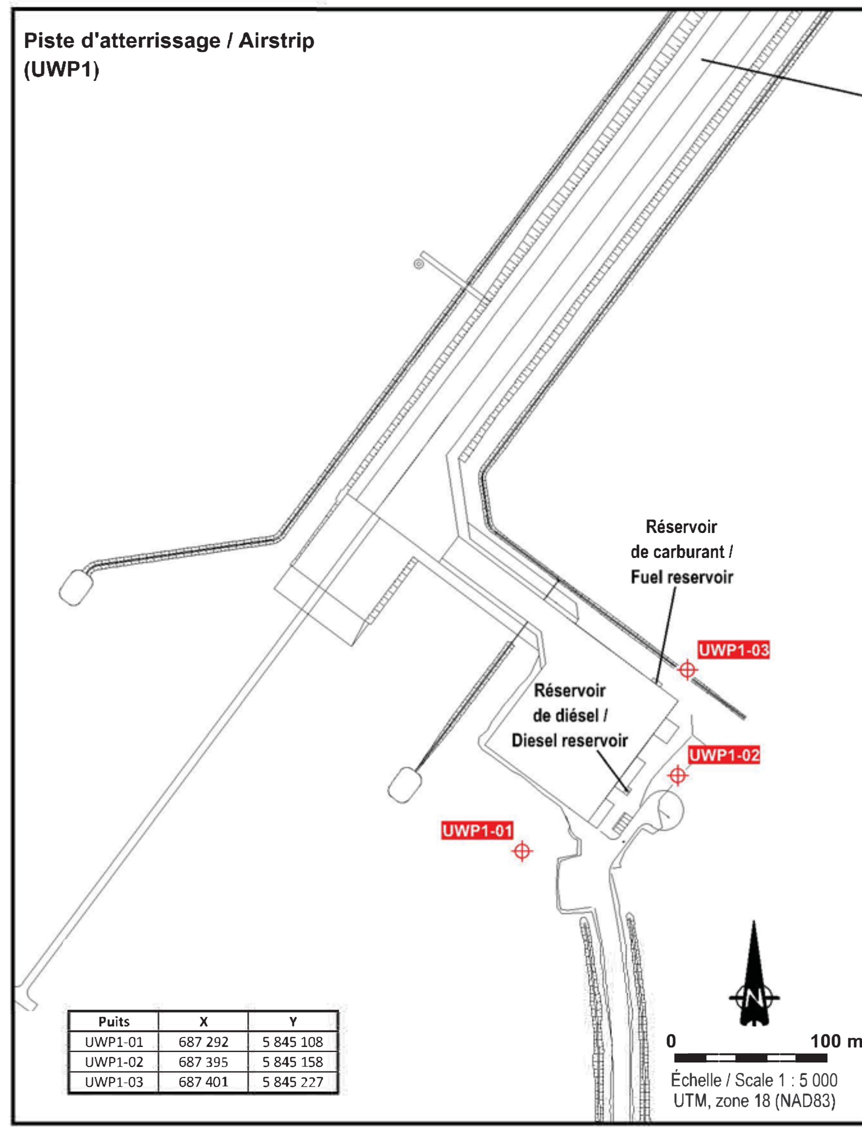
In the bedrock in Sector 1, certain metals and minerals exceeded the criteria in 2021. A rising trend is observed over the years for a few parameters. However, the two parameters that exceed the resurgence criteria (copper and nickel) are naturally present in high quantities in the regional geochemical background.



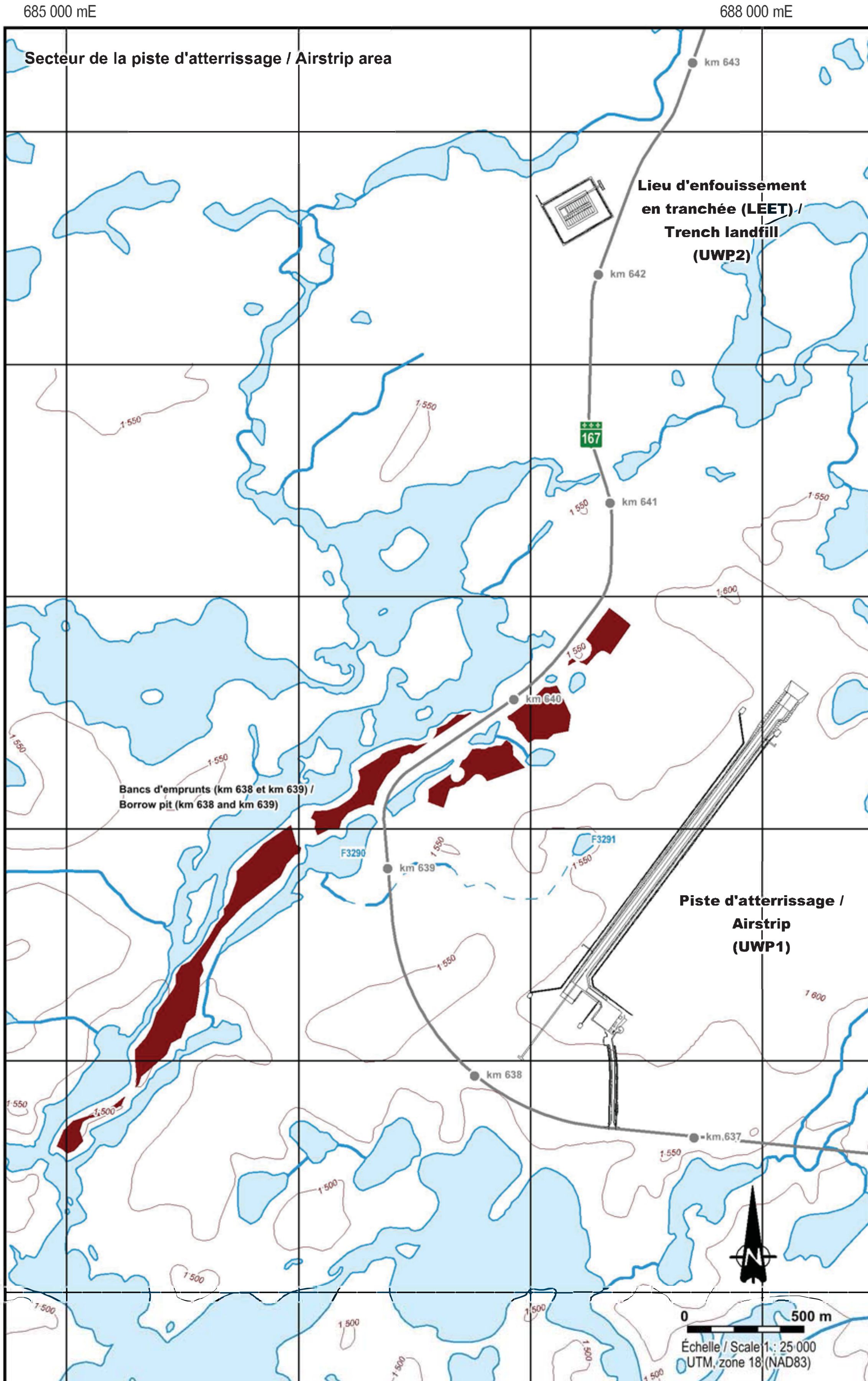

| Puits | X | Y |
|---|---|---|
| UWR1-01D | 688 714 | 5 855 036 |
| UWR1-01R | 688 713 | 5 855 034 |
| UWR2-02D | 688 676 | 5 854 784 |
| UWR2-02R | 688 677 | 5 854 785 |
| UWR3-01 | 688 977 | 5 854 555 |
| UWR3-02 | 689 015 | 5 854 486 |
| UWR3-03 | 688 892 | 5 854 411 |
| UWR4-01D | 688 926 | 5 856 185 |
| UWR4-01R | 688 926 | 5 856 185 |
| UWR4-02D | 688 761 | 5 855 512 |
| UWR4-02R | 688 761 | 5 855 512 |
| UWR5-01R | 690 394 | 5 856 236 |
| UWR5-02R | 690 326 | 5 856 433 |
| UWR5-03D | 690 336 | 5 856 754 |
| UWR5-03R | 690 338 | 5 856 753 |
| UWR5-04D | 689 650 | 5 857 031 |
| UWR5-04R | 689 652 | 5 857 032 |
| UWR5-05D | 689 490 | 5 856 331 |
| UWR5-05R | 689 490 | 5 856 331 |
| UWR8-01D | 688 985 | 5 855 576 |
| UWR8-01R | 688 985 | 5 855 576 |
| UWR8-02D | 689 905 | 5 855 018 |
| UWR8-02R | 689 905 | 5 855 018 |
| UWR9-01D | 689 218 | 5 854 596 |
| UWR9-01R | 689 218 | 5 854 596 |
| UWR10-01 | 688 250 | 5 856 757 |
| UWR10-02 | 688 191 | 5 856 709 |
| UWR10-03 | 688 217 | 5 856 631 |

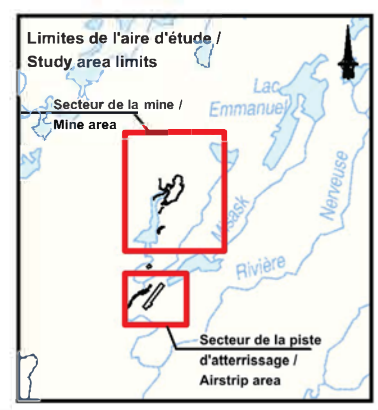



| Puits | X | Y |
|---|---|---|
| UWP2-01 | 687 254 | 5 848 858 |
| UWP2-02 | 687 122 | 5 848 770 |
| UWP2-03 | 687 021 | 5 848 691 |
| UWP2-04 | 687 062 | 5 848 564 |
| UWP2-05 | 687 130 | 5 848 476 |
| UWP2-06 | 687 255 | 5 848 525 |
| UWP2-07 | 687 358 | 5 848 634 |
| UWP2-08 | 687 346 | 5 848 759 |




| Puits | X | Y |
|---|---|---|
| UWP1-01 | 687 292 | 5 845 108 |
| UWP1-02 | 687 395 | 5 845 158 |
| UWP1-03 | 687 401 | 5 845 227 |




stornoway

**Mine Renard / Renard mine**

Programme de suivi environnemental / Environmental monitoring program

Infrastructure (24 sept. 2014; mise à jour 15 jan. 2016) / Infrastructure layout (as of Sept. 24, 2014; updated Jan. 15, 2016)

Cours d'eau permanent / Permanent stream

Limite approximative du secteur

**Nomenclature des stations / Station nomemclature**

UWP — Zone à risque de contamination des sols / Area at risk of soil contamination

UWP1 — Station de suivi de l'eau souterraine / Groundwater monitoring station

AIR1

*Type de station / type of station*
AI = Qualité de l'air / Air quality
SO = Environnement sonore / Sound environment
DO = Affluent et effluent domestique / Domestic affluent and effluent
ME = Station météo / Weather station
UW = Eau souterraine / Groundwater

*Secteur / Area*
R = Secteur Renard / Renard area
H = Secteur Hibou / Hibou area
L = Secteur Lynx / Lynx area
P = Secteur de la Piste d'atterrissage / Airstrip area

*Courbe de niveau ( intervalle de 50 pieds) / Contour line ( 50 feet interval)*
*Carte de base / Base Map : Stornoway, 2010; CanVec, 1: 50 000, 33A16-33A09, RNCan, 2010*
*Fichier / File : 61470-050_C4-13-2_Loc st eau souter aero_190410.WOR*

**Avril 2019 / April 2019**

**Stations du suivi de la qualité et du niveau des eaux souterraines du secteur de la piste d'atterrissage / Groundwater quality and level monitoring stations in the airstrip area**

NORDA STELO

**Carte / Map 3.14**

In the bedrock, although some values exceed the applicable criteria, all averages are below them (Table 3.21). However, there is an upward trend for sodium, barium and manganese.

Note that the mean concentrations of copper, nickel and zinc in the 2021 well in bedrock downstream of the MPKC are lower than those in 2020, although they are still higher than those in the wells upstream of the MPKC.

Increases in the concentration of metals such as copper, nickel and zinc were anticipated in the 2011 impact assessment (Roche, 2011a), specifically for the MPKC sector (Golder, 2011c). The concentration of these metals measured in well UWR5-05R, initially below the local background level, increased as anticipated. After reaching a peak in 2018, these concentrations are now at similar or lower levels.

SWY will continue to pay special attention to changes in these metal concentrations in the wells surrounding the MPKC facility in future monitoring campaigns.

Increases in conductivity and concentrations for some ions were noted in 2021 in bedrock (UWR5-04R: bicarbonates and lead; UWR5-05R: barium) and in surface deposits (UWR5-04D: aluminum, bicarbonates and potassium; UWR5-05D: calcium, bicarbonates, potassium and magnesium) downstream of the MPKC. Most of the other parameters returned almost to 2019 values.

These variations could be due to the reworking of the soils and the addition of granular materials (coarse processed kimberlite) carried out during usual work at the MPKC. In addition, the exposure of these materials to precipitation and snowmelt in the spring may have led to the initial leaching of elements present on their surface as reported by Golder (2012) for overburden and mine waste rock. If this is the case, then concentrations of these ions should eventually decline over time.

#### 3.14.3.2 Sectors 2, 3 and 5

In 2021, no major issues seem to have affected the groundwater in sectors 2, 3 (bedrock and surface deposits) and 5, respectively the emulsion storage area in the explosives facility, the mine infrastructure and the airstrip. Some parameters increased in 2021 as compared to 2020, which can be explained by the limited activity at the mine site in 2020, an unusual year. However, other parameters such as lead, manganese and aluminum decreased and returned to similar or lower levels than in 2019.

During the impact study (Roche, 2011a), high concentrations of metals such as nickel were anticipated. In 2010, relatively high levels were found in the bedrock for some parameters, notably manganese, nickel, sulfides and barium, suggesting that naturally high levels were already present in the water contained in the rock formations rather than in contamination from anthropogenic activities (Roche, 2011a).

The same is true for some metals such as aluminum, which already had levels above the resurgence criteria in 2010 in surface deposits (Roche, 2011a). It is therefore not surprising to observe high levels for some of these parameters in sectors 2, 3 and 5 in 2021 (tables 3.22, 3.23 and 3.25). Finally, in 2021, there were no detectable concentrations of petroleum hydrocarbons in these areas.

In 2020, the snow management procedure in Sector 3 was modified to avoid disturbing the ground near the wells. However, this did not lead to a widespread reduction in contaminants. In fact, among 19 parameters, 10 increased and seven decreased between 2020 and 2021. The parameters that decreased include metals (lead, manganese, nickel, aluminum, chromium and copper) and bicarbonates, while the parameters that increased include other metals such as zinc and barium, ions (sulfates, potassium, sodium, magnesium and calcium), and conductivity.

#### 3.14.3.3 Sector 4

In sector 4 (TLS), the quality of groundwater samples, collected since 2015, remained good (Table 3.24). The 2021 results indicated mean concentrations generally below the applicable RLIRM standards. Some parameters increased, indicating increased use of the TLS since activities restarted in 2020.

In 2021, there was increased organic matter in the water, as showed by increased BOD5 and COD in the monitoring that year. Lastly, higher levels of iron and manganese in 2021 may be due to different snow management at the TLS in winter 2020–2021.

### 3.14.4 Piezometric Levels

One of the objectives of groundwater monitoring is to measure the effects of the drawdown of the water table in the bedrock around the open pits on groundwater levels. Piezometric water level readings modelled in 2017 (Golder, 2017) were compared with values measured in the field as part of various campaigns undertaken from 2017 to 2021 (Map 3.14).

For comparison purposes, the piezometric values at the site of each of the observation wells were extracted from Golder's digital model (2017) for each of the reference years. Comparisons were made among the wells in the bedrock in sectors 1 and 3 only, since the other sectors are not expected to be impacted by the drawdown of groundwater (Norda Stelo, 2020b).

The piezometric levels measured in the two 2021 campaigns indicated that water levels generally remained stable as compared with levels measured in previous years. These levels are also consistent with those modelled by Golder in 2017 as part of the latest version of the hydrogeological study.

Water levels in Sectors 1, 2 and 5 (the accumulation areas and the R65 pit, the emulsion storage area in the explosives facility, and the airstrip), have been relatively stable in relation to levels measured in previous years.

In Sector 1, water levels observed are similar to those modelled by Golder (2017) for the wells in the sector.

In Sector 3, the mining infrastructure area, comparing actual water levels with those modelled by Golder (2017) shows a strong similarity between the two. Groundwater levels in bedrock have decreased in wells UWR1-01R and UWR2-02R.

Note that the 2011 impact assessment (Roche, 2011a) had predicted a decline in piezometric levels, and that it would have a negligible effect on the Lake Lagopede watershed overall (Roche, 2011a).

Finally, water level measurements at the TLS (Sector 4) point to some seasonal variations of about one metre, depending on the monitoring campaign. The direction of flow in this sector is not, however, affected by these variations.

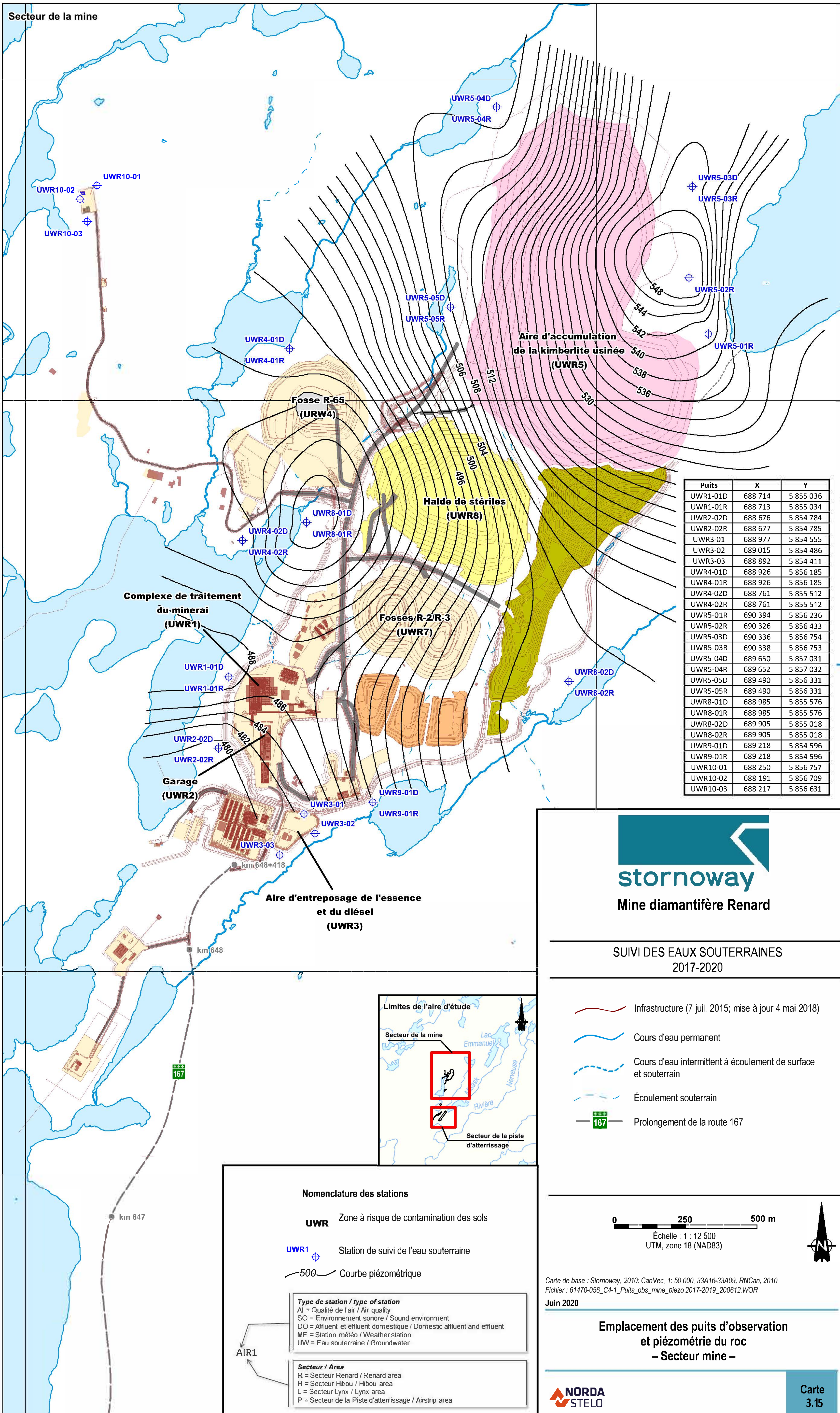
Piezometric water levels will continue to be monitored in 2022 in order to check whether they continue to be compliant and follow the trends modelled by Golder (2017) throughout the full life of the mine.

### 3.14.5 2022 Monitoring

In 2022, the recommendations outlined below will improve the effectiveness of groundwater level and quality monitoring at the Renard mine, facilitate the processing and interpretation of the data collected, and detect the impacts of mine activities on groundwater more precisely (Norda Stelo, 2020b).

The recommendations are as follows:

- Continue to monitor snow disposal sites during the winter in order to minimize contamination of the wells in Sectors 1, 2 and 3;
- Ensure the Renard mine ESMP is updated whenever changes are made to applicable criteria set out in the soil protection and contaminated site rehabilitation guide (*Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés*; Beaulieu, 2019);
- Pay special attention to quality assurance/quality control (QA/QC) during sample collection, especially at the TLS, regarding fecal coliform testing;
- Confirm (or disprove) the theory that the drop in piezometric levels in certain wells (UWR5) is tied to the winter low-flow period.




| Puits | X | Y |
|---|---|---|
| UWR1-01D | 688 714 | 5 855 036 |
| UWR1-01R | 688 713 | 5 855 034 |
| UWR2-02D | 688 676 | 5 854 784 |
| UWR2-02R | 688 677 | 5 854 785 |
| UWR3-01 | 688 977 | 5 854 555 |
| UWR3-02 | 689 015 | 5 854 486 |
| UWR3-03 | 688 892 | 5 854 411 |
| UWR4-01D | 688 926 | 5 856 185 |
| UWR4-01R | 688 926 | 5 856 185 |
| UWR4-02D | 688 761 | 5 855 512 |
| UWR4-02R | 688 761 | 5 855 512 |
| UWR5-01R | 690 394 | 5 856 236 |
| UWR5-02R | 690 326 | 5 856 433 |
| UWR5-03D | 690 336 | 5 856 754 |
| UWR5-03R | 690 338 | 5 856 753 |
| UWR5-04D | 689 650 | 5 857 031 |
| UWR5-04R | 689 652 | 5 857 032 |
| UWR5-05D | 689 490 | 5 856 331 |
| UWR5-05R | 689 490 | 5 856 331 |
| UWR8-01D | 688 985 | 5 855 576 |
| UWR8-01R | 688 985 | 5 855 576 |
| UWR8-02D | 689 905 | 5 855 018 |
| UWR8-02R | 689 905 | 5 855 018 |
| UWR9-01D | 689 218 | 5 854 596 |
| UWR9-01R | 689 218 | 5 854 596 |
| UWR10-01 | 688 250 | 5 856 757 |
| UWR10-02 | 688 191 | 5 856 709 |
| UWR10-03 | 688 217 | 5 856 631 |

stornoway

Mine diamantifère Renard

SUIVI DES EAUX SOUTERRAINES
2017-2020

Infrastructure (7 juil. 2015; mise à jour 4 mai 2018)
Cours d'eau permanent
Cours d'eau intermittent à écoulement de surface et souterrain
Écoulement souterrain
167 Prolongement de la route 167

**Nomenclature des stations**

UWR Zone à risque de contamination des sols
UWR1 Station de suivi de l'eau souterraine
500 Courbe piézométrique

*Type de station / type of station*
AI = Qualité de l'air / Air quality
SO = Environnement sonore / Sound environment
DO = Affluent et effluent domestique / Domestic affluent and effluent
ME = Station météo / Weather station
UW = Eau souterraine / Groundwater

AIR1

*Secteur / Area*
R = Secteur Renard / Renard area
H = Secteur Hibou / Hibou area
L = Secteur Lynx / Lynx area
P = Secteur de la Piste d'atterrissage / Airstrip area

0 250 500 m
Échelle : 1 : 12 500
UTM, zone 18 (NAD83)

*Carte de base : Stornoway, 2010; CanVec, 1: 50 000, 33A16-33A09, RNCan, 2010*
*Fichier : 61470-056_C4-1_Puits_obs_mine_piezo 2017-2019_200612.WOR*

Juin 2020

**Emplacement des puits d'observation et piézométrie du roc – Secteur mine –**

NORDA STELO

Carte 3.15

**Table 3.26 Descriptive statistics for groundwater quality in Sector 1 (Modified Processed Kimberlite Containment Facility) in 2021**

| Parameter | Unit | Sector 1 – Mine – Surface Deposits (n=13) | | | Sector 1 – Mine – Bedrock (n=18) | | |
|---|---|---|---|---|---|---|---|
| | | Applicable Standard | Origin of Standard (*) | Median | Applicable Standard | Origin of Standard (*) | Median |
| **Organic Compounds** | | | | | | | |
| Petroleum hydrocarbons ($C_{10}$-$C_{50}$) | mg/L | 2.8 | R | <0.1 | 2.8 | R | <0.1 |
| **Basic Physical-Chemical Characteristics** | | | | | | | |
| Conductivity | µS/cm | - | - | *30.2* | - | - | 54.6 |
| pH | pH units | - | - | 6.65 | - | - | 7.05 |
| **Major Ions** | | | | | | | |
| Bicarbonates ($HCO_3^-$) | mg/L $CaCO_3$ | 50 | F | *8.5* | 94 | F | 29 |
| Chlorides ($Cl^-$) | mg/L | 860 | R | 0.14 | 860 | R | 0.25 |
| Sulfates ($SO_4^{2-}$) | mg/L | 19.2 | F | 2.1 | 512 | F | 2.9 |
| Calcium ($Ca^{2+}$) | mg/L | 19.885 | F | *2.4* | 59.4 | F | 8.9 |
| Magnesium ($M^{2+}$) | mg/L | 3.61 | F | 0.37 | 2.94 | F | 1.8 |
| Potassium ($K^+$) | mg/L | 5.865 | F | 0.41 | 109.6 | F | 1.4 |
| Sodium ($Na^+$) | mg/L | 10.6 | F | *1.1* | 52 | F | *1.9* |
| **Dissolved Metals and Metalloids** | | | | | | | |
| Aluminum (Al) | mg/L | 0.892 | F | 0.016 | 0.653 | F | 0.033 |
| Silver (Ag) | mg/L | 0.00004 | R | <0.00010 | 0.00004 | R | <0.00010 |
| Arsenic (As) | mg/L | <0.002 | F | <0.00030 | 0.002 | F | <0.0003 |
| Barium (Ba) | mg/L | 0.028 | R | *0.008* | 0.042 | F | *0.0105* |
| Chromium (Cr) | mg/L | 0.0072 | F | <0.00050 | 0.048 | F | <0.0005 |
| Copper (Cu) | mg/L | 0.0016 | R | **0.0029** | 0.0016 | R | 0.00115 |
| Iron (Fe) | mg/L | 2.908 | F | <0.06 | 1.46 | F | 0.06 |
| Manganese (Mn) | mg/L | 0.255 | F | 0.029 | 0.091 | F | *0.034* |
| Nickel (Ni) | mg/L | 0.0067 | R | ***0.0069*** | 0.0067 | R | 0.00415 |
| Lead (Pb) | mg/L | 0.00036 | F | <0.00010 | 0.001 | F | <0.00010 |
| Zinc (Zn) | mg/L | 0.017 | R | 0.0072 | 0.017 | F | 0.00515 |

R Resurgence criteria (Beaulieu, 2019)
F Natural background level values in target sector (Norda Stelo, 2017d)
**in bold** Value exceeds applicable standard
*in italics* Upward trend

**Table 3.27 Descriptive statistics for groundwater quality in Sector 2 (emulsion storage area in the explosives facility) in 2021**

| Parameter | Unit | Sector 2 – Mine – Surface Deposits (n=6) | | | |
|---|---|---|---|---|---|
| | | Applicable Standard | Origin of Standard (*) | Number of Values > Standard | Median |
| **Organic Compounds** | | | | | |
| Petroleum hydrocarbons (C10-C50) | mg/L | 2.8 | R | 0 | <0.1 |
| **Basic Physical-Chemical Characteristics** | | | | | |
| Conductivity | µS/cm | - | - | - | *54.2* |
| pH | pH units | - | - | - | 5.98 |
| **Major Ions** | | | | | |
| Bicarbonates ($HCO_3^-$) | mg/L-CaCO3 | 57 | F | 0 | *12* |
| Chlorides ($Cl^-$) | mg/L | 860 | R | 0 | 0.2 |
| Sulfates ($SO4^{2-}$) | mg/L | 18 | F | 2 | *7.8* |
| Calcium ($Ca^{2+}$) | mg/L | 12.7 | F | 2 | *5.8* |
| Magnesium ($M^{2+}$) | mg/L | 2.7 | F | 0 | *0.58* |
| Potassium ($K^+$) | mg/L | 13.72 | F | 0 | 1.12 |
| Sodium ($Na^+$) | mg/L | 9.8 | F | 0 | 1.05 |
| **Dissolved Metals and Metalloids** | | | | | |
| Aluminum (Al) | mg/L | 1.135 | F | 0 | 0.108 |
| Silver (Ag) | mg/L | 0.00004 | R | 0 | <0.00010 |
| Arsenic (As) | mg/L | 0.0055 | F | 0 | <0.00030 |
| Barium (Ba) | mg/L | 0.075 | F | 0 | *0.0225* |
| Chromium (Cr) | mg/L | 0.0022 | F | 0 | 0.000515 |
| Copper (Cu) | mg/L | 0.0016 | R | 2 | 0.0014 |
| Iron (Fe) | mg/L | 37 | F | 0 | *0.195* |
| Manganese (Mn) | mg/L | 0.6 | R | 0 | 0.046 |
| Nickel (Ni) | mg/L | 0.0018 | F | 5 | **0.003** |
| Lead (Pb) | mg/L | 0.0021 | F | 0 | 0.000135 |
| Zinc (Zn) | mg/L | 0.017 | R | 0 | 0.00665 |

| | |
|---|---|
| R | Resurgence criteria (Beaulieu, 2019) |
| F | Natural background level values in target sector (Norda Stelo, 2017d) |
| **in bold** | Value exceeds applicable standard |
| *in italics* | Upward trend |

**Table 3.28 Descriptive statistics for groundwater quality in Sector 3 (gasoline and diesel fuel depot) in 2021**

| Parameter | Unit | Sector 3 – Process Plant and Fuel Depot – Surface Deposits (n=12) | | | | Sector 3 – Process Plant and Fuel Depot – Bedrock (n=6) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Applicable Standard | Origin of Standard (*) | No. of values > standard | Median | Applicable Standard | Origin of Standard (*) | No. of values > standard | Median |
| **Organic Compounds** | | | | | | | | | |
| Petroleum hydrocarbons ($C_{10}$-$C_{50}$) | mg/L | 2.8 | R | 0 | <0.1 | 2.8 | R | 0 | <0.1 |
| **Basic Physical-Chemical Characteristics** | | | | | | | | | |
| Conductivity | µS/cm | - | - | - | 183.9 | - | - | - | 360.4 |
| pH | pH units | - | - | - | 6.24 | - | - | - | 7.17 |
| **Major Ions** | | | | | | | | | |
| Bicarbonates ($HCO_3$-) | mg/L $CaCO_3$ | 62 | F | 2 | 34 | 74 | F | 1 | 62.5 |
| Chlorides (Cl-) | mg/L | 860 | R | 0 | 22 | 860 | R | 0 | *23.2* |
| Sulfates (SO42-) | mg/L | 9.3 | F | 10 | ***64*** | 27 | F | 4 | ***106*** |
| Calcium (Ca2+) | mg/L | 16.55 | F | 10 | ***30*** | 29.52 | F | 4 | ***50*** |
| Magnesium (Mg2+) | mg/L | 2.495 | F | 12 | ***5.4*** | 3.77 | F | 4 | ***8.2*** |
| Potassium (K+) | mg/L | 2.89 | F | 8 | **3.2** | 14.76 | F | 0 | *3.2* |
| Sodium (Na+) | mg/L | 7.16 | F | 11 | ***15.5*** | 31.05 | F | 2 | *27.5* |
| **Dissolved Metals and Metalloids** | | | | | | | | | |
| Aluminum (Al) | mg/L | 0.122 | F | 0 | 0.027 | 1.449 | F | 0 | *0.014* |
| Silver (Ag) | mg/L | 0.00004 | R | 0 | <0.0001 | 0.00004 | R | 0 | <0.0001 |
| Arsenic (As) | mg/L | <0.001 | F | 2 | 0.0003 | 0.0062 | F | 0 | <0.00030 |
| Barium (Ba) | mg/L | 0.03 | F | 8 | ***0.054*** | 0.036 | F | 3 | ***0.05*** |
| Chromium (Cr) | mg/L | <0.005 | F | 0 | <0.00050 | 0.009 | F | 0 | <0.00050 |
| Copper (Cu) | mg/L | 0.0016 | R | 4 | 0.0009 | 0.0016 | R | 2 | <0.00050 |
| Iron (Fe) | mg/L | 2.01 | F | 6 | *1.96* | 1.384 | F | 0 | <0.06 |
| Manganese (Mn) | mg/L | 0.6 | R | 4 | 0.1475 | 0.171 | F | 2 | *0.0218* |
| Nickel (Ni) | mg/L | 0.0067 | R | 7 | ***0.0083*** | 0.0067 | R | 4 | **0.0072** |
| Lead (Pb) | mg/L | 0.0044 | R | 0 | <0.00010 | 0.0044 | R | 0 | <0.00010 |
| Zinc (Zn) | mg/L | 0.017 | R | 1 | *0.0092* | 0.017 | R | 0 | *0.0063* |

R Resurgence criteria (Beaulieu, 2019)
F Natural background level values in target sector (Norda Stelo, 2017d)
**in bold** Value exceeds applicable standard
*in italics* Upward trend

**Table 3.29 Descriptive statistics for groundwater quality in Sector 4 (trench landfill site) in 2021**

| Parameter | Unit | Sector 4 – TLS – Surface Deposits (n=24) | | | |
|---|---|---|---|---|---|
| | | Applicable Standard | Origin of Standard (*) | No. of values > standard | Median |
| **Organic Compounds (Integrating Parameter)** | | | | | |
| Petroleum hydrocarbons (C10-C50) | mg/L | 2.8 | R | 0 | <0.1 |
| **Basic Physical-Chemical Characteristics** | | | | | |
| Conductivity | µS/cm | - | - | - | *33* |
| pH | pH units | - | - | - | 6.3 |
| COD5 | mg/L-O2 | <4 | F | 3 | *2.7* |
| COD | mg/L-O2 | 65 | F | 2 | 5 |
| **Major Ions and Nutrients** | | | | | |
| Chlorides (Cl-) | mg/L | 1.4 | R | 3 | 0.42 |
| Sulfates (SO42-) | mg/L | 7.8 | F | 0 | 0.97 |
| Total sulfides (S2-) | mg/L-S2- | 0.05 | M | 0 | <0.02 |
| Total cyanides (CN-) | mg/L-CN | 0.004 | F | 0 | <0.003 |
| Ammoniacal nitrogen (N-NH3) | mg/L-N | 0.27 | F | 0 | <0.02 |
| Nitrates-Nitrites (N-NO3--NO2-) | mg/L-N | 0.22 | F | 3 | *0.088* |
| Sodium (Na+) | mg/L | 3.52 | F | 3 | 1.35 |
| **Metals and Metalloids** | | | | | |
| Boron (B) | mg/L | 0.028 | R | 1 | <0.02 |
| Cadmium (Cd) | mg/L | <0.0002 | F | 0 | <0.0002 |
| Chromium (Cr) | mg/L | 0.0006 | F | 16 | ***0.00205*** |
| Copper (Cu) | mg/L | 0.0016 | R | 2 | 0.00051 |
| Iron (Fe) | mg/L | 0.138 | F | 4 | 0.06 |
| Manganese (Mn) | mg/L | 0.05 | M | 7 | *0.00475* |
| Mercury (Hg) | mg/L | <0.0001 | F | 1 | <0.0001 |
| Nickel (Ni) | mg/L | 0.0067 | R | 3 | 0.001 |
| Lead (Pb) | mg/L | 0.0003 | F | 1 | <0.0001 |
| Zinc (Zn) | mg/L | 0.017 | R | 0 | <0.005 |
| **Bacteriological** | | | | | |
| Fecal coliforms | CFU/100 ml | - | - | - | 0 |
| **Volatile Organic Compounds** | | | | | |
| Benzene | mg/L | 0.95 | R | 0 | <0.0002 |
| Ethylbenzene | mg/L | 0.16 | R | 0 | <0.0001 |
| Toluene | mg/L | 0.2 | R | 0 | <0.001 |
| Xylenes (o, m, p) | mg/L | 0.37 | R | 0 | <0.0004 |
| **Phenol Compounds** | | | | | |
| ***Non-Chlorinated*** | | | | | |
| o-Cresol | mg/L | 0.74 | R | 0 | <0.0010 |
| m-Cresol | mg/L | - | - | - | - |
| p-Cresol | mg/L | 0.23 | R | 0 | <0.001 |
| 2,4-Dimethylphenol | mg/L | 1.3 | R | 0 | <0.00060 |
| 4-Nitrophenol | mg/L | 0.94 | R | 0 | <0.001 |
| Phenol | mg/L | 3.4 | R | 0 | <0.00060 |
| ***Chlorinated*** | | | | | |
| 2,3,4,6-Tetrachlorophenol | mg/L | 0.011 | R | 0 | <0.00040 |
| 2,3,5,6-Tetrachlorophenol | mg/L | 0.0085 | R | 0 | <0.00040 |
| 2,3-Dichlorophenol | mg/L | 0.1 | R | 0 | <0.00050 |
| 2,4 + 2,5-Dichlorophenol | mg/L | 0.192* | R | 0 | <0.30 |
| 2,4,5-Trichlorophenol | mg/L | 0.046 | R | 0 | <0.00040 |
| 2,4,6-Trichlorophenol | mg/L | 0.039 | R | 0 | <0.00040 |
| 2,6-Dichlorophenol | mg/L | 0.1 | R | 0 | <0.00040 |
| 2-Chlorophenol | mg/L | 0.1 | R | 0 | <0.00050 |
| 3,4-Dichlorophenol | mg/L | 0.1 | R | 0 | <0.00040 |
| 3,5-Dichlorophenol | mg/L | 0.1 | R | 0 | <0.00040 |

| Parameter | Unit | Sector 4 – TLS – Surface Deposits (n=24) | | | |
|---|---|---|---|---|---|
| | | Applicable Standard | Origin of Standard (*) | No. of values > standard | Median |
| 3-Chlorophenol | mg/L | 0.1 | R | 0 | <0.00050 |
| 4-Chlorophenol | mg/L | 0.1 | R | 0 | <0.00040 |
| Pentachlorophenol | mg/L | 0.0087 | R | 0 | <0.00040 |
| ***Total chlorinated phenolic compounds*** | mg/L | *0.1* | *R* | *0* | *<0.3* |

R Resurgence criteria (Beaulieu, 2019)
F Natural background level values in target sector (Norda Stelo, 2017d)
M Limit values specified in Section 57 of the Regulation respecting the Landfilling and Incineration of Residual Materials (Chapter Q-2, r. 19)
* Addition of standards for 2,4-dichlorophenol and 2,5-dichlorophenol
**in bold** Value exceeds applicable standard
*in italics* Upward trend

**Table 3.30 Descriptive statistics for groundwater quality in Sector 5 (airstrip area) in 2021**

| Parameter | Unit | Sector 5 – Airport – Surface Deposits (n=6) | | | |
|---|---|---|---|---|---|
| | | Applicable Standard | Origin of Standard (*) | Number of values > standard | Median |
| ***Organic Compounds*** | | | | | |
| Petroleum hydrocarbons (C10-C50) | mg/L | 2.8 | R | 0 | <0.1 |
| Ethylene glycol | mg/L | - | - | - | <5.0 |
| Propylene glycol | mg/L | - | - | - | <10 |
| ***Basic Physical-Chemical Characteristics*** | | | | | |
| Conductivity | µS/cm | - | - | - | 68.3 |
| pH | pH units | - | - | - | 5.59 |
| ***Major Ions*** | | | | | |
| Bicarbonates (HCO3-) | mg/L-CaCO3 | 86 | F | 0 | *21* |
| Chlorides (Cl-) | mg/L | 860 | R | 0 | 0.32 |
| Sulfates (SO42-) | mg/L | 16 | F | 0 | 5.5 |
| Calcium (Ca2+) | mg/L | 8.35 | F | 0 | *2.6* |
| Magnesium (Mg2+) | mg/L | 3.025 | F | 0 | 1.3 |
| Potassium (K+) | mg/L | 9.6 | F | 0 | *1.5* |
| Sodium (Na+) | mg/L | 36.15 | F | 0 | 3.3 |
| ***Dissolved Metals and Metalloids*** | | | | | |
| Aluminum (Al) | mg/L | 0.722 | F | 0 | 0.11 |
| Silver (Ag) | mg/L | 0.00004 | R | 1 | <0.00010 |
| Arsenic (As) | mg/L | 0.0054 | F | 0 | <0.0003 |
| Barium (Ba) | mg/L | 0.07 | F | 0 | *0.042* |
| Chromium (Cr) | mg/L | 0.0018 | F | 4 | ***0.00265*** |
| Copper (Cu) | mg/L | 0.0016 | R | 4 | **0.0028** |
| Iron (Fe) | mg/L | 15.95 | F | 2 | *14* |
| Manganese (Mn) | mg/L | 0.6 | R | 2 | 0.44 |
| Nickel (Ni) | mg/L | 0.0067 | R | 5 | ***0.0085*** |
| Lead (Pb) | mg/L | 0.0043 | F | 0 | <0.0001 |
| Zinc (Zn) | mg/L | 0.017 | R | 0 | 0.012 |

R Resurgence criteria (Beaulieu, 2019)
F Natural background level values in target sector (Norda Stelo, 2017d)
**in bold** Value exceeds applicable standard
*in italics* Upward trend

## 3.15 Containment Facilities Monitoring

### 3.15.1 Objective of Monitoring

Inspections of the modified processed kimberlite containment (MPKC) facility are carried out to control the integrity and hence stability of the structure, verify the application of the materials deposition plan, track changes in the structures over time, and identify any maintenance work required to ensure the structure is in good working order.

### 3.15.2 Use of Containment Areas

Every type of material produced during current operations at the Renard Mine site is stored in designated containment areas, in compliance with the deposition plan (Map 3.15). These containment areas include ore heaps, the waste rock heap, the overburden heap and the MPKC facility.

Ore is transported to the ore heap south of pit R2/R3. The ore heap is monitored and inspected to ensure its stability.

Processed ore comes from the ore stockpile accumulated during open pit operations (until April 2019), as well as the underground mine and the ore heap. Overburden is transported to the overburden heap northeast of pit R2/R3. It is monitored and inspected to ensure its stability.

Waste rock is deposited on the waste rock heap north of pit R2/R3. It is monitored and inspected to ensure its stability. Some of the waste rock is also used to build berms at the MPKC facility, in addition to being used for road maintenance and civil engineering work. An estimated 100,000 tonnes of waste rock are crushed annually to meet these requirements.

Waste rock from the plant is transported by truck or pipeline to the MPKC facility. Coarse rock represents 65% of the material produced, whereas fine fraction makes up the remaining 35%. The coarse kimberlite fraction is used to build berms to contain the hydraulically deposited kimberlite (Photo 3.54).


**Photo 3.54 Deposition and compaction of processed kimberlite (coarse fraction) to raise a bearing downstream of the line centre**


| DESSINÉ PAR: A.Dorval | DATE: 2019-01-21 | PROJET: MINE RENARD | Carte / Map 3.16 stornoway | NUMÉRO DE DESSIN: |
|---|---|---|---|---|
| APPROUVÉ PAR: A. Dorval | DATE: | TITRE: SUPERFICIES DES AIRES D'ACCUMULATION | | SUR - 00 - ENV - 000 - SUR - 01 - 04 |
| ÉCHELLE: 1:10 000 | IMPRIMÉ: 2019–03–28 | VUE DE PLAN GÉNÉRAL | | SECTEUR / DISCIPLINE / DÉTAIL / DESCRIPTION / TRAVAIL / SÉQUENCE / RÉVISION |

#### 3.15.2.1 Operational monitoring of tailings

In 2021, an estimated average of 6 500 tonnes of ore was produced daily. The underground mine was in operation on a daily basis for 12 months, from January to December. There was no activity in the open pit. Table 3.31 shows:

- The quantities of material extracted from the underground mine, as well as the ore processed at the plant and the material transported to the MPKC;
- The areas involved and the tonnage of material contained in each stockpile area.

The tailings produced during operations at the Renard Mine site are considered low risk, in accordance with Directive 019. In fact, there is no metal leaching, which was confirmed in lab leachate testing results reported in the environmental and social impact assessment (Roche, 2011a).

The operation, maintenance and surveillance (OMS) manual for the MPKC facility is updated annually. There were two updates in 2021; the first was completed as scheduled in January, and the second was in December 2021.

Various operational procedures were also developed and/or updated in keeping with the OMS and the design consultant's plans and specifications. These updates were read and understood by containment area operators.

#### 3.15.2.2 Inspections and audits

The MPKC facility is subject to monitoring, audits and inspections to ensure the stability of the structure. Various monitoring and visual inspections are carried out on a weekly, quarterly and annual basis, and specific inspections are performed as required.

In 2021, an audit was carried out by the design consultant on May 25–27. The audit confirmed that Stornoway has appropriately managed and monitored the containment area. Various recommendations were issued and incorporated into the post-audit action plan, thereby ensuring gradual improvement in operational and monitoring components.

**Table 3.31 Tonnage of materials extracted and processed in 2021**

| Description | Tonnage (kt) | | |
|---|---|---|---|
| **Materials Extracted** | **Open Pit** | **Underground Mine** | **TOTAL** |
| Stripping (overburden) | 38.0 | 0 | 38.0 |
| Waste rock | 0 | 160.134 | 160.134 |
| Ore | 0 | 3 869.475 | 3 869.475 |
| **TOTAL** | **38.0** | **4 029.609** | **4 067.609** |
| **Ore Processed** | | | |
| Ore | | | **2 458.8467** |
| **Materials Stockpiled in the Modified Processed Kimberlite Containment Facility** | | | |
| Processed waste rock transported by truck (agglomerate and other waste rock) | 0 | 0 | 32.138 |
| Processed kimberlite transported by truck (coarse fraction of the processed kimberlite) | 0 | 0 | 1 620.112 |
| Processed kimberlite (fine fraction) transported hydraulically | 0 | 0 | 834.028 |
| **TOTAL** | **-** | **-** | **2 480.316** |
| **Sterile from the underground mine recovered on site** | | | |
| Sterile used for crushing | 0 | 0 | 93.763 |
| Agglomerate (50–112) used for underground backfill | 0 | 0 | 21.715 |
| **TOTAL** | | | **115.478** |

#### 3.15.2.3 Containment berms

In summer 2021, work required to continue building containment berms was undertaken, including:

- Excavating the overburden;
- Cleaning the bedrock foundation;
- Placing a transition layer of crushed rock between the stone material and the processed kimberlite in the berms.

The height of the berm was raised by two metres in keeping with the increase in the hydraulically placed processed kimberlite. The gradual closure of the berm's slopes began in 2020 for a small portion of the final slope on the west side. Another small part of the final slope on the west side was covered with MG-50 in fall 2021. Significant work to close the slopes is scheduled for the second and third quarters of 2022.

Quality control measures applied in the building of the structures confirmed compliance with design requirements, and corrective measures were put in place in the event any non-compliance was detected. Thus, in 2021, it was possible to correct the non-compliances.

The identified problems mainly involved isolated cases of high water content in the deposited materials. A number of measures were put in place to reduce water content in the material at the source and facilitate water management on site.

In 2022, the plan is to increase the height of the berm by two to three metres. According to current estimates and projected production, MPKC facility #1 will be full by the end of May 2025 for coarse processed kimberlite and one year later for hydraulically placed fine kimberlite (Photo 3.55). Construction on the second processed kimberlite containment facility should begin in the first quarter of 2024.


**Photo 3.55 Fine processed kimberlite beach near an unloading point**

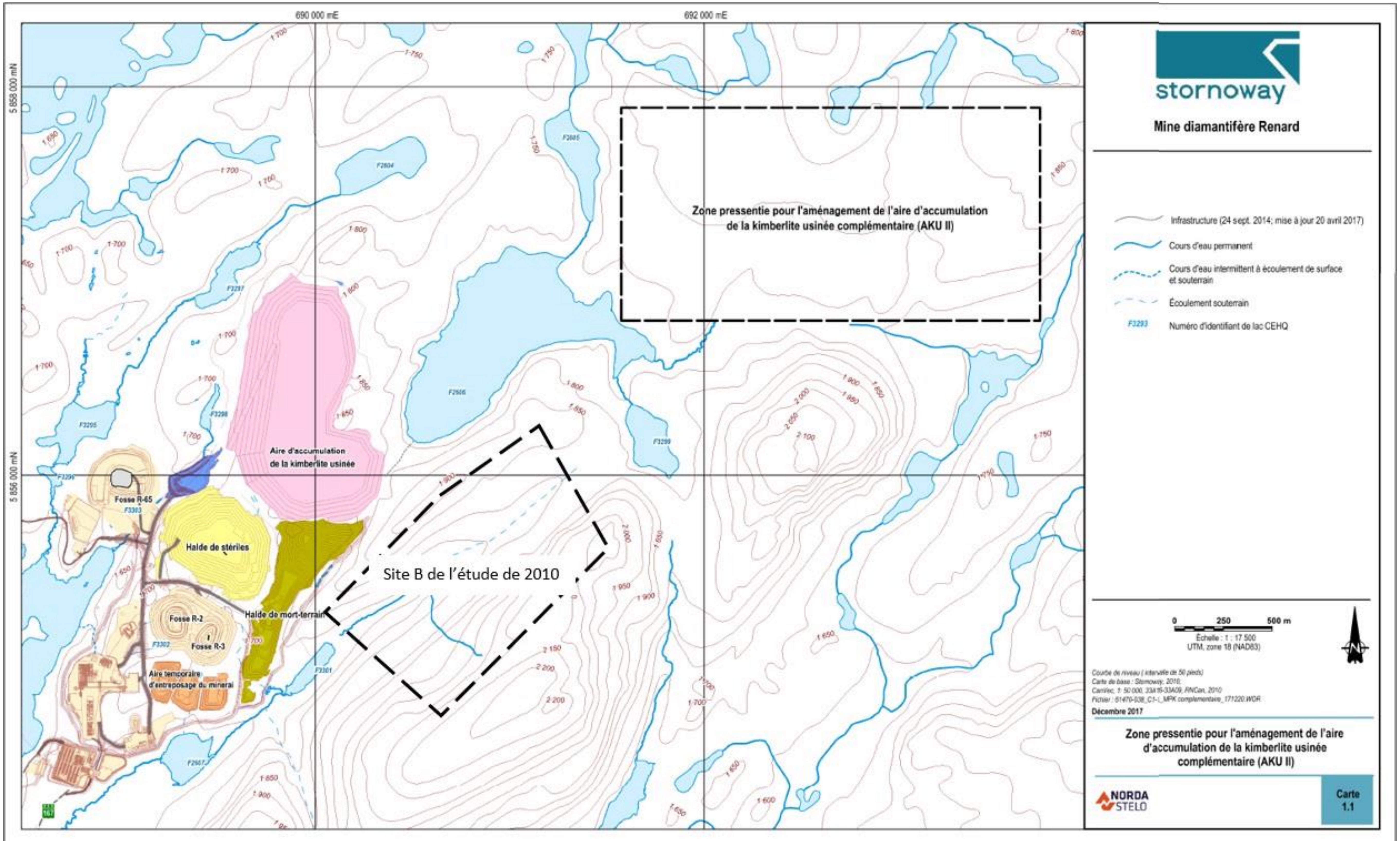
#### 3.15.2.4 Construction of MPKC Facility #2

In November 2021, SWY took the first step in building the second modified processed kimberlite containment facility (or MPKC #2): a site selection study to choose the future location of the MPKC #2. This study was produced in compliance with Environment Canada's requirements and follows the *Guidelines for the assessment of alternatives for mine waste disposal* (ECCC, 2021).

SWY mandated Golder Inc., the engineering firm that designed MPKC #1, to prepare the site selection study in the last quarter of 2021. Three sites are under review as candidates for the next tailings containment facility (Map 3.16). Weighting indicators, placed into four categories (environment, social, technical and economic) and defined according to the *Guidelines*, are being used to evaluate the potential of each site.

In December 2021, Stornoway emailed the list of indicators to the Environment Committee, which represents the Indigenous communities for the Renard Mine. Stornoway is planning the first consultation with the Environment Committee in mid-January 2022 to gather comments and recommendations regarding the site selection study and integrate them into the study. The study should then be submitted to Environment Canada in January 2022. Geotechnical drilling and condemnation work on the selected site is scheduled for winter 2022.

**Map 3.17 Sites under comparative review for the next tailings containment facility at the Renard Mine**



### 3.15.3 Instrument Surveillance

Measuring instruments are installed at the MPKC, including:

- Piezometers, which measure the pressure of liquids, such as interstitial water pressure;
- Thermistors, devices that measure the temperature inside the dam.

The surveillance performed by measuring instruments (piezometers and thermistors) in 2021 confirmed that the water table has remained below design limits.

Also, monitoring the internal temperature of materials in the berm confirmed that it is filtering properly, even in winter, because no freezing conditions were observed except in the case of two instruments near the surface that indicate thawing in summer.

A few instruments were damaged during snow removal operations, and a replacement plan will be established in 2022, if required. For now, the damaged instruments have no impact on the effectiveness of the monitoring since there are other instruments in place nearby.

### 3.15.4 Compliance with CA Requirements

The conditions set in the certificate of authorization (CA) with regard to the MPKC facility have been met. First, a one-metre freeboard was maintained at all times between the summit of the berm and the level of the hydraulically placed kimberlite (condition #11).

Next, a visual marker was maintained to ensure a safe freeboard for working. After the annual increase, new markers are planned for the second quarter of 2022 with the following colour code for the freeboard distance:

- Green: 3-m freeboard;
- Yellow: 2-m freeboard;
- Red: 1-m freeboard.

The stability study will be updated by the design consultant in 2022—i.e. in the fourth year of operation of the containment area, given the shutdown of operations in 2020—in compliance with condition #13.

In June 2022, a geotechnical drilling campaign will be carried out to gather information on the fine and coarse PK deposited since the start of operations. The MPKC facility report and monitoring clearly satisfies condition #14.

### 3.15.5 Air Quality

In 2021, air quality monitoring results confirmed compliance with the standards. In addition, dust emission was minimized by watering roads twice daily on dry days.

### 3.15.6 Water Management System

In 2021, regular visual inspections confirmed that filtered water from the permeable berm was clear. During operations, sediment-laden water is diverted to the peripheral ditches and then treated at the mine wastewater treatment plant.

### 3.15.7 Spills

In 2021, there were no major petroleum spills recorded in the containment areas, just some minor leaks from mechanical failures that were immediately contained and recovered and did not have time to seep into the ground.

### 3.15.8 MPKC Progress

In 2021, coarse and fine processed kimberlite production was stored at the MPKC and placed according to the plans and specifications. Figures 3.23 and 3.26 demonstrate the progress before and after depositing the processed kimberlite and provide a visual overview of the progress of the MPKC. The dark blue area in Figure 3.23 represents the coarse processed kimberlite (CPK) that was placed in 2021 and the light blue area represents the fine fraction processed kimberlite (FPK) that was also deposited in the MPKC in 2021. Thus, the height of the MPKC had to be raised by three metres to follow the progress of the fine processed kimberlite. The coarse discharge was used to begin construction on the eastern extension. The rest of the CPK was used to raise the slopes downstream of the berm to reinforce the structure.

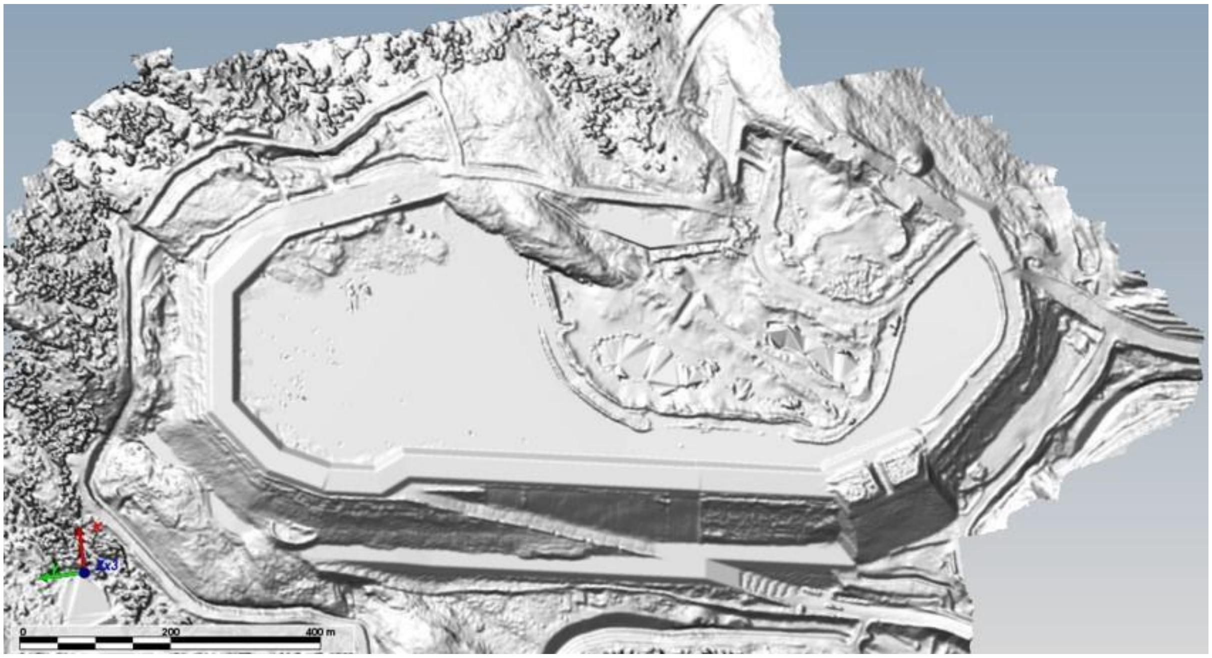



**Figure 3.23 MPKC topography on January 1, 2021**

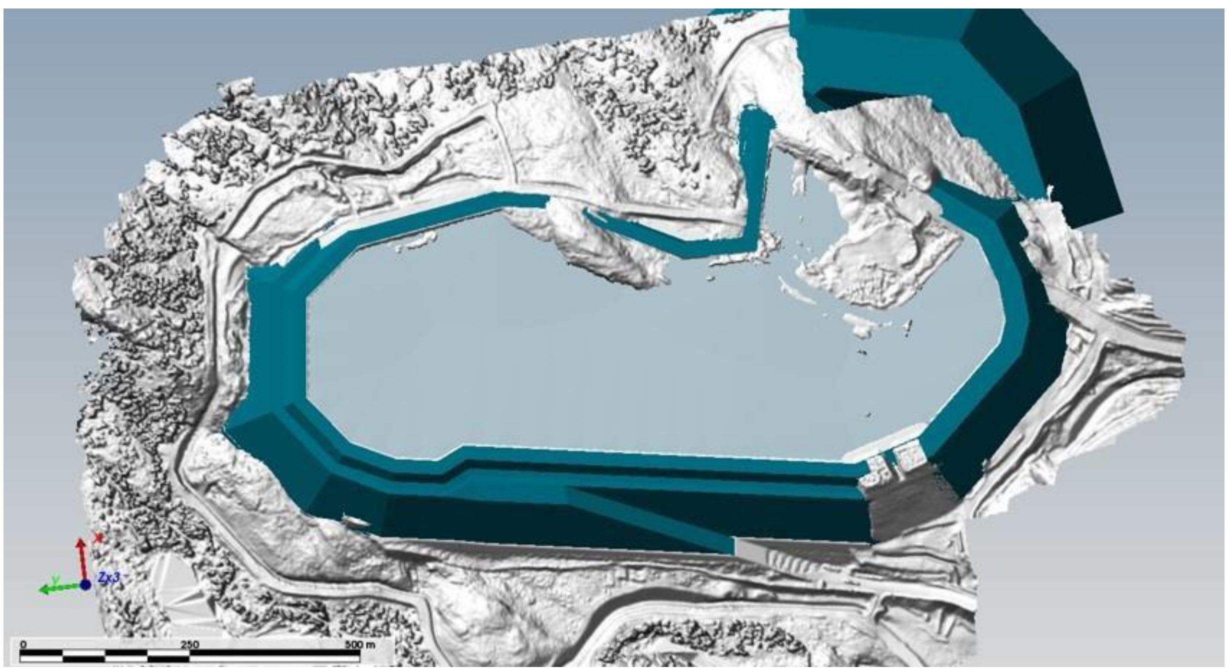



**Figure 3.24 MPKC topography on December 31, 2021**

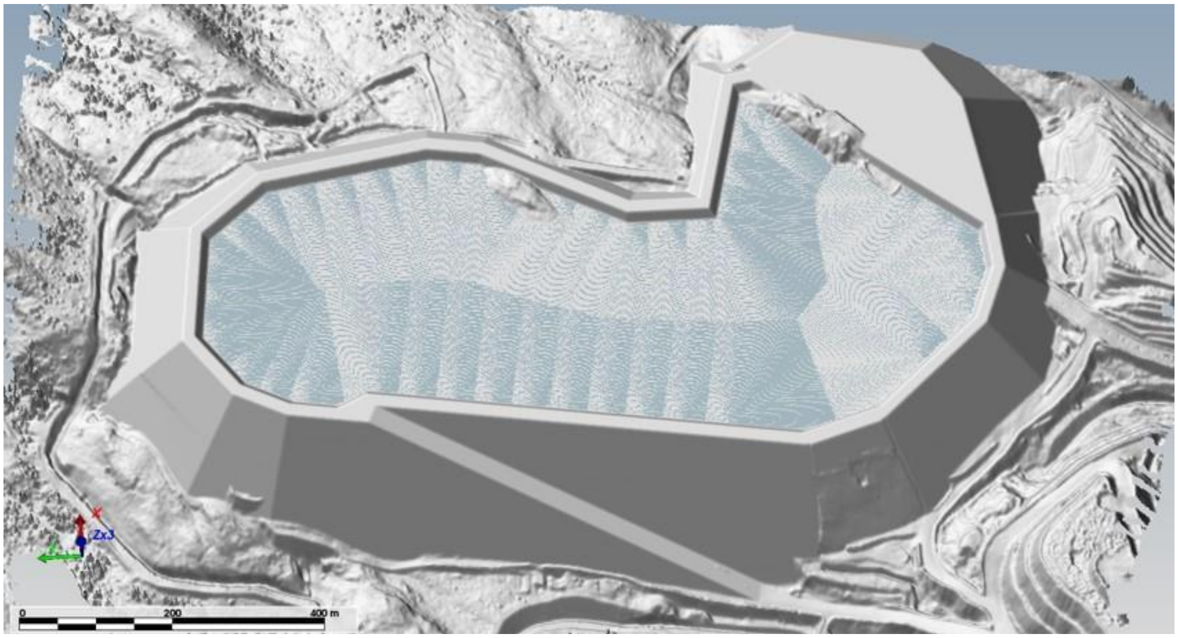



**Figure 3.25 Final MPKC layout, excluding western extension**

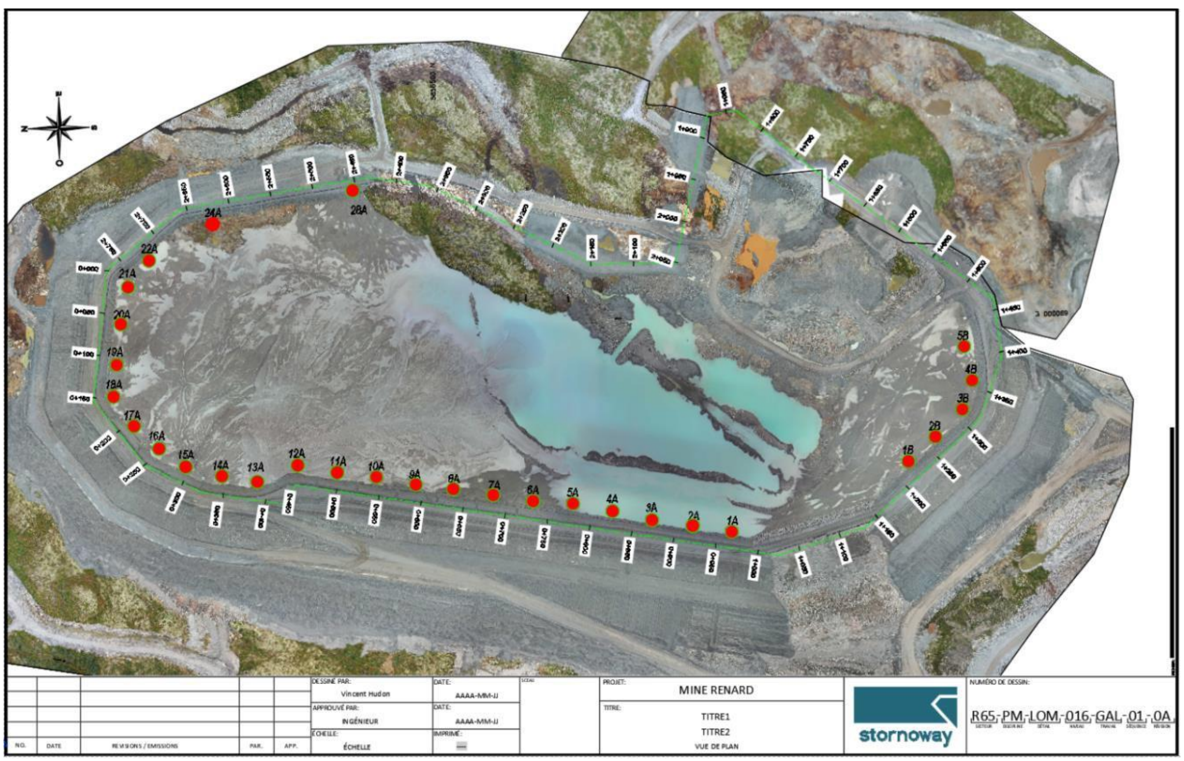



**Figure 3.26 Map view of the MPKC**

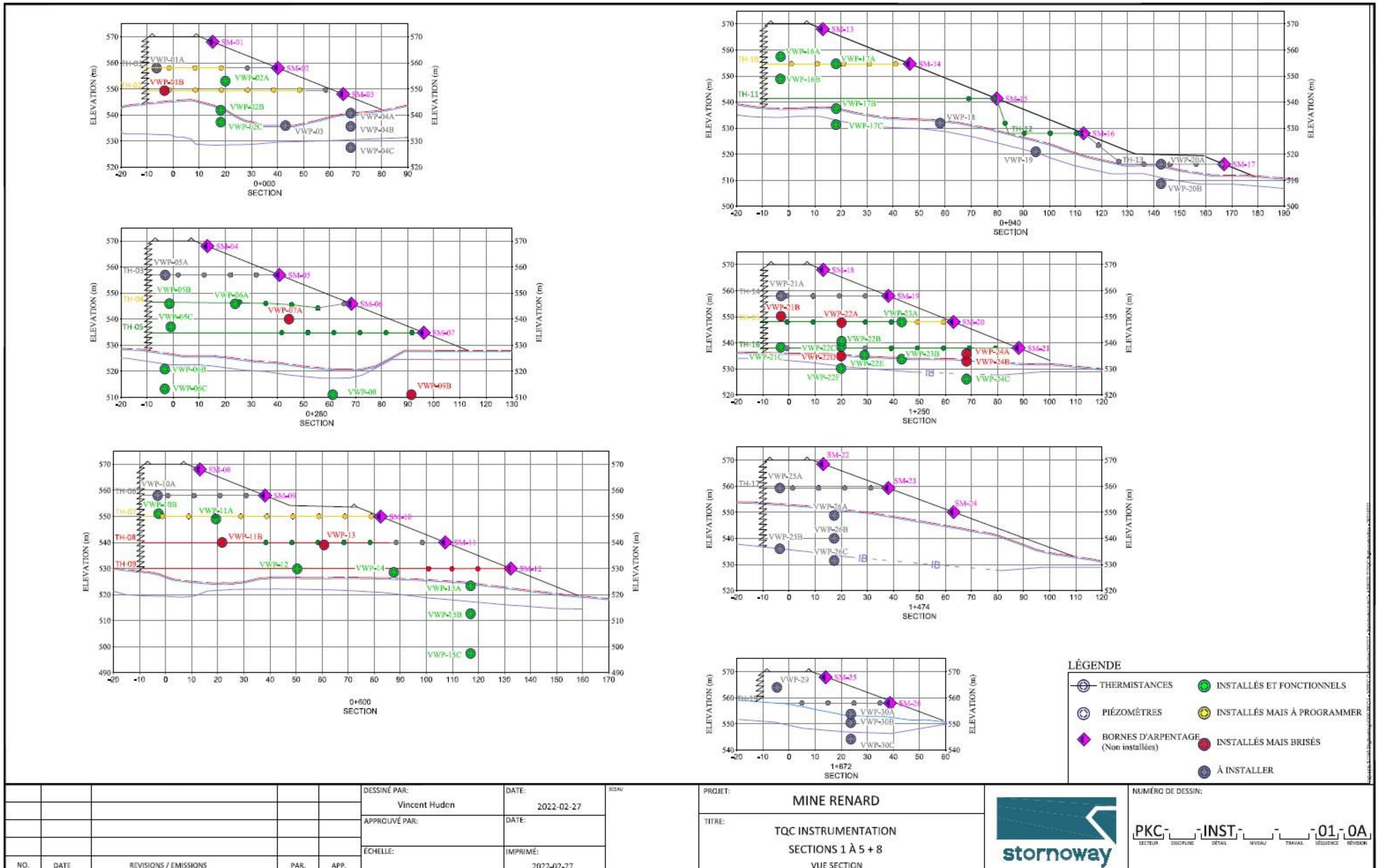



**Figure 3.27 Geotechnical surveillance instruments (piezometers and thermistors) installed and as constructed on February 27, 2022 – area perpendicular to the permeable berm**

# 4 Continuous Improvement in 2021

***Federal Regulations***

As required by the *Metal and Diamond Mining Effluent Regulations*, SWY submitted the interpretation report of EEM Cycle 1 on June 1, 2021.

***Provincial Regulations***

SWY undertakes to deploy environmental management adapted to the progress of each mine phase (construction, operations and closure). To do so, the Renard Mine's ESMP, including activities that are a direct result of the 2011 ESA (Roche, 2011a), will be revised in 2022. This update will ensure that the monitoring program continues to meet the regulatory requirements and commitments made by Stornoway. It will also incorporate changes to the overall CA since the mine started up in 2016.

Since November 15, 2019, the Renard Mine has been subject to its first industrial depollution attestation under the *Regulation respecting the operation of industrial establishments (RROIE).*

This industrial depollution attestation is a five-year renewable permit that applies specifically to industrial operations, whereas the global certificate of authorization (CA) is a statutory instrument that comes into force prior to project start-up.

The attestation includes operating conditions addressing discharges into water, atmospheric emissions, solid waste materials and the receiving environment. The depollution attestation was issued by the MELCC on November 15, 2019. It marked the launch of various validation studies within prescribed timelines.

In March 2021, SWY paid the annual fee that applies to its Renard Mine authorization. The first annual report for the year 2020 required under section 15 of the RROIE was submitted to MELCC on March 30, 2021.

***Environmental and Social Management System***

The environmental and social management system (ESMS) remained operational in 2021, and some improvements were made, including :

- Optimization of chemical dosages in order to continuously improve operations and control costs;
- Review and update of operational procedures at the water treatment plants (MWWTP, DWWTP and DWTP).

***Mining Operations Management***

The Renard Mine maintained the public health directives put in place by the Government of Quebec during the COVID-19 pandemic in order to continue its mine activities.

SWY resumed full operations in October 2020 and continued its development efforts, particularly for level 490 of the underground mine and for initial development of the ramp at levels 530 and 560.

***Towards Sustainable Mining (TSM™) Initiative***

In 2021, SWY ensured that the indicators for all seven TSM™ protocols were maintained. The 2021 results were reported on the Mining Association of Canada (MAC) website on December 21, 2021. All TSM protocols were self-assessed and several actions were put in place to consolidate the protocol ratings, particularly for *Safety and Health*, *Indigenous and Community Relationships*, and *Energy Use and GHG Emissions Management*. All seven protocols continue to be rated AA.

Since SWY has been self-assessing its protocols since 2019 and an external audit must be done after three years, it was rescheduled to the first quarter of 2022 with the approval of the QMA (more details in section 2.1).

***Water Management***

Water management at the mine site was maintained during the temporary shutdown period. Pumping wells around the underground mine remained in place to intercept groundwater before it entered the underground mine.

The use of the collection basin (Reclaim) for the water needs of the ore processing plant is always optimized to prioritize this source of water before any other and thus reuse the water in the circuit as much as possible.

***Hazardous Materials Management***

Quarterly inspections were maintained in 2021 to ensure compliance of the residual hazardous materials management area.

***Control of Contamination Sources***

With a view to controlling and reducing the risk of final mine effluent toxicity, an internal investigation is launched as soon as a weekly mine wastewater sample from underground mining operations shows an increase in:

- The ammoniacal nitrogen concentration (>15 mg/L);
- or the $C_{10}$-$C_{50}$ hydrocarbon concentration (>10 mg/L).

This internal procedure has been in effect since 2018 and allows SWY to effectively determine the root cause of contamination sources in order to apply appropriate preventive measures. This practice was in effect in 2021 and will continue into 2022.

The investigation process triggered by an accidental spill of a contaminant was also maintained in 2021 and the investigation report form, improved in 2019, makes it possible to standardize all such investigations.

***Human Resources Management***

In 2021, the Environment Department did not take on any environmental or water treatment interns. However, SWY plans to take on two in the summer of 2022.

***Waste Management***

A sustained waste reduction awareness effort took place among the workers in 2021 to reduce the amount of residual materials in the TLS.

SWY also optimized products that were initially stored to dehydrate waste sludge and used to treat phosphorus in domestic wastewater at the DWWTP (see section 3.12.6 for more details). Treatment costs were optimized as a result of this improvement and the total phosphorus concentration in domestic wastewater effluent was maintained under the MELCC's environmental discharge objective (<0.1 mg/L).

To reduce the quantity of solid waste, SWY continues to develop a water fountain program with a view to gradually replacing single-use water bottles. SWY would like to assess the feasibility of a waste management study in 2022, subsidized in particular by the Fonds Écoleader. However, SWY maintains good practices at the mine site by educating workers on the use of reusable bottles and drinking water at the camp.

Finally, SWY has maintained its water management practices for mining operations, notably by maintaining an annual mining water reuse rate in 2021 (99%) similar to that of 2019 (97.1%) (more details in section 3.14.6).

***Tailings Management***

In 2021, the operation, maintenance and surveillance (OMS) manual for the modified processed kimberlite containment (MPKC) facility was updated twice, in January and December 2021.

Various operational procedures were also developed and/or updated in keeping with the OMS and the design consultant's plans and specifications. An audit on the MPKC was performed from May 25–27, 2021, by the infrastructure design consultant.

***Environmental Emergencies Management***

The emergencies measures plan (EMP) was revised, and the 11th edition was published in January 2021. This edition includes a specific section dedicated to the environment.

No changes have been made to the environment dome or ecocentre. It is still used as a residual hazardous materials (RHM) management area (Photo 4.1). The catchment trap installed in 2019, along with the concrete floor, still helps to limit and control any potential soil contamination from accidental spills.

**Photo 4.1 Environment Dome and its concrete floor**

# 5 External Audits and Verifications

***Surveillance Activities***

Since the start of mining operations, observations from the environmental surveillance program have been recorded in the IsoVision© system. Regular monitoring of the program ensures that any non-compliance is addressed immediately.

Environment technicians conduct a number of daily surveillance activities to ensure sound environmental management of the mine site. This surveillance may include:

- Inspections of work sites and workplaces;
- Site visits and inspections to ensure machinery is in good working order;
- Monitoring of authorized Eco-Permits and related mitigation and control measures.

Surveillance activities are recorded and flagged in IsoVision© by category, i.e., as a preventive action, compliant inspection, remedial action, internal non-compliance or legal non-compliance.

Figure 5.1 provides a summary of measures that have been carried out by the Environment Department since 2015. A total of 349 surveillance activities were carried out in 2021, or 143 more activities than in 2020 (206).

The annual breakdown of observations raised during environmental surveillance activities is provided in Figure 5.2. In 2021, there were no legal non-compliances. Above all, the year was marked by an increase in the proportion of preventive actions. This means that in 2021, environmental management efforts on the mine site involved proportionally more preventive action than remedial action.

Surveillance activities in 2021 included 308 preventive actions, 37 compliant inspections, 2 remedial actions and 2 internal non-compliances. It should be noted that the number of internal non-compliances has been relatively low since 2020.

These results illustrate the efforts made by SWY on the mine site, namely, sustained environmental surveillance and the application of internal requirements such as:

- Compliance with an ammoniacal nitrogen concentration in a mine wastewater sample from underground mining operations;
- Compliance with a basic mitigation measure or a procedure.

Non-compliance with these requirements automatically resulted in an internal non-compliance being reported, which would lead to an investigation. The decrease in the number of internal non-compliances in 2021 can be attributed to the fact that the Environment Department held more awareness sessions in the various departments. Finally, no legal non-compliances were reported.

The annual MELCC inspection took place from June 8–10, 2021. Table 5.1 provides a chronological list of the inspections and visits at the Renard mine site in 2021.

**Photo 5.1 MELCC annual visit (June 8, 2021)**

***Audits***

SWY has had the information provided in the Renard Mine's annual environmental and social monitoring report audited by an external consultant since 2015.

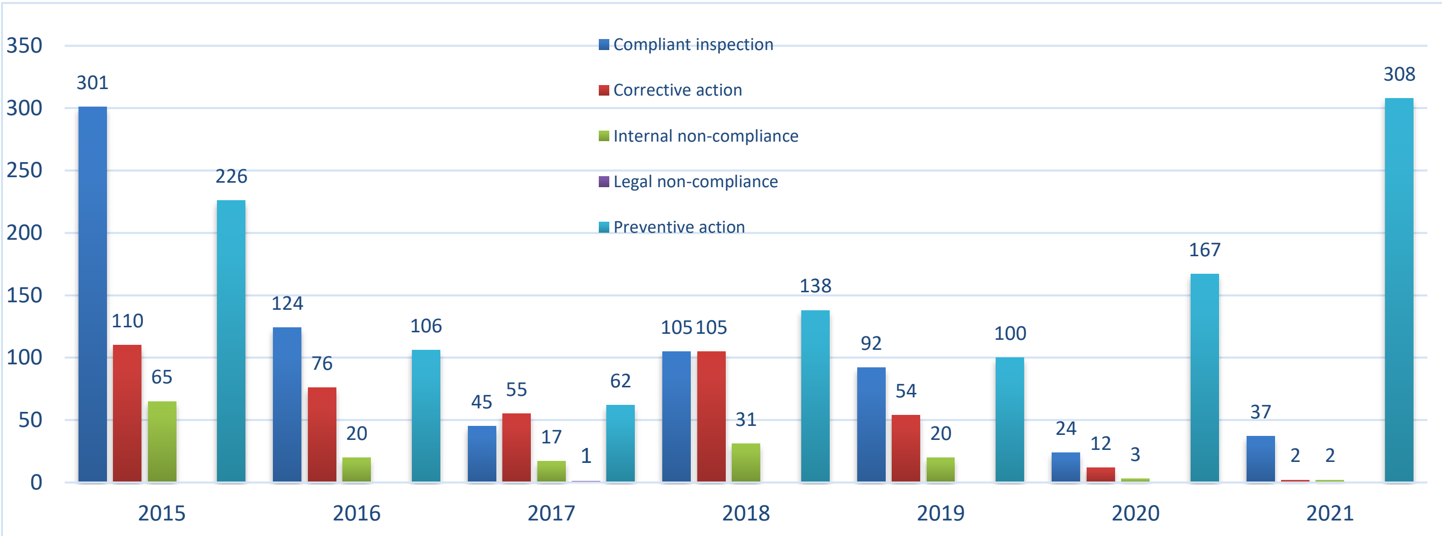



**Figure 5.1 Summary of Environment Department actions since 2015**

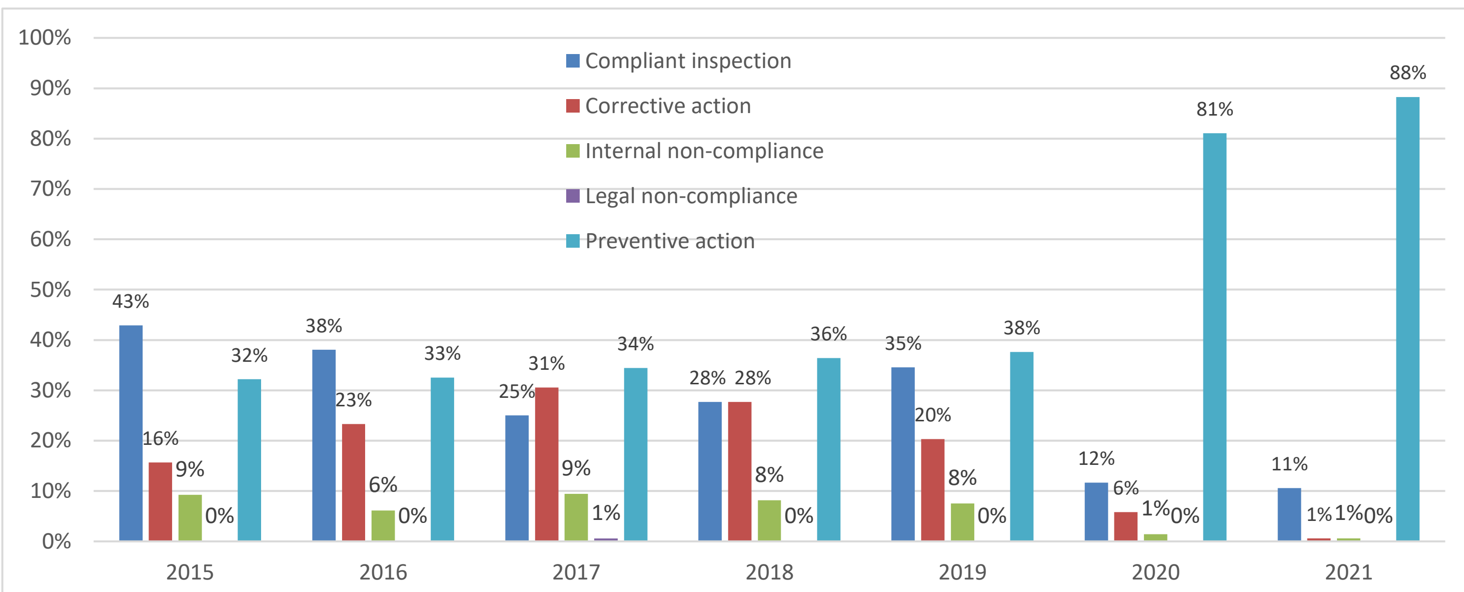



**Figure 5.2 Annual breakdown (%) of observations during environmental surveillance activities on site since 2015**

The review and validation of the annual monitoring report are appended (Appendix I) to the report in the form of a letter before it is submitted to stakeholders and the authorities, in order to comply with the regulatory framework.

With regard to environmental monitoring, SWY engaged the services of an external consultant to verify the GHG emissions reported in 2021 for the Renard Mine (see Section 3.2.3 for further information).

Air quality and noise and vibration level monitoring was performed by specialized consultants, as is done every year. With this approach, the data collected by SWY can be audited externally (see sections 3.2 and 3.3 for further information).

In 2021, SWY did not have the water level stations installed around Lake Lagopède reviewed to ensure that they were in good working order. However, this maintenance is scheduled in the 2022 monitoring.

The verification of the flow meters by an external consultant was done in 2021 and will now be performed every three years, as stipulated in the depollution attestation. Therefore, the next verification will take place in 2024.

In terms of wildlife, large wildlife monitoring was done in March 2021 by an external consultant. The recommendations of the MFFP with regard to black bear management and the corrective measures put in place in summer 2019, following the visit of the ministry's biologist, are still in effect. Their implementation continued in 2021 and will do so in 2022.

As for tailings, of the two audits scheduled annually by the design consultant of the facility (Golder) to check the stability of the MPKC, only one took place in 2021, from May 25–27 (more details in section 3.15).

Finally, as previously mentioned, SWY organizes an annual visit by MELCC inspectors to confirm the compliance of the mine site's environmental management facilities. This year, the inspection took place on June 8–10. An additional visit by MELCC, by the Wastewater Directorate, also took place on August 3–5.

As part of the Equipment, Measurement Methods and Sampling Control Program 2021–2022, the Renard Mine was selected for an inspection. The visit involved on-site verification by two members of the Wastewater Directorate in which the inspectors validated the sampling methods applied by company representatives, along with the equipment verification and maintenance methods required by the authorization.

**Table 5.1 Inspections and visits at the Renard mine site in 2021**

| Date | Entity | Reason for visit |
|---|---|---|
| May 25–27, 2021 | Golder | Spring audit of the MPKC by the design consultant. Action plan update |
| June 8–10, 2021 | MELCC | Control inspection |
| August 3–5, 2021 | MELCC | Equipment, Measurement Methods and Sampling Control Program 2021–2022 |
| September 2021 | N/A | Fall audit of MPKC initially planned for TSM external verification postponed to Q1 2022 |

# 6 Gradual Restoration

## Mine Site

In 2021, no revegetation work occurred on the mine site. Plant regrowth was monitored as in each year.

### *Plant Regrowth*

The 2021 plant regrowth monitoring took place on June 17 and showed the success of the planting following the seeding that took place from 2017 to 2019 (more details in section 3.6).

Although the revegetation is moving along successfully, SWY will continue to monitor the revegetation in 2022 in order to seed the less productive areas and
continue to monitor the progress of the seeded areas (more details in section 3.6).

### *Borrow Pits*

A majority of the borrow pits were closed in 2014 once construction of Route 167 North ended. Closure of the borrow pits means that every area where surface mineral substances (SMS) were extracted has to be completely restored, with plant regrowth monitored as required by the *Regulation respecting sand pits and quarries*.

The restoration work or natural regeneration involves stabilizing the slopes by reducing the inclines on the perimeter of the borrow pits and revegetating the area with native shrub species.

As in previous years, non-exclusive leases (NELs) to mine surface mineral substances along Route 167 North at kilometres (km) 561.4; 572.5; 586.8; 597.3 and 618.5 are still in the progressive restoration phase. These sections, located in borrow pits along Route 167 North, remain open for road maintenance (Map 3.9).

Borrow pit monitoring has been conducted since 2018 in order to check the condition of the planting (Photo 6.1).

**Photo 6.1 Monitoring of plant regrowth on the borrow pit at km 566 (June 2021)**

The 2021 revegetation monitoring took place on June 18 at the borrow pits on km 639 and km 639.8 along Route 167 North, as planned in the ESMP. The survival rates observed for the seedlings planted in 2018–2019 confirmed the effectiveness of progressive restoration activities on plant regrowth.

Considering that a minimum of three growing seasons is typically required, the 2021 monitoring assessed the quality of plant recovery over a four-year period (2018, 2019, 2020 and 2021) and validate that seedling growth continues.

SWY will continue to monitor the quality of the restoration until MELCC rules that the borrow pit restoration is satisfactory and meets quality requirements to obtain a release of the leases of land in the domain of the State.

# 7 Environmental Incident Management

***Commitments***

SWY is committed to respecting and protecting the environment where the mine is located. Environmental risks have been taken into consideration starting in the design phase.

To ensure it fulfills its commitment and complies with applicable laws and regulations, SWY put in place a procedure to deal with accidental spills and leaks.

In 2021, the Environment Department held training sessions with workers in all departments to promote best practices at the mine site and thereby minimize equipment failures.

In addition, since 2016, induction training on best practices in case of a spill and everyone's environmental responsibilities has been systematically given to all new workers, contractors and visitors entering the mine site. Everyone is responsible for rigorously applying the procedure when a spill occurs at the mine.

The first step in environmental incident management involves preventive measures designed to control pollution at the source, along with mitigation measures set out in the project's impact assessment (Roche, 2011a). These measures are specified in every Eco-Permit issued prior to the start-up of new work on site.

***Facilities***

Fuel farms at the Renard Mine site are designed to be safe and prevent accidental leaks or spills. Fuel tanks (diesel, gas, etc.) are all double walled and are equipped with a fire protection system with hydrants on the perimeter of the fuel farm.

The mine site is also equipped with a modern fuelling station operated with electronic identification cards and a level control system at each pump. In addition, the fuelling station

has a leak detection and recovery system in place.

***Type of Incidents***

Environmental incidents are divided into two categories: spills and near misses. A spill occurs when a contaminant spreads out or unintentionally comes into contact with the environment. A near miss happens when the spill is immediately contained and recovered before it seeps into the ground or comes into contact with the natural environment. This type of incident does not constitute an accidental spill as defined in the regulations and does not need to be reported to the authorities.

However, all near misses are reviewed and may be subject to an internal investigation. This management practice helps detect anomalies and prevent the recurrence of similar accidents in an unprotected environment, leading to serious environmental damage.

Tracking this type of incident makes it possible to record their impact. In 2021, 100% of

near misses occurred in locations (e.g. a concrete surface) and in quantities that did not lead to spreading or seepage of the contaminant in the ground.

***Incident Report***

When an environmental incident occurs, SWY is required to protect the environment by containing and recovering the contaminants in a timely manner.

Then, as prescribed in sections 8 and 9 of the *Regulations respecting hazardous materials* (Q-2, r.32 of the *Environment Quality Act*), SWY is legally obligated to report accidental spills to Urgence-Environnement (MELCC).

SWY is also required to recover all the contaminated soil and dispose of contaminated materials at an MELCC-accredited site. An incident report must be prepared for each event and remedial measures applied to prevent the recurrence of similar incidents.

*Containment Recovery Operations*

Recovering contaminants is initiated immediately, regardless of the type of spill, so as to comply with the regulations and prevent any long-term environmental risks.

More specifically, contaminated soil recovered from an incident is transported to an MELCC-accredited treatment centre, based on the type of soil and the concentration or type of contaminant.

To reduce response time in the event of a spill on the mine site, spill containment and recovery kits have been placed in strategic locations on site.

SWY also has a mobile environmental emergency unit: a trailer that can be moved quickly to a major spill site (Photo 7.1). The mobile unit contains the equipment and materials needed to respond appropriately to an environmental emergency. An inventory of the equipment in the trailer is performed every month.


**Photo 7.1 Environmental emergency unit**

*Incident Summary Reports*

In 2021, there were a total of 108 environmental incidents, as compared with 66 in 2020. More specifically, 95 spills were reported in 2021, representing a steady decline from 2017 (149), 2018 (132) and 2019 (104), but an increase from 2020 (54), which can be explained by the temporary shutdown (Figure 7.1).

This ongoing reduction in the number of spills since 2017 is primarily due to the migration of mining operations underground, the temporary shutdown of operations from March to October 2020 at the mine site, as well as an equipment reconditioning program put in place by the mobile maintenance department. This preventive program involves changing hoses and components after a defined number of hours for each piece of equipment.

Since 2018, SWY has maintained an increased focus on investigating environmental incidents, as well as identifying root causes and implementing appropriate corrective actions.

In 2021, SWY continued the improvements made in 2019 to maintain the decrease in spills.

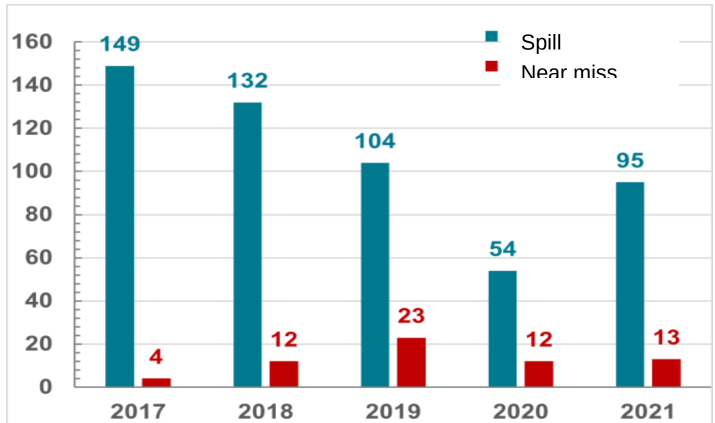



**Figure 7.1 Environmental incidents at the Renard Mine since 201**

*Causes*

In 2021, the recurring factors for accidental spills are mechanical failures and human error, as in 2020. Figure 7.2 illustrates the breakdown of spills by causal factor. For the year 2021, about 74% of spills were the result of mechanical failures, including 66% directly attributable to hydraulic hose failures (see Figure 7.4).

To reduce the risk of mechanical failures on machinery, SWY put in place a preventive maintenance program to track the number of hours each piece of equipment is used.

Nearly 19% of spills were caused by human error. Human errors are defined, in a non-exhaustive way, as using inadequate replacement parts, poor handling, etc.

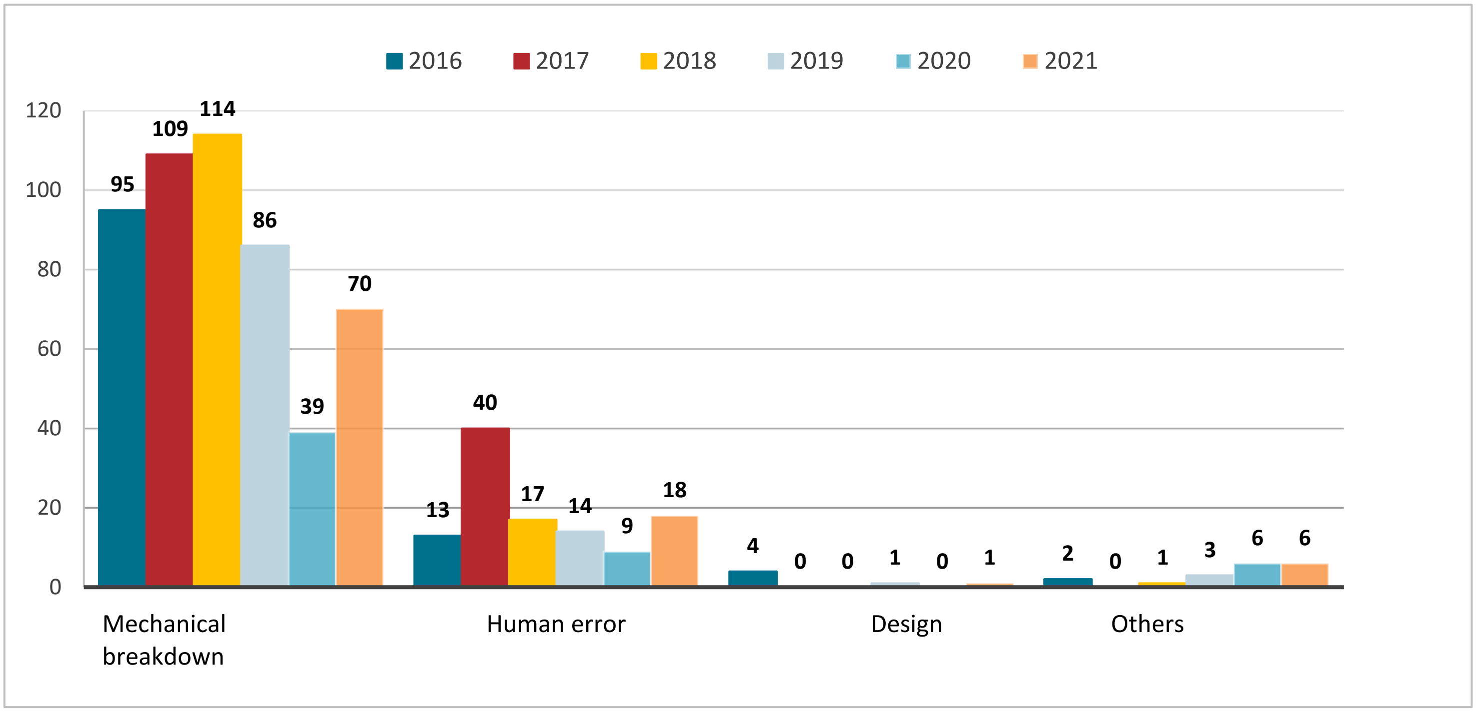



**Figure 7.2 Comparison of causal factors of spills since 2016**

***Volumes***

In terms of volume, of the 95 spills reported in 2021 (Figure 7.3):

- 53 involved volumes of less than 20 litres;
- 24 involved volumes between 20 and 100 litres;
- 18 involved volumes greater than 100 litres.

Spills increased in comparison to 2020, regardless of the quantity. This increase is justified by the return to normal operations in late 2020.

However, in comparison to 2019, the number of spills less than 20 litres and those between 20 and 100 litres decreased, while spills greater than 100 litres increased. As mentioned above, the maintenance department developed an equipment reconditioning program, which should have a positive long-term effect on incidents, and continues to investigate spills greater than 50 litres (Figure 7.3)

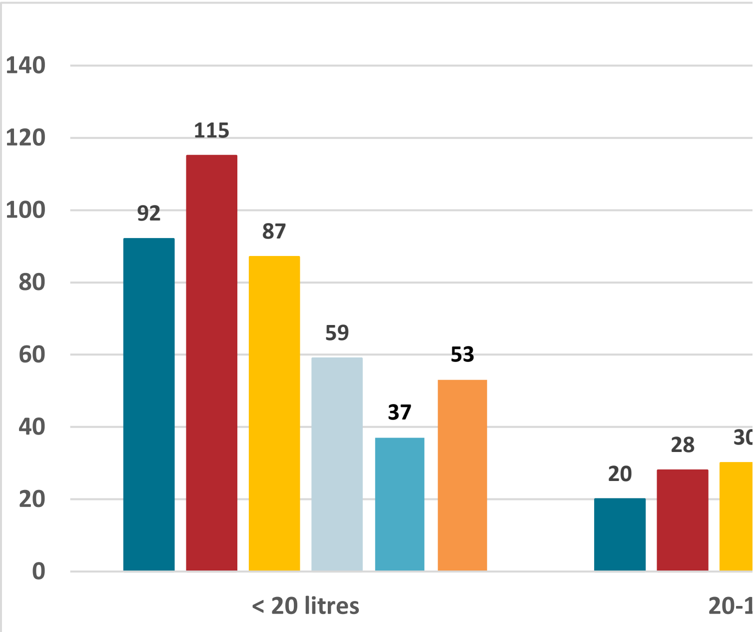



**Figure 7.3 Number of environmental incidents by volume class since 2016**

***Investigations***

As in past years, all environmental incidents in 2021 whose cause was determined to be human error automatically led to an in-depth investigation of the underlying cause, with a view to applying appropriate preventive and corrective measures.

Efforts made to develop operational procedures within the organization since 2018 contributed to decreasing the number of incidents caused by human error. This applies to large spills (>100 litres) as well as small spills (<20 litres) (Figure 7.4).

In 2021, the Environment Department focused on the quality of the investigations, on the corrective measures and the follow-up of their realization.

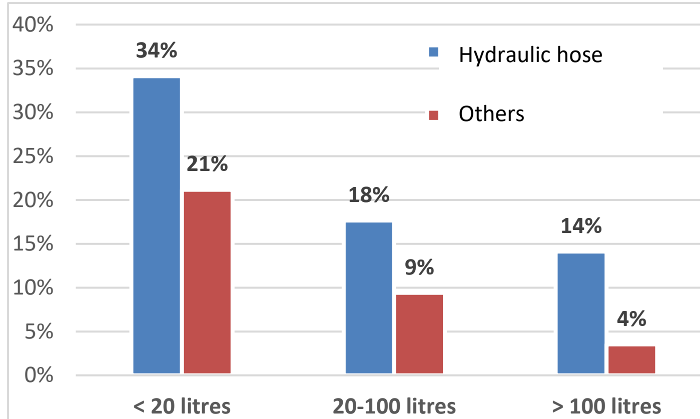



**Figure 7.4 Proportion of spills caused by hydraulic hose failures**

# 8 Social Monitoring Program

## 8.1 Scope of Social Monitoring

As specified in the Environmental and Social Monitoring Program initially submitted to government authorities in July 2015 and updated in October 2016 and in 2019, this monitoring concerns the social component of the Renard mine operation phase for the year 2021.

The monitoring program involves the Crees from the Mistissini community (including trapline M-11 family members) as well as Crees from other Eeyou Istchee communities. Certain aspects of this monitoring also apply to the Chibougamau and Chapais communities and by extension to all James Bay communities.

More specifically, the Social Monitoring Program was prepared in response to conditions 5.1, 5.2 and 5.3 in the Global Certificate of Authorization (CA) granted to Stornoway on December 4, 2012, and to subsequent amendments to the CA to reflect changes in the project.

In addition to the conditions set out in the CA, the Social Monitoring Program included the commitments Stornoway specified in the Environmental and Social Impact Assessment (ESIA) (Roche, 2011a) as well as those in the documents answering COMEX questions and comments (August 2012).

The Social Monitoring Program is also based on the commitments made by the signatories to the following documents:

- Mecheshoo Agreement in March 2012 (signed by Stornoway, the Cree Nation of Mistissini and the Cree Nation Government (CNG), etc.);
- Partnership Declaration dated July 2012 (signed by Stornoway, Chibougamau and Chapais).

The monitoring covers:

- Recruitment, including job types and number;
- Cree worker integration;
- Land use by M-11 trapline users (including conditions governing Cree use of Lake Lagopede's natural resources);
- Local and regional economic spinoffs (including goods and services contracts awarded to local and regional companies);
- Chapais and Chibougamau worker integration;

This report therefore presents 2021 findings along with observations regarding primarily the monitoring of:

- Recruitment and job types and numbers;
- The integration of workers from Cree communities and Chibougamau-Chapais communities;
- The retention of workers from Cree communities and Chibougamau-Chapais communities;
- Use of M-11 trapline;
- Regional economic spinoffs.

**At Stornoway, our staff characterize our company and embody our values.**

**We generate opportunities for our employees to fulfill their aspirations and advance their professional development in order to ensure PROSPERITY for all.**

**We bring aboard talented people who work with PASSION and are committed to making our vision a reality—to operate a world-class diamond mining company.**

**We support a climate of RESPECT and integration through open communication at all levels. We also promote and value the diversity of people and cultures that is one of the factors that drives our success.**

**We are proud to work with INTEGRITY, respect, honesty and strong moral principles.**

**In addition, the preservation of the physical well-being of our employees guides all of our actions with the best of practices in health and safety.**

**We value each individual as an integral part of the team. Each person contributes his or her talents to the success of Stornoway.**
**Stornoway exists only through the contribution of each person. By encouraging and promoting TEAMWORK, we are working together to write our history and redefine sustainable development.**

## 8.2 Recruitment and Job Types and Numbers

### 8.2.1 Scope

As specified in sections 8.3 and 8.4 of the Environmental and Social Impact Assessment (ESIA), Stornoway anticipated in 2011 that the Renard project would have a positive impact on employment for the Crees of Mistissini and other Cree communities as well as for Chapais and Chibougamau communities.

To enhance these positive spinoffs, Stornoway made a number of commitments to train Cree and Chapais and Chibougamau individuals and develop their aptitudes and skills. These commitments were confirmed in the Mecheshoo Agreement and the Chibougamau and Chapais Partnership Agreement, which also establish general employment-related objectives.

Condition 5.1 of the Global CA indicates that the proponent is required to “monitor recruitment, types and number of jobs created by category of employee and the opportunities for advancement for the Crees of Mistissini and other Cree communities and hold a discussion on the factors that contribute to the results achieved.” Similarly, the promoter must collaborate with regional and local organizations, Cree and non-Cree, whose objectives are to promote local, regional and provincial employment through training. Thus, this monitoring also concerns the Jamesian populations of the cities of Chibougamau and Chapais, and by extension, all Jamesians.

Condition 5.2 of the Global CA further specifies that the proponent is required to “publish mine employment opportunities in Cree communities, regionally and elsewhere.”

The objectives of monitoring recruitment, job types and numbers are as follows :

- Document the dissemination of information about mine employment opportunities to Cree communities, both regionally and elsewhere;
- During the construction, operation and closure phases, document the job category and changes in jobs created by the Renard diamond project for the Crees of Mistissini (including the M-11 trapline family members), on the one hand, and Crees from other communities on the other hand;
- During the construction, operation and closure phases, document the type (job category) and changes in jobs created by the Renard diamond project for residents of Chibougamau and Chapais, on the one hand, and for all James Bay residents on the other hand;
- During the operation phase, document the advancement of Cree workers within the company;
- Document the participation of Crees, and more specifically the M-11 trapline family members, in the various environmental monitoring activities;
- Validate the employment objectives achieved among the Cree in construction (short term) and operations (long term) as adopted by the Renard Committee under the Mecheshoo Agreement;
- Document the effectiveness of recruitment and training measures applied by the company and its Cree partners;
- Identify the determining factors for the results achieved (successes and failures) as well as any remedial measures.

### 8.2.1.1 Dissemination of monitoring results


Under the Mecheshoo Agreement, relevant documents are filed and submitted to the Renard project Training and Employment Committee. The same applies to the Renard Liaison Committee created by the Partnership Agreement signed with Chibougamau and Chapais municipalities.

In compliance with the instructions given to the proponent in Condition 5.3 of the Global CA (MDDEFP, 2012), the recruitment results, job types and numbers will also be distributed to interested project stakeholders.

Finally, Cree and non-Cree regional and local organizations whose objectives are to promote local, regional and provincial employment through training will also be informed of these results.

#### *8.2.1.1.1 Stornoway's values*

Stornoway follows good hiring practices and knows that the onboarding step is essential to new employees understanding the importance of their role within the organization.

Onboarding also represents an opportunity to describe working conditions, employee benefits, procedures and rules set out in the Human Resources Management Manual.

One of the five values underlying Stornoway's operations is teamwork. At Stornoway, our people are our strength. Stornoway strives to be an exemplary employer, one who:

- Maintains open and fair relationships;
- Establishes and facilitates stakeholder committees;
- Provides a working environment that is conducive to integrating cultural minorities;
- Communicates proactively and transparently;
- Promotes and develops skills and competencies;
- Listens to the needs of its workforce with a view to improving labour relations;
- Equips itself with analytical tools that are used to incorporate agreements into the decision process;
- Instills its managers with Stornoway values and agreements so that in their day-to-day operations, they become vectors of Stornoway's philosophy.

Stornoway pays particular attention to recruiting the industry's most talented people with the greatest potential and ensures that it is meeting its commitment to promote the hiring and development of members of the Cree, Chapais and Chibougamau communities of interest.

## 8.2.2 Recruitment, Information and Other Activities

Overall results related to hiring and retention activities in 2021 are presented below:

**175**

***Hires and rehires***

**503**

***Employees who worked for Stornoway as of December 31, 2021***

**123**

***From Northern Quebec, comprising 110 Crees and Jamesians***

**18,153**

***Hours of training devoted to the professional development of Cree employees (1,334 hours) and Chibougamau-Chapais employees (2,106.5 hours) on various functions at the surface, treatment plant and underground mine***

**5,480**

***Certifications and attestations[1] were awarded to our employees and 3,776 to our contractors***

**386**

***Certifications and attestations have been awarded to our Cree staff***

**775**

***Certifications and attestations have been awarded to employees from Chibougamau and Chapais***

[1] Certification: the employee has learned all facets of a position and is now able to act autonomously in that position. Attestation: the employee has learned a facet of a position.

Throughout 2021, Stornoway organized or participated in a number of information and recruitment events in the region. These included:

#### *8.2.2.1.1 Attraction and recruitment*

- Chibougamau and Chapais Recruitment Group meetings;
- Messages on Mistissini's local radio station about vacancies;
- Distribution of the booklet *"Pars à la découverte de Chapais et Chibougamau"* (Discover Chapais and Chibougamau) to recruiters and at the Renard mine;
- Posting of vacant positions on the lighted bulletin board outside the Council of the Cree Nation of Mistissini building;
- Two job fairs with Apatisiiwin held in Mistissini and Eastmain;
- Partnership with Apatisiiwin and the Chibougamau Vocational Training Centre to promote attraction and recruitment.

#### *8.2.2.1.2 Personnel retention*

- A study to determine how many employees in the region have moved to another region. This monitoring is now included in the Renard Liaison Committee's monthly monitoring reports;
- Confidential satisfaction survey of our Cree employees;
- Cree Cultural Awareness Program delivered to employees via email or videoconferencing;
- Distribution of the Echo-Renard informational pamphlet about the status of Stornoway and the Renard mine (approximately every 3–6 months);
- Communication on Chibougamau-Chapais radio about the status of Stornoway and the Renard mine or consisting of greetings to local populations;
- Scholarships (offered by Triple Flag and Stornoway in 2022) for Voyageur Memorial High School in Mistissini;
- Donation of 75 backpacks by Triple Flag to Mistissini Elementary School (Photo 8.1).

#### *8.2.2.1.3 Environmental implications (Tallymen and Mistissini)*

- Preparatory meetings for the helicopter tour of the territory with the tallyman;
- Correspondence with the Review Committee (Comex) on environmental issues and dissemination of the Cree Cultural Awareness Program in English;
- Meeting with the tallyman following his request to be informed about the procedures for personal vehicles at the Renard site;
- Meeting with the Environment Committee to present the social portion of the 2020 Annual Report;
- Meeting with the Matoush family at their camp at 595 km, concerning large wildlife;
- Communication with the Government of the Cree Nation regarding fish habitats;
- Presentation by the Norda Stelo group of the results of large wildlife monitoring to the Environment Committee;
- Correspondence with the Environment Committee on the methodology used by the Ministry of Forests, Wildlife and Parks for animal inventory in the territory (MPKC 2);
- The indicators selected to determine the study areas for the location of the MPKC 2 were sent to the Environment Committee.


**Photo 8.1 Students at Mistissini Elementary School receiving their backpacks (donation by Triple Flag)**

#### *8.2.2.1.4 Various implications, information and activities*

- Participation in the day *journée des donneurs d'ordre* in Chibougamau by videoconference;
- Several telephone meetings with the Chief of Mistissini to discuss various topics concerning Cree Stornoway employees;

- Assisting the tallyman in clearing snow from his camp;
- Meetings with the Chibougamau-Chapais Chamber of Commerce;
- Meetings with the Board of Directors of Développement Chibougamau;
- Cree Cultural Awareness Program presented to employees and Cree partners via email or videoconference;
- Ongoing monitoring alongside partners on pandemic status and responses to any infections in Renard mine;
- Sending Mistissini authorities and committees the various memoranda sent to Renard employees.

The relaxation of certain protective measures for a few months has allowed certain activities to be held in-person. However, the majority of meetings were held through videoconferencing.

The application process implemented directly at the Apatisiiwin office in Mistissini since 2019 has also facilitated the reception of Cree applications during the pandemic. Apatisiiwin's constant virtual involvement with the Crees of Mistissini by helping them complete their job applications and ensuring that they obtain the required documentation has also contributed to increasing the number of applications.

In addition, the involvement of the Integration and Diversity Coordinator at the mine site and in the community of Mistissini, as well as that of the Director of Organizational Development and Community Relations in Mistissini and in the communities of Chibougamau and Chapais, contribute to attracting and retaining the regional workforce.

### 8.2.3 Recruitment Details during a Pandemic

To promote regional recruitment, Stornoway recruiters have been put in direct contact with representatives from Apatisiiwin, the Cree Nation of Mistissini, Attraction Nord, the Newcomers Committee and Développement Chibougamau.

It is thanks to their exchanges that recruiters have been able to provide all new employees with fact books and videos presenting communities of interest and other items. Stornoway and its partners believe that this can encourage the relocation of some candidates to the region. The monitoring reports now include a section that shows the changes in address that have occurred and will allow partners to measure this impact to better address it.

In addition, Stornoway communicates with all of its partners such as Apatisiiwin, Emploi-Québec, the Comité sectoriel de main-d'oeuvre de l'industrie des mines, the various committees related to the agreements and its own employees to disseminate its job offers or events related to the acquisition of regional talent.

It also emphasizes the development of these talents in the workplace by promoting learning from experienced employees. A rotation through similar positions is also set up to promote learning. This strategy promotes group belonging, develops the sense of duty, encourages solidarity, and motivates the learner, who is able to understand quality and performance requirements constraints, rules, values and culture, as well as learn a new language. Immersion in the work environment helps develop self-reliance and a sense of responsibility within the team in achieving the sector's objectives.

The slowdown in the development program at the height of the pandemic and employees' fears for their families during their rotations negatively affected the retention of the new workforce, concerning both Cree personnel and Chapais and Chibougamau personnel. In addition, the pandemic and the suspension of operations in 2020 had a negative impact on the few employees in the Chibougamau regional office. In the face of uncertainty, some left for other jobs in the region or elsewhere. Stornoway and partners will be focusing on hiring regional candidates to fill this office in various positions that do not require constant presence at the mine site.

Stornoway wants its stakeholders to continue to view it as a company committed to and engaged in regional sustainable development and is therefore redoubling its efforts to regain this reputation. Indeed, the people's vision of Stornoway is a positive element that manifests itself every day and has become central to the way we manage our work teams.

#### *8.2.3.1.1 Recruiting results*

Although a number of workers left the company in 2021, Stornoway brought 174 new employees on board, increasing the total number of employees to 503, including the Chibougamau, Mistissini and Longueuil offices.

As of December 31, 2021, therefore, of the 503 employees who made up Stornoway's total active workforce, 467 worked at Renard mine, 14.1% of employees were from Chibougamau and Chapais and 4% were from other northern Quebec communities. In addition, there are 40 Cree employees (9%), mostly from Cree communities (Eeyou Istchee).

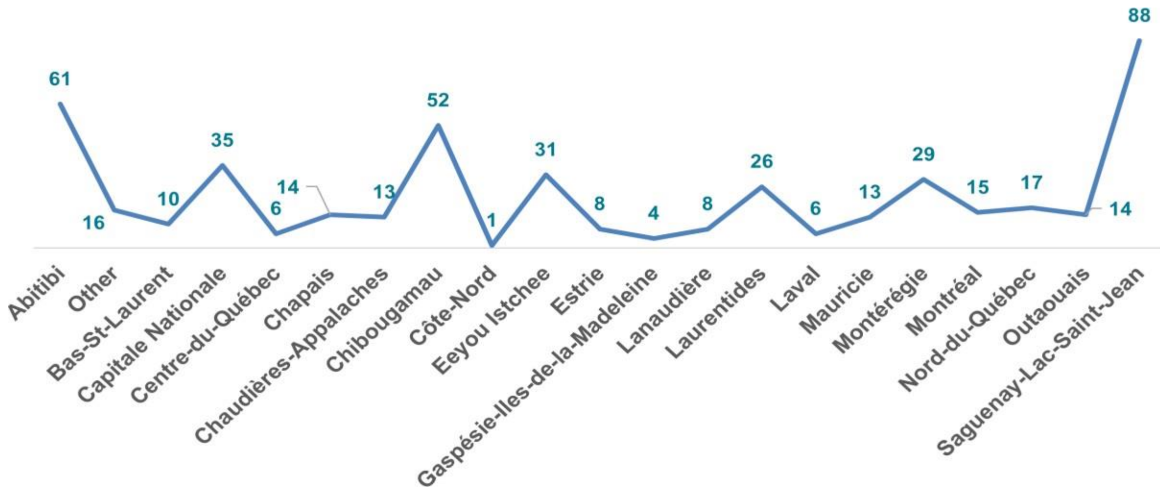



**Figure 8.1 Number of employees (467) at Renard mine by region as of December 31, 2021**


**Photo 8.2 Recognition board at Renard mine underground: Tyler Larivière and Donovan Blacksmith, Jonathan Allard Processing Plant**

These workers are divided among various trades (Figure 8.2). There are also 70 employees who work as kitchen or janitorial staff and are employed by our supplier *Kiskinchiish Camp Services*.

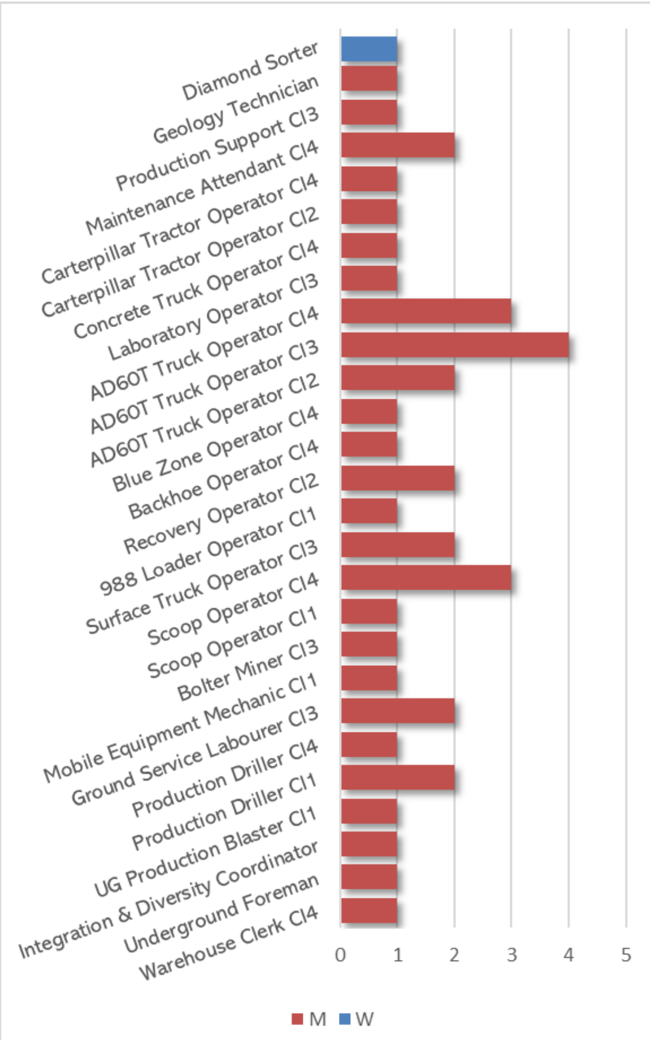



**Figure 8.2 List of positions held by Cree employees as of December 31, 2021 (W=women and M=male)**

#### *8.2.3.1.2 Stornoway's total workforce*

Stornoway is operating Quebec's first diamond mine with support from its host communities: Mistissini, Chibougamau and Chapais.

For this reason, regional hiring is a priority for us. In addition to the employees from our host communities, we have workers from throughout Quebec, primarily from Saguenay-Lac-Sain-Jean, Abitibi-Temiscamingue, the municipality of Chibougamau, the National Capital region, and Monteregie. Figure 8.1 illustrates the geographic origins of Renard mine employees working at the mine site as of December 31, 2021.

The workforce associated with the operation includes 66 residents of the municipalities of Chapais and Chibougamau, plus 17 employees from other Northern Québec communities.

In total, 123 employees are from the Eeyou Istchee—James Bay region (including our Cree staff).

#### *8.2.3.1.3 Retention of our Cree and regional workforce*

**A company's retention rate is the percentage of employees who retained their positions for a given period.**

**Conversely, the turnover rate is the percentage of employees who left within the same period.**

In 2021, turnover rates decreased compared to previous years for Stornoway in general, but especially for the Chibougamau and Chapais workforce (figure 8.3).

However, 2021 was characterized by several departures within the Cree workforce. For example, the retention rate for Cree workers has decreased from 84% in 2018 to 72% in 2021 (figure 8.4). As for our other host communities Chapais and Chibougamau, we note a significant increase.

Chapais increased from 65% in 2020 to 88% in 2021 and Chibougamau from 72% to 87% (figure 8.5). Overall retention levels are significant. In fact, Stornoway's overall retention rate is 80%. This means that in 2021, at least 8 out of 10 employees remained within the company. Renard mine's retention rate is 81%. It should be noted that the best retention rate was among employees from other communities in Northern Quebec at 94% (Figure 8.6).

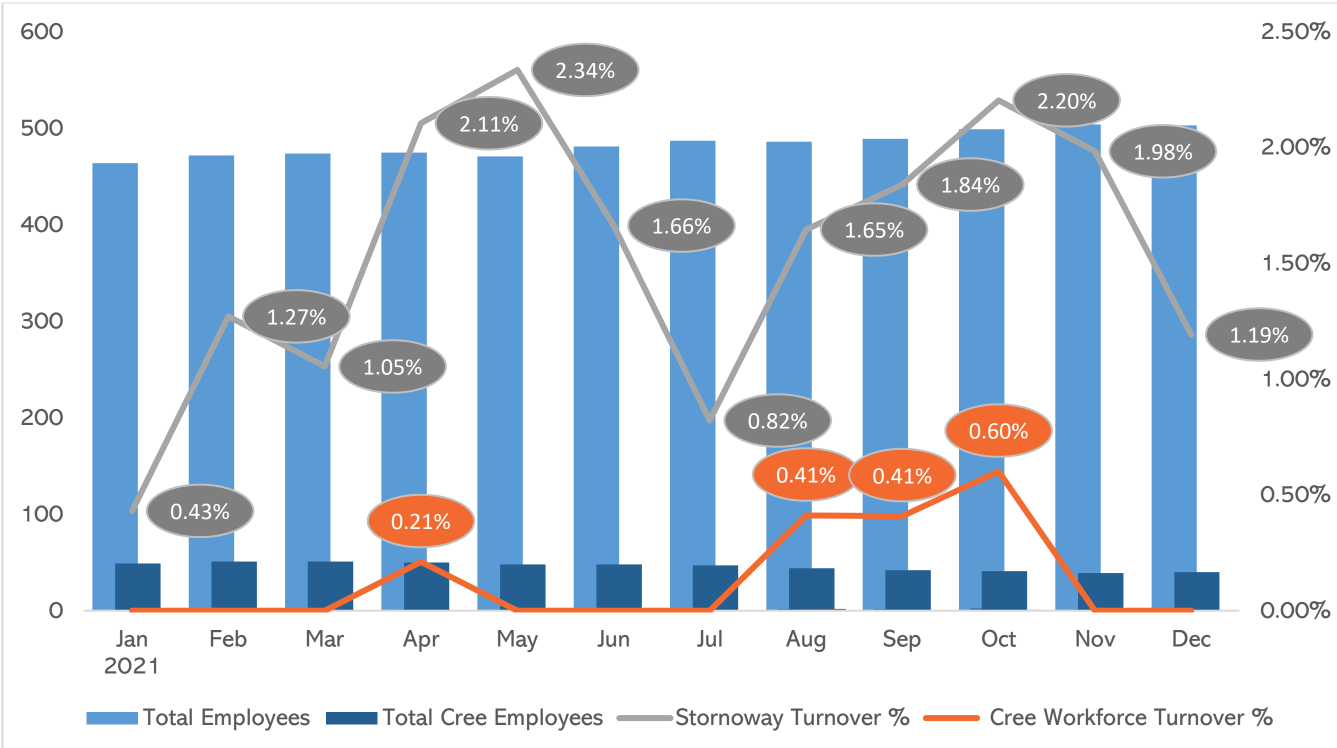



**Figure 8.3 Employee turnover—Stornoway & Cree workforce 2021**

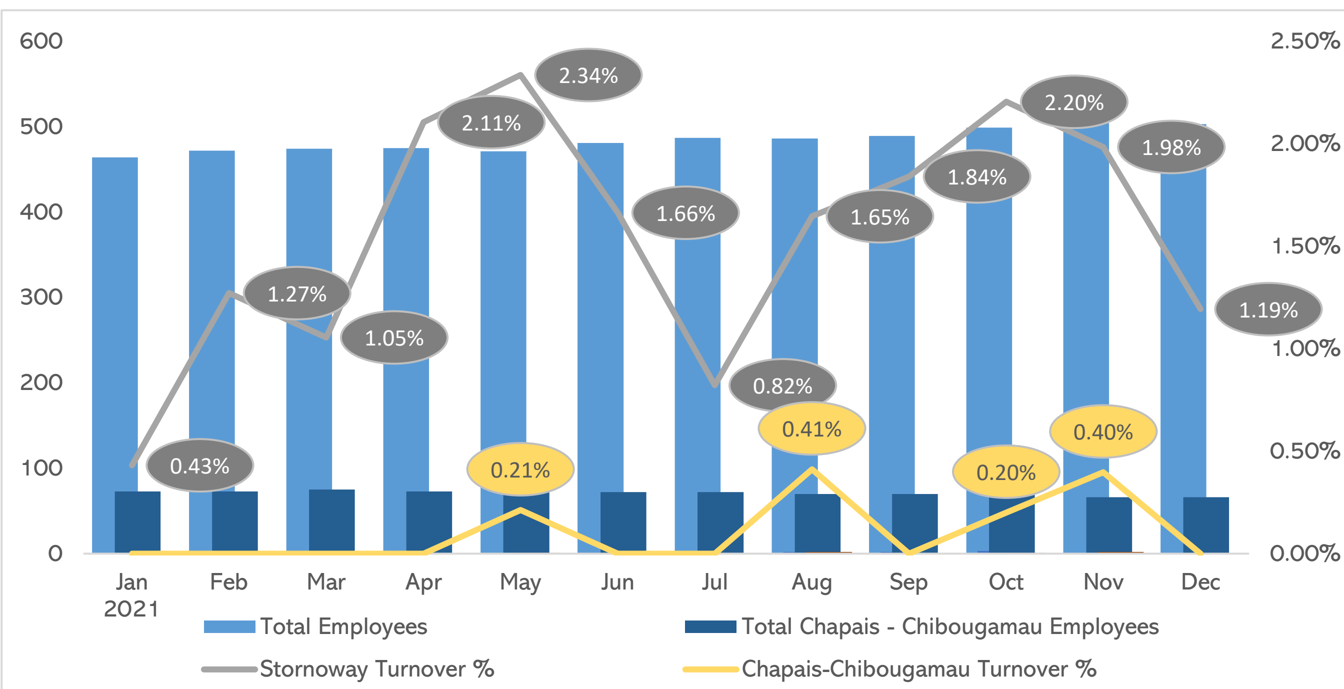



**Figure 8.4 Employee turnover—Stornoway & Chapais-Chibougamau 2021**

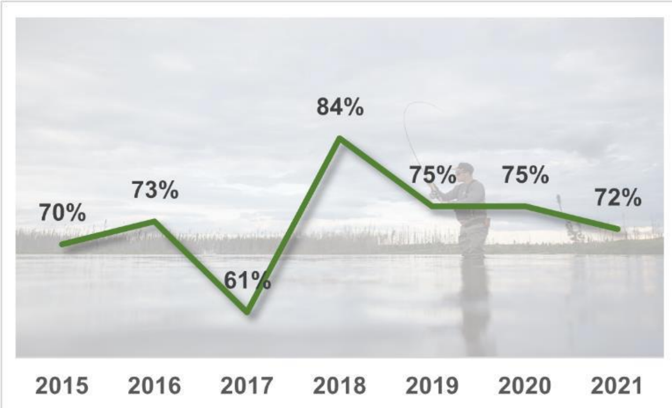



**Figure 8.5 Retention rate for Cree employees from 2015 to 2021**

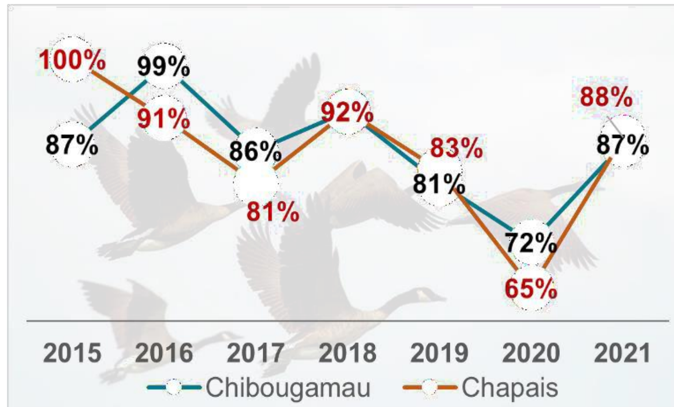



**Figure 8.6 Retention rate for Chapais and Chibougamau employees from 2015 to 2021**

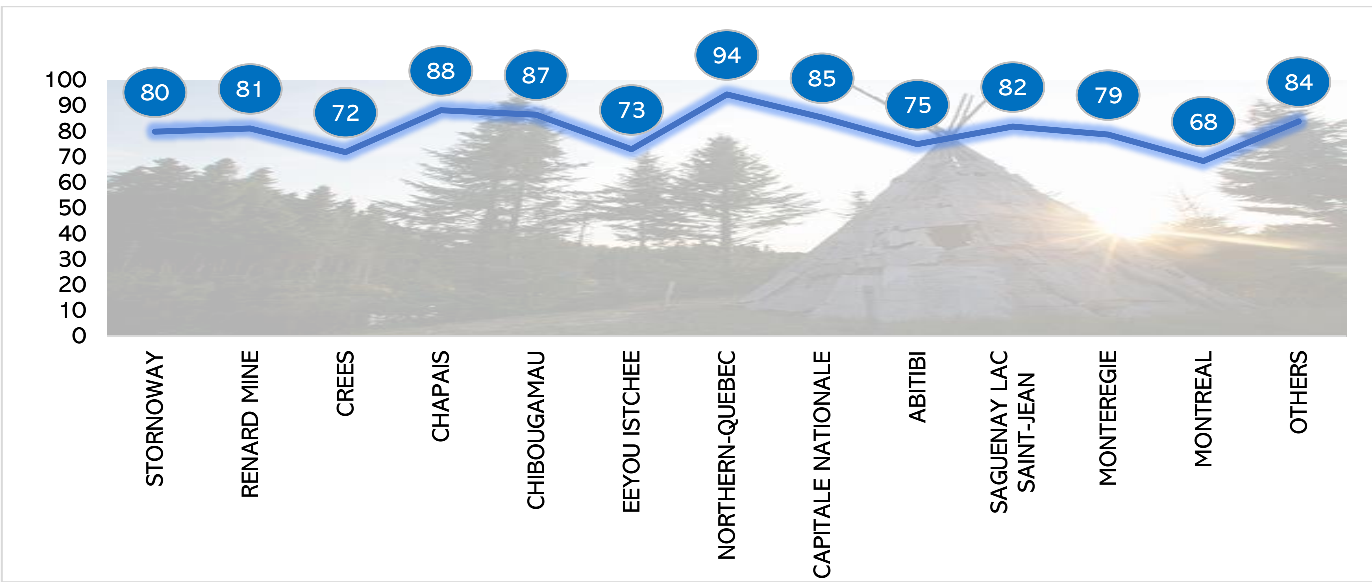



**Figure 8.7 Retention rate (5) 2021 — All regions combined**

Although in general retention rates are good, attracting Cree and Chapais-Chibougamau candidates remains particularly challenging. This worrying situation has led to several initiatives to learn about our strengths and weaknesses and to develop strategies to promote recruitment. A confidential survey was carried out, based on the results of which we have set out our objectives for 2022 with our partners. In addition, in 2021, in partnership with our committees, we carried out various recruitment activities and revisited all of our programs in consideration, of course, of the constraints imposed by Covid-19.

Northern Quebec (Eeyou Istchee), Abitibi-Témiscamingue and Côte-Nord are the regions where most Quebec mines are concentrated, and these have become real drivers of economic growth that offer varied and well-paid jobs.

Most of these regions are located in areas far from urban centers and recruitment difficulties were greatly increased in 2021. Thus, with more retirements in 2022 (according to Quebec statistics) and the creation of several new jobs, especially in Northern Quebec, Stornoway in collaboration with its stakeholders rethought its methods of recruitment and revised its management methods, prioritizing regional sustainable development.

In addition, the fact that the retention rate of Cree staff and the communities of Chapais, Chibougamau and Northern Quebec are good, it seems to us that bringing in newcomers to the region would greatly help in providing us with access to an accessible and sustainable pool of personnel.

2021 therefore prompted authorities of the Chapais and Chibougamau communities to strengthen their position to attract new residents and thus contribute with regional mining companies to the creation of a regional workforce. For example, The Professional Training Centre in Chibougamau has acquired an underground machinery operation simulator to support training focused on mining work and has prioritized other training to promote development in ore processing operations or other types of services in the region. More recently, the Cree and Chapais-Chibougamau development authorities are studying partnerships to extend training usually given to non-Indigenous peoples to Cree populations.

**Photo 8.3 Carlos Mapachee — Renard Mine Warehouse**

Videos of the benefits of living in Northern Quebec have been made and are being presented to all new employees at the time of their hiring at Stornoway. Similarly, explanatory pamphlets on all services offered accompany the videos. Recruitment abroad is also used.

To enhance the effectiveness and coherence of community engagement and regional sustainable development activities, Stornoway draws inspiration from the following principles:

- Building relationships of trust by communicating clearly, openly and honestly with our host communities, governments, partners and other stakeholders;
- Understanding, promoting and defending basic human rights in our actions, while respecting traditional rights and cultural heritage;
- Monitoring the emergence of new issues with the help of the monitoring committees and dealing with issues as needed and as amicably as possible. To this end, Stornoway has put in place a chart that accompanies the minutes of the committee meetings whereby members ensure that they complete their assigned responsibilities prior to the next meeting;
- Monitoring social and economic impacts to possess the necessary information to track successful, transparent integration;
- Endeavouring to minimize our operations' undesirable social and economic impacts on communities.

Consequently, Stornoway took the host communities' concerns into consideration when structuring Renard mine's operations. To this end, as early as 2021, we established "*Nos mandats*" (Our Agenda). This is a list of tasks that fills up and empties between each committee meeting (Figure 8.8). At meetings, partners bring their concerns and grievances, and together, give tasks to members best placed to act.

The status of the agenda is provided by the designated officer at the next meeting or if it is an emergency, the officer informs the members before the meeting by email or during a special meeting. This activity allows us to monitor the progress of the agenda and assures committees that all situations are being studied and are or will be resolved together.

Thus, the revision of "Our Agenda" is added to each meeting agenda and the new tasks are added to the minutes of the current meeting.

Workforce development allowed the implementation, in 2017, of the Cree apprentice integration program at the processing plant. This program is generating positive results and, in 2019 and 2020, its implementation continued in other departments at Renard mine, namely the underground mine, mechanical, electrical and building maintenance, environment and the power plant.

#### *8.2.3.1.4 Continuous development program*

Stornoway has established structures that promote the development of a culture of integration and diversity, in part through continuous in-house training (figure 8.8), hands-on accompanied learning that:

- Provides experienced people opportunities to become instructors;
- Puts employees from different cultures and age groups into contact (multicultural and multigenerational);
- Offers young inexperienced people opportunities for advancement;
- Offers experienced workers and young aspiring employees an unparalleled sense of pride in working together in a group;
- Solidifies common values;
- Credits hours worked on each piece of equipment and in each function towards the Ministry of Education's "prior learning assessment," including that of the Quebec Construction Commission;
- Standardizes work methods and improves equipment availability;
- Helps supervisors with employee relations;
- Cultivates versatility and a workforce that can replace absentees, thereby reducing costs.

This strategy is optimized when applied in daily operations, enabling us in particular to:

- Integrate cultural communities in the mining environment (remote mining camps);
- Train employees on a number of specific mining trades, for example, oversized and auxiliary equipment operation, and various ore processing machines, drilling and blasting trades, underground mining functions, and leadership development in a growth context;
- Develop greater flexibility among instructors, trainers and their student-employees;
- Apply innovative teaching methods adapted to our environment that help develop knowledge, along with work-related and behavioral skills: sense of observation, teamwork, desire for learning, entrepreneurship, assuming responsibility, etc.;
- Transfer mining expertise.

#### *8.2.3.1.5 Communications*

Fully aware that communication is key to developing relationships with Stornoway's employees and partners, various methods have been deployed internally such as the sharing of quarterly results by the Vice President of Operations, the Labour Relations Committee, team meetings, vignettes, informal meetings, presentations, etc.

When it comes to external communications, in addition to committee meetings, Stornoway has developed a monitoring report that provides monthly jobs, training, and economic spinoff data. Our partners appreciate these discussion forums because they open up discussions to continuously improve our results.

| *Mandaté et réunion* | *Mandat* | *Complété?* | *Date complétée* |
|---|---|---|---|
| DM - 30 | Que soit partagé la présentation faite à la Chambre de commerce de Chapais-Chibougamau le 7 juillet 2021 ainsi que le compte-rendu de la réunion associée à cette présentation | Oui | Août 2021 |
| **DM - 30** | **Inclure un graphique à courbes à partir de janvier 2021 (mensuel) afin de connaître la tangente des retombées économiques régionales** | **Non** | |
| **AP - 30** | **Cri du cœur – demande que les partenaires réfléchissent à des moyens pour favoriser le déménagement des familles à Chibougamau-Chapais (suggestions incluses au compte-rendu no 30)** | **Constant** | |
| DM - 30 | Il est demandé par SH que dorénavant le suivi des réunions du comité attractivité main d'œuvre soit assumé par DM. Accepté | Oui | Août 2021 |
| DM - 29 | Rendre le lien OneDrive permanent pour tous les partenaires et l'inscrire de façon continue aux ordres du jour | Oui | 2021-05-07 |
| MCB - 29 | S'assurer que les partenaires soient informés lorsque la base de données des entreprises de la Baie-James sera disponible. | Oui | Août 2021 |
| SGe - 29 | Inscrire SWY au programme d'emploi en sol Québécois offert par La Chambre de Commerce de Chibougamau-Chapais (immigrants reçus) | Oui | Mai 2021 |
| DM - 29 | Rendre le point "Attractivité main d'œuvre" permanent à l'ordre du jour | Oui | 2021-05-07 |
| **DM - 29** | **Mesurer les avantages/désavantage de l'instauration du port d'attache à Québec – taux d'embauche – taux de départ – taux de rétention – comparatifs (dans un horizon de 12 mois))** | **Non** | |
| DM - 29 | Envoyer à tous les partenaires la lettre de SWY concernant le port d'attache à Québec à tous les partenaires – mandat complété par MC sur le champ | Oui | 2021-05-07 |
| **RF - 29** | **Dorénavant, les documents d'appel d'offre seront envoyés aux partenaires avant d'être rendus publics** | **Constant** | |
| SGe - 28 | Veiller à ce qu'un représentant de SWY soit présent à la journée des donneurs d'ordre et des fournisseurs – M. Patrick Sévigny était présent virtuellement | Oui | 2021-02-19 |
| SWY - 28 | Répondre à la lettre acheminée aux dirigeants de SWY par MC et SGa | Oui | 2021-05-06 |
| **Membres - 28** | **Dorénavant, la consultation sera prioritaire même sur des sujets dont les décisions ne sont pas prises.** | **Constant** | |
| **DM RF - 28** | **Organiser une visite au site Renard pour les membres du comité Ad-Hoc (attraction Nord etc. Chib-Chap) pour sensibiliser sur les services offerts dans la région** | **Non Réunion déplacée Covid** | |
| **Nouveau Directeur CA - 28** | **S'assurer que le nouveau Directeur Approvisionnement transmette au comité les informations ci-dessous indiquées et non complétées** | **Non** | |
| **DM - 28** | **À la fin 2021, au moment du rapport du développement durable, DM enverra aux membres le paragraphe traitant des mandats complétés par le comité pour leur vérification avant de l'inclure dans le rapport** | **Non** | |
| **Membres - 28** | **Réfléchir à des moyens pour favoriser le développement économique régional** | ***Constant*** | |
| SGE - 28 | S'assurer d'inclure Emploi-Québec (Chapais-Chibougamau) dans les listes de destinataires pour les affichages. | Oui | *Mai 2021* |

**Figure 8.8 Evolving partner agendas**

#### 8.2.3.1.6 *Local community relations*

Stornoway's 2021 communications plan was established, developed and launched with the goal of consolidating support from local stakeholders (monitoring committees, tallymen, employees, politicians, companies, etc.) and maintaining their respect (figure 8.9).

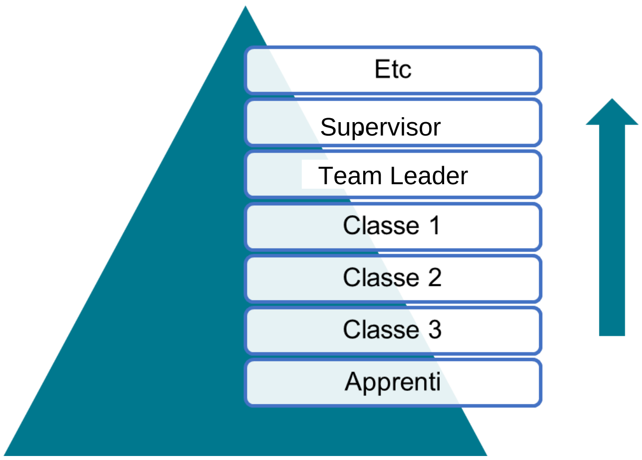



**Figure 8.9 Internal promotion example**

The following activities, set out in the communication plan, took place in 2021:

- Quarterly meetings of all follow-up committees established according to the Mecheshoo Agreement with the Crees as well as the Declaration of Partners with the communities of Chibougamau and Chapais. A representative of the James Bay Regional Authority (ARBJ) also joined the Liaison Committee to ensure that the other communities in Northern Quebec are taken into account in the economic development of the region;
- Regular follow-up and consultation meetings with the tallymen;
- The publication of Renard mine's Annual Sustainable Development Report and its distribution to Chapais, Chibougamau and Mistissini households;
- During the construction, operation and closure phases, documentation of the job categories and changes in jobs created by the Renard diamond project for the Crees of Mistissini (including the M-11 trapline family members), on the one hand, and Crees from other communities on the other hand;
- During the operation phase, documentation of the advancement of Cree workers within the company;
- Information sessions with Renard mine employees and agreement partners;
- Labour recruitment sessions and communication of employment opportunities to local and regional populations as well as to Renard mine employees;
- Sporadic information vignettes regarding agreements;
- Videos presenting communities to promote the relocation of employees to the regions;
- Regional radio interviews to keep people informed about the operations of Renard mine;
- Revision and implementation of employee skills development programs in the underground mine, the pit and in the mine equipment maintenance services; Meetings with key managers of regional education institutions to foster connections and take advantage of training opportunities related to the mining industry at a low cost;
- Dissemination of the Cree Cultural Awareness Program to all follow-up committees and Stornoway employees;
- Documentation of the participation of Crees, and more specifically the M-11 trapline family members, in the various environmental monitoring activities;
- Documentation of the effectiveness of recruitment and training measures applied by the company and its Cree partners;
- Identification of the determining factors for the results achieved (successes and failures) as well as any remedial measures;
- Validation of the employment objectives achieved among the Cree in construction (short term) and operations (long term) as adopted by the Renard Committee under the Mecheshoo Agreement.

As the pandemic severely restricts gatherings, visits by representatives of communities of interest and others to Renard mine to raise awareness of the benefits of living in the region had to be cancelled and postponed.

We are therefore putting emphasis on other means at the moment and meetings are organized to ensure a follow-up on the attraction of new residents.

The company is proud that our stakeholders consider Stornoway to be engaged and fully invested in regional development. Our efforts in this regard are evident in day-to-day operations and are pivotal to our management approach.

#### *8.2.3.1.7 Towards culturally sensitive integration*

Over the years, several Impact Benefit Agreements have been signed in the Stornoway host region and the implementation of these agreements has allowed for the acquisition of real experience so that the Crees are now full partners in the economic and social development of the territory of Eeyou Istchee—James Bay.

#### *8.2.3.1.8 Development and advancement program*

Stornoway's human resources strategic planning focuses on permanent improvement of its workforce and on skills development. Employees gain expertise, become more productive and can envisage a career path within the company.

The development and advancement program, introduced in 2016, was fully deployed in 2017. Owing to its success, Stornoway has adapted the program to all its operations and employees. In 2018-2019, this program enabled the smooth transfer of several Cree workers from the open pit to the underground mine.

In 2021, recruitment difficulties led the Company and its partners to put more emphasis on attracting, acquiring and retaining talent, revising the training program and making it more accessible, including supervision in front-line management training and improving our salary policies. We believe that these concerted efforts will bear fruit in 2022.

#### *8.2.3.1.9 Employee training*

Stornoway has also built a team of experienced trainers who have laid sound groundwork for workforce development and state-of-the-art training in all aspects of health and safety, in line with Stornoway's values.

These hours of training have resulted in the promotion of many employees to desirable positions, the development of a sense of belonging, the integration of non-experienced Cree and regional staff into experienced teams and have allowed Stornoway to use employee development as a unique tool with multiple benefits.

According to the development and advancement program, each employee who moves to a higher level must first receive a certification issued by the training sector, following a general evaluation involving the supervisor, the superintendent of the department concerned and/or the director of the sector, as well as the training coordinator and the trainer.

This certification confirms that the employee has successfully completed all the required training according to the program associated with the function, and that he/she can occupy the certified position, if necessary. Once in the position, the employee receives the associated salary for the hours worked in that position.

For Stornoway, 8,077 hours were spent on training, 10.7% on development and 52% on health and safety. Thus, a total of 5,131 attestations and 152 certifications were earned by Stornoway employees.

# COMMUNICATION PLAN 2021

MECHESHOO AGREEMENT

*Working with Stornoway is a chance to grow, to reach our career goals and to give back to our community*

Diane Marois, Organizational Development & Community Relations Manager, Mistissini

Charlie Petawabano, Diversity & Integration Coordinator, Mistissini

OBJECTIVES OF THE COMMUNICATION PLAN

To ensure the respect of the Mecheshoo agreement for the acquisition, the retention, the development of the workforce and the contractors of Stornoway and to contribute to the Mistissini community grownt.

CONTEXT

***Parties involved***

- ✓ Target group:
  - The Cree of Mistissini and Eeyou Istchee;
- ✓ The superiors who must support the project:
  - All Stornoway Vice-Presidents and Managers;
- ✓ Collaborators, partners, stakeholders:
  - Stornoway supervisors, professionals, employees; Stornoway Contractors; Cree Nation Government; Cree Nation of Mistissini; Renard Committee; Training & Employment Committee; Environment Committee; Cree School Board; Apatisiiwin Skills Development; Cree Nation Administration.

***Expected impacts***

- ✓ Strengths:
  - Senior Management engagement (Vice Presidents and Managers)
  - The community relations team is based in Mistissini and has experience in Human Resources and agreement management
  - The Diversity and Integration Coordinator is a Cree from Mistissini
  - Stornoway's development program based on the Mecheshoo agreement attracts Crees to be develop by Stornoway
- ✓ Weaknesses:
  - The importance of the agreement is not well understood by all staff
  - Many employees and partners have never worked in an impact/benefit agreement context
  - The pandemic
  - The fluctuation of the diamond price
  - Financial situation.
  - Turnover
  - Use of the development program to be improved following the pandemic
- ✓ Strategic considerations:
  - Budget
  - Pandemic
  - Costs
  - Expectations of partners, the community
  - Centralize training in the region (ex. Training center in Mistissini, Mining training in Chibougamau…)

***Our target audience***

- ✓ Mistissini
- ✓ Eeyou Istchee

Mecheshoo Agreement
2021 Communication Plan

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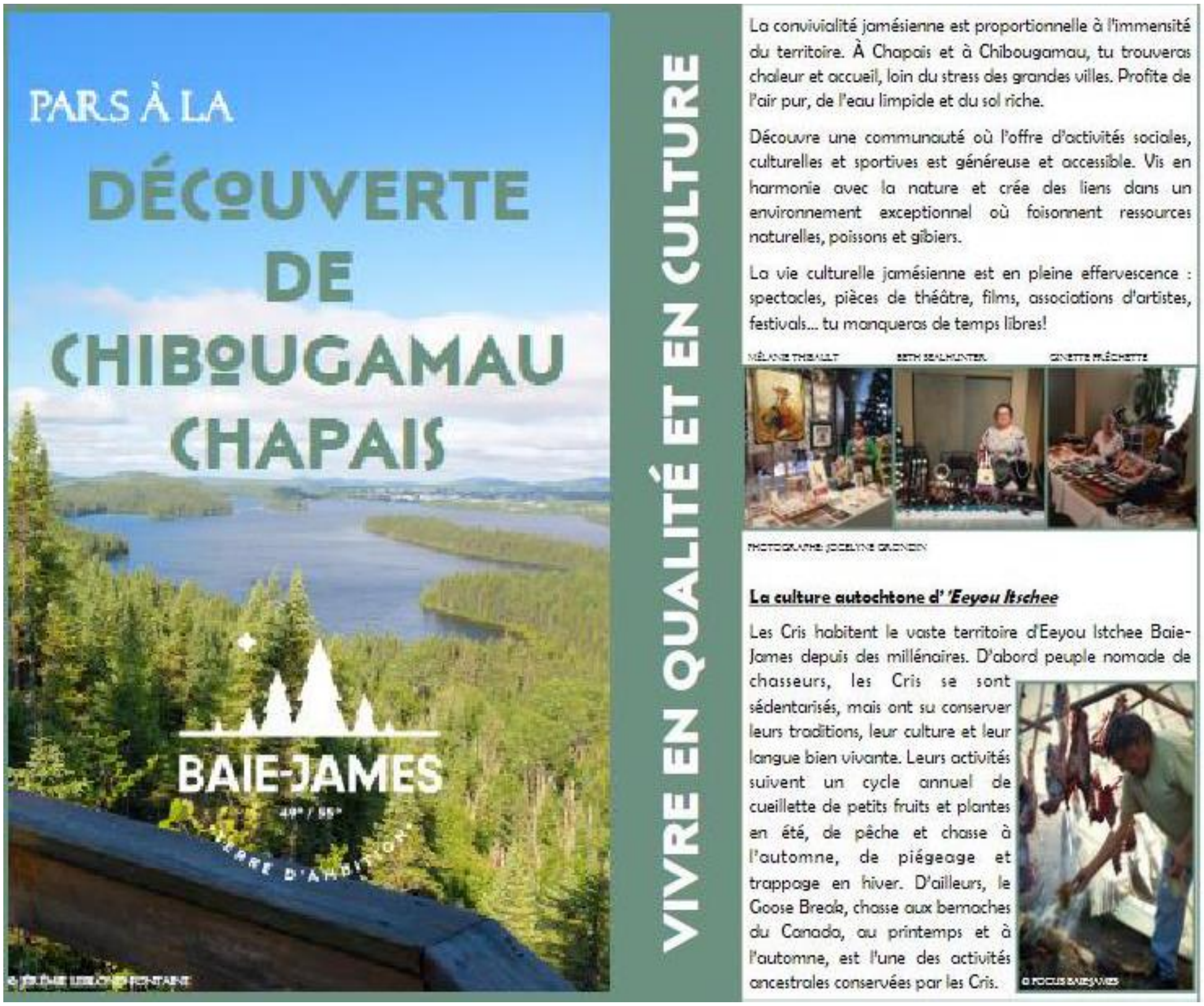
**Figure 8.10 Introduction of the communication plan and excerpt from the Meccheshoo Agreement**




La convivialité jamésienne est proportionnelle à l'immensité du territoire. À Chapais et à Chibougamau, tu trouveras chaleur et accueil, loin du stress des grandes villes. Profite de l'air pur, de l'eau limpide et du sol riche.

Découvre une communauté où l'offre d'activités sociales, culturelles et sportives est généreuse et accessible. Vis en harmonie avec la nature et crée des liens dans un environnement exceptionnel où foisonnent ressources naturelles, poissons et gibiers.

La vie culturelle jamésienne est en pleine effervescence : spectacles, pièces de théâtre, films, associations d'artistes, festivals... tu manqueras de temps libres!

**La culture autochtone d' *'Eeyou Itschee***

Les Cris habitent le vaste territoire d'Eeyou Istchee Baie-James depuis des millénaires. D'abord peuple nomade de chasseurs, les Cris se sont sédentarisés, mais ont su conserver leurs traditions, leur culture et leur langue bien vivante. Leurs activités suivent un cycle annuel de cueillette de petits fruits et plantes en été, de pêche et chasse à l'automne, de piégeage et trappage en hiver. D'ailleurs, le Goose Break, chasse aux bernaches du Canada, au printemps et à l'automne, est l'une des activités ancestrales conservées par les Cris.

**Figure 8.11 Excerpt from the book "*Pars à la Découverte de Chibougamau-Chapais*" (Discover *Chibougamau-Chapais)***

#### *8.2.3.1.10 Certifications received by our staff from communities of interest*

In 2021, a total of 12,895 hours were devoted to professional development of Renard mine employees, including contractors, 12.7% specifically for professional development and 87.3% for health and safety.

Several professional development tools were deployed and used, including learning logs for each trade, e-learning for various health and safety elements, as well as the acquisition of attestations and certifications after exams and/or evaluation committees. All of these tools have allowed for constructive and rewarding learning.

A total of 36 certifications in development were awarded to our Cree staff in 2021. Recipients are now independent on one or more of the functions listed in Figure 8.13.

**Photo 8.4 Reliability Trainer — Maintenance Planning**

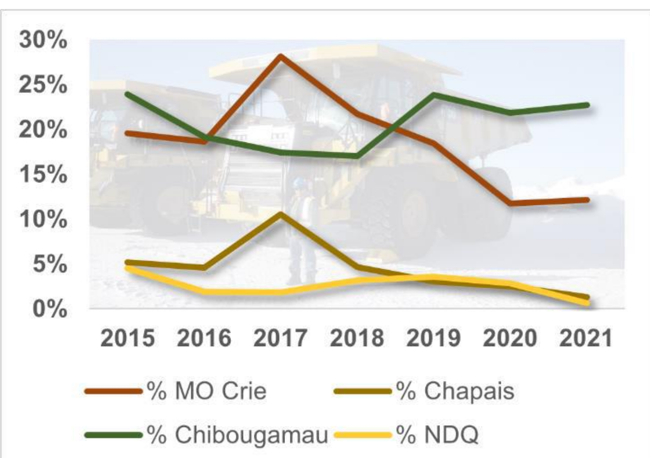



**Figure 8.12 Workforce professional development by region 2015-2021**

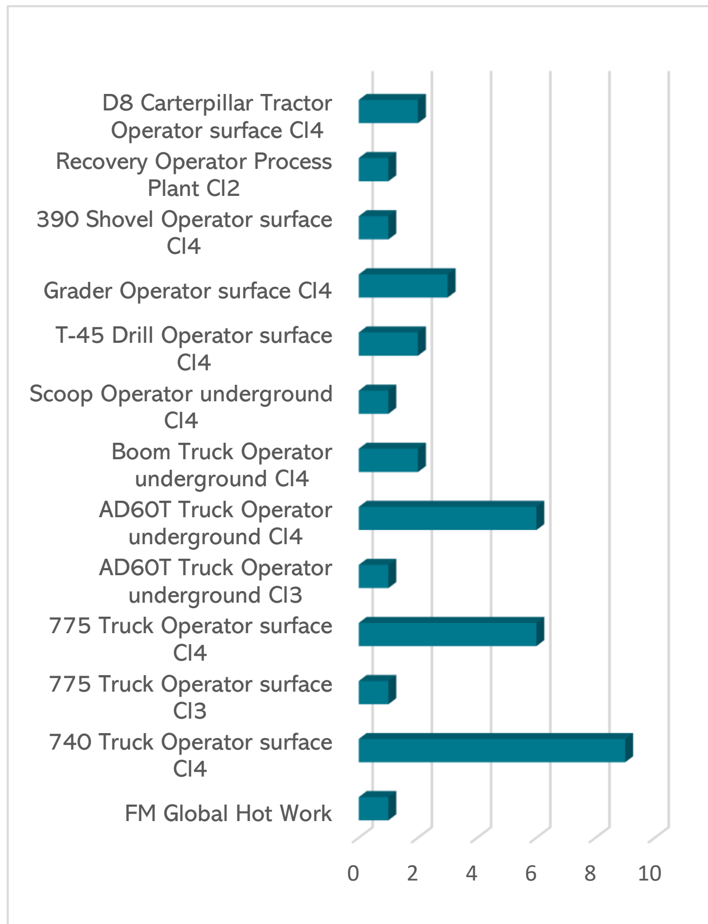



**Figure 8.13 Total certifications (36) obtained by Cree employees in 2021**

In addition, a total of 71 certifications in development were awarded to our Chibougamau staff in 2021. Recipients are now independent on the functions listed in Figure 8.14.

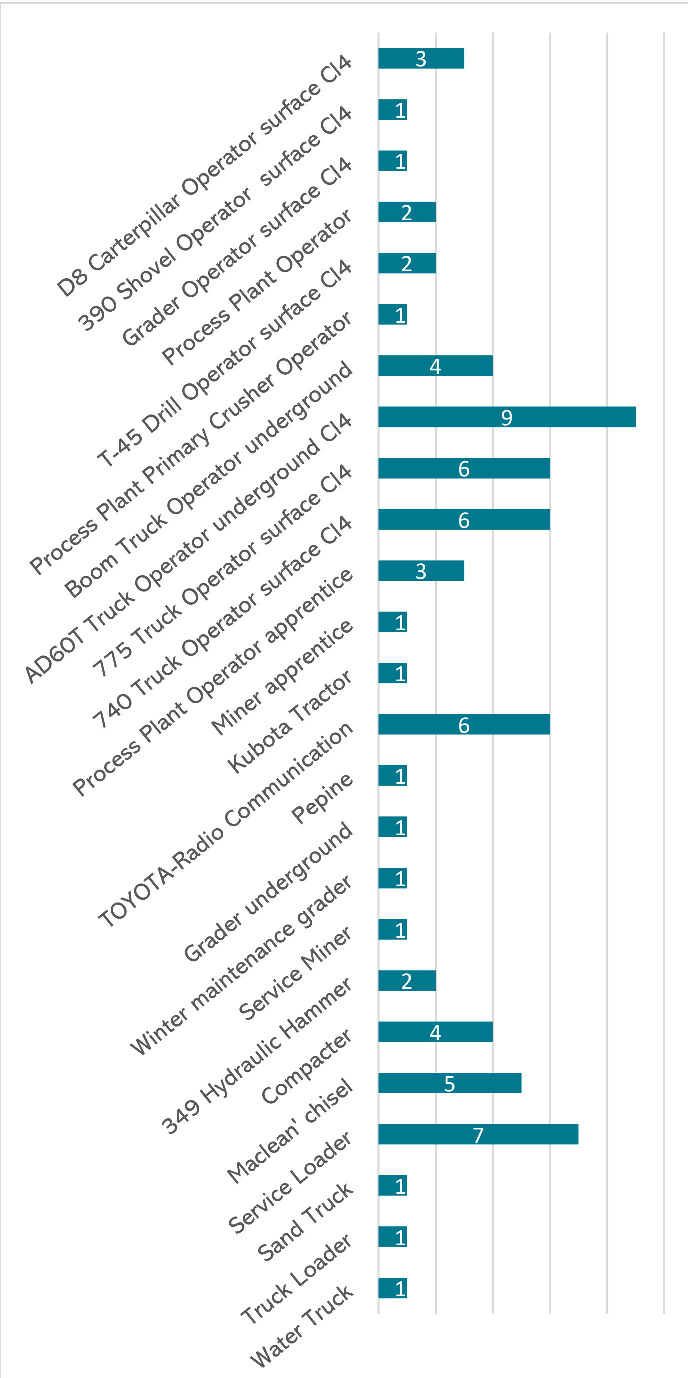



**Figure 8.14 Total certifications obtained by employees from the Chibougamau and Chapais region in 2021**

It should be noted that no certification/attestation was received by our Chapais employees in 2021. For our staff in the other communities of Northern Quebec (NDQ), an employee has been awarded a Class 2 underground loader operator certification (Figure 8.15).

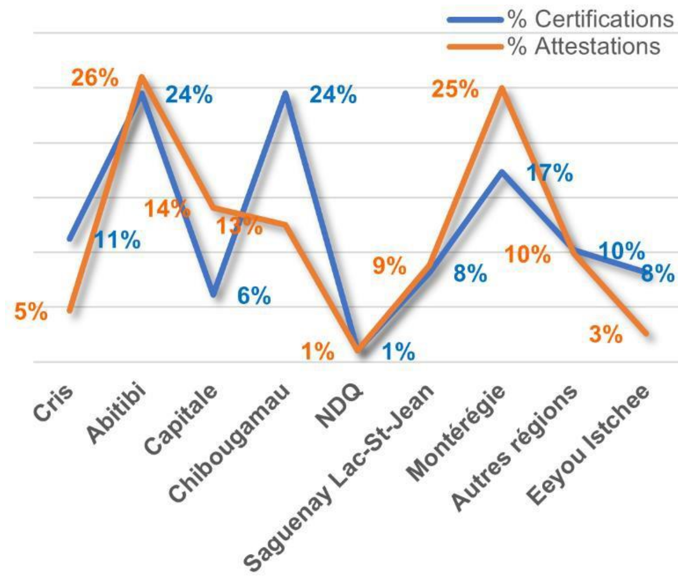



**Figure 8.15 Percentage of certifications (98) and certifications (192) obtained by region in 2021**

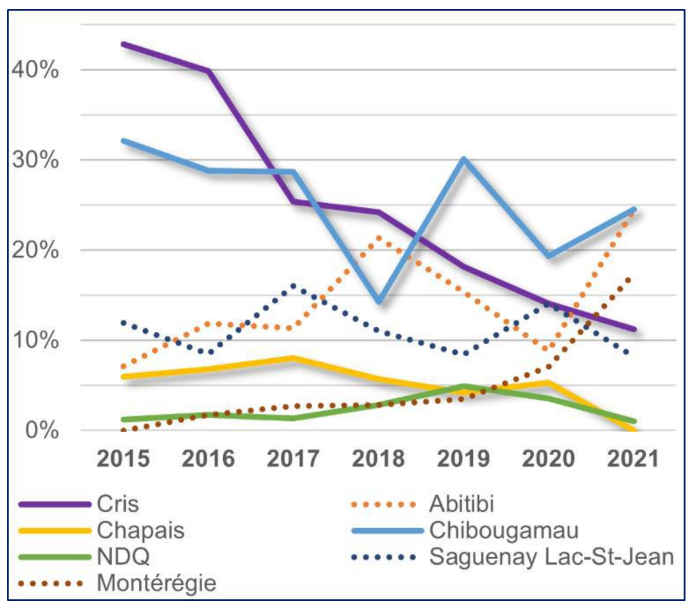



**Figure 8.16 Change in the number of professional development certifications obtained from 2015 to 2021**

#### *8.2.3.1.11 Internal mobility is a retention tool*

There is no doubt that internal mobility is a proven avenue at Stornoway (Figure 8.17). This strategy notably offers:

- Lower costs than recruitment;
- Shorter adaptation times;
- Employee satisfaction, mobilization and retention;
- Flexibility for the company;
- Assurance of greater versatility for all employees.

#### *8.2.3.1.12 Relocation policy*

In 2017, Stornoway set up and promoted its relocation policy (figure 8.18).

The policy provides employees who relocate to Chapais or Chibougamau with financial benefits from Stornoway.

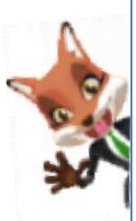
Moving expenses may be reimbursed up to a maximum of $10,000 and a bonus of 15% of base salary over the first two years of residence in Chibougamau or Chapais is paid to the employee. The objective is to attract new residents to the region and retain the mine's workforce. The policy addresses the need to build the population in Stornoway's host communities Chapais and Chibougamau, in addition to maintaining a stable workforce for Stornoway.

**Section 20: MOBILITY**

**20.1 Mobility**

All employees are considered "versatile," i.e. they can be assigned to various work stations within the Company. Stornoway assigns tasks according to operational needs in respect, as much as possible, of the qualifications and seniority of each employee.

**Figure 8.17 Excerpt from *the Mobility Policy***



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Hourly Employee Handbook

**Section 8: Relocation Policy**

The policy aims to encourage current and future employees of the Company to relocate to the communities of Chapais or Chibougamau, in compliance with the commitments outlined in the Partners' Declaration, and to work with them to attract and retain new residents to the towns of Chapais and Chibougamau and facilitate achievement of the commitments undertaken by the Renard Liaison Committee.
The policy aims to grant employees of the Company reimbursement of relocation and settling costs in their new homes.

To be admissible, the employee must submit a request to the Human Resources Department. To obtain reimbursement of expenses incurred for a relocation to one of the communities of Chapais or Chibougamau, the claimant must be approved by Human Resources as being admissible to this program and must have expenses approved in advance by Human Resources. Approved relocation expenses are detailed in the following sections.

Reimbursement of relocation expenses is not liable for personal income tax. However, grants for purchasing furniture and settling into a new home do represent taxable income in accordance with fiscal legislation applicable at the time of compiling this handbook. The Company shall comply with provincial and federal tax laws at all times and any amendments made to such laws by government bodies.

**Figure 8.18 Chapais and Chibougamau relocation policy**


**Figure 8.19 Poster featuring Chapais and Chibougamau relocation program**

## 8.3 Our Agreements

### 8.3.1 Provisions of the Mecheshoo Agreement and the Partnership Declaration

When the Macheshoo Agreement was signed, three committees were created:

- ***The Renard Committee*** (including employee representatives from the Cree government, the Mistissini Cree Nation and Stornoway), which oversee two subcommittees;
- ***The Training and Employment Committee***, which focuses on maximizing Cree employment opportunities;
- ***The Environment Committee*** , which sees to all commitments relating to Stornoway's environmental monitoring;
- ***The Renard Liaison Committee***, which manages the Partnership Declaration overall (represented by municipal authorities from Chapais and Chibougamau, as well as Stornoway representatives). Since 2021, the James Bay Regional Authority ("ARB") has been a member of the committee.

These committees track the implementation of agreements that address social and environmental impacts, economic spinoffs tied to employment and company development, to the environmental protection and to biodiversity.

The Partnership Declaration, for its part, includes a monitoring committee (the Renard Liaison Committee) that manages all employment and contract issues. The mayors of Chibougamau and Chapais sit on this committee along with main regional economic development officials.

### 8.3.2 Meetings of Renard mine monitoring committees held in 2021

Meetings of the various monitoring committees are held, at a minimum, once a quarter to discuss the issues that are specific to each committee. Similarly, discussions are taking place regarding the regional spinoffs of Renard mine and any issues or concerns expressed by stakeholders in the region.

The focus of these committees is to oversee the implementation of agreements on social and environmental impacts, the economic spinoffs associated with jobs and business development, environmental protection and biodiversity, all in keeping with our sustainable development vision.

In 2021, we held:

9

***Regular meetings of the Renard, Employment and Training and Renard Liaison committees were held by videoconference in 2021.***

19

***Activities, special meetings and events were organized to ensure ongoing communication with host communities.***

All meetings are followed by minutes, which are recorded as OneDrive links shared with each committee. Similarly, as indicated earlier in this report, a section entitled "*Nos mandats"* (Our Agenda) is included in the minutes to allow constant monitoring of actions to be implemented or managed by the partners.

### 8.3.3 Monitoring Committee Achievements

The implementation of partner agendas and their follow-ups has led to the creation of various elements that promote committee communication and workforce recruitment. This activity has proven useful in promoting awareness of the area and encouraging new residents to move to the area. As such, despite pandemic-related health measures, the partners of all the committees carried out a number of activities in 2021 for the host populations, the results of which are listed below:

- Consultation within the committee is now a priority, even with respect to decisions not yet made;
- Emploi-Québec (Chapais-Chibougamau) is now included in the recipient lists for postings;
- Members now enjoy a better breakdown of economic impacts (the details requested have been added);
- The status of the funds provided for in the Meccheshoo Agreement shall be communicated on a regular basis to Stornoway;

- Stornoway ensures that the forest fire protocol is up-to-date and periodically communicated to all employees;
- Encouraging people to move to the region is an integral part of Stornoway's hiring process;
- Reports on promotions obtained are sent to Cree authorities to promote opportunities for the advancement of Cree staff and to ensure that Cree staff have the opportunity to learn other functions at the same pace as non-Cree employees. Thus, starting 2022, the development and progression system will be gradually restored;
- Stornoway agrees that the "practical" component of the mine module training will be given directly to Renard mine. For this purpose, one of the SWY trainers is authorized to provide modular training. This will be possible as soon as health restrictions are relaxed;
- Partners are working with the Cree School Board and the Chibougamau Vocational Training Centre to develop programs that meet the needs of the mining industry;
- A partnership has been developed with the Chibougamau Vocational Training Centre, and mining trainees can do their internships directly at Renard mine (taking into account the health measures in force due to the pandemic);
- Cree partners will now provide (where possible) detailed reports on the candidates trained and the results;
- In order to encourage new residents in the region, promotional items (the book "*Pars à la découverte de Chapais-Chibougamau*," videos promoting communities, etc.) were created by regional economic development groups in collaboration with partners, and are posted on the Renard site and given or presented to all new employees;
- Since 2021, open jobs are posted on the Stornoway employee Facebook page;
- Monitoring reports provide details on address changes, hiring, departures, movements, spinoffs, etc. by region and enable effective analyses for partners;
- Presentations are made upon request to the Chibougamau-Chapais Chamber of Commerce, to the boards of directors of the regional economic development sectors and to regional institutions involved in economic development. These presentations are made by Stornoway's Supply Chain with the goal of informing about the modus operandi of the department and/or ways to create regional businesses;
- The promotion of employment opportunities at Stornoway in Cree communities is now continuous. Cree partners continue to seek ways to recruit Cree employees;
- As soon as possible, a list of Cree students in training will be provided to enable Stornoway to visit the professional centres in order to attract these individuals to join the company at the end of their training;
- Apatisiiwin Skill Development ("ASD"), Cree skills and employability development program, will be reactivated in early 2022 and will include the same team as before the pandemic. It will be held online via Zoom and representatives will be in touch with Stornoway managers to ensure proper follow-up. This professional support program, including mentoring, learning and workplace integration, was implemented in 2018 and had to be suspended in 2020 due to the pandemic. It enables experience-building and it is an excellent means of retention;
- Graphs on regional economic spinoffs are included in the monitoring reports;
- Absenteeism reports are now included in monitoring reports;
- A list of contracts and renegotiation dates shall be provided to Cree and regional authorities in order to give them the opportunity to bid for future contracts or to prepare if special qualifications are necessary;
- Constant exchanges are made between the three communities and supply chain management to find ways together to promote economic development and spinoffs in the region;

- Constant exchanges are held between the economic sectors of the communities and the partners in order to find ways to facilitate the arrival of new residents together;
- Stornoway is now represented on the Economic Development Board;
- The common OneDrive link containing all committee documentation is now available to all members and is always included on the agendas for regular meetings;
- Members now have access to the James Bay business database.

### 8.3.4 Committees for Implementing and Monitoring Agreements

The committees are instrumental in ensuring Stornoway's host communities and employees become familiar with the agreements, building the basis for collaboration, setting up enhancement, integration and development programs, and in ensuring the social environment and Stornoway employees benefit from the success.

## 8.4 Cree worker integration

### 8.4.1 Scope of Monitoring

Experience on other projects in the James Bay territory (e.g. the Troïlus mine [Inmet], Eastmain-1-A and Sarcelle power plants and Rupert diversion [Hydro-Québec]) drew attention to the challenges associated with integrating Indigenous workers in the working environment. Indigenous workers face several adjustments, notably in terms of language, mentoring, work scheduling and cultural habits.

The smooth integration of workers in the work environment is vital in that it has a significant impact on their health status.

To accomplish this, the Mecheshoo Agreement sets out a number of integration and retention measures for Cree personnel at the mine. The objective is to ensure long-term retention of Cree employees and the development of the Cree workforce, in addition to ensuring Cree employees have the same opportunities for advancement as other workers. In addition to measures associated with working conditions, the recommended measures take into consideration cultural specifics and the maintenance of family ties.

For example, the work schedule of two weeks of work followed by two weeks of leave is highly appreciated by Cree personnel, since it allows them to practice traditional family activities over a significant period of time. This also enables our employees to reach their full potential while pursuing Stornoway's goals.

In 2021, 14 Cree employees left the company, 11 left voluntarily and three involuntarily (dismissal). Voluntary departures are directly or indirectly associated with the pandemic. Several preferred to get a job close to their community to be closer to their families.

According to the interviews and a confidential satisfaction poll completed midway through the year, Cree employees appreciated the career opportunities available to them, ongoing training, the onboarding program and the integration systems and work schedules. In 2021, as in 2020, several pre-employment training programs slowed down or even completely halted. This included “mining worker modular training.”

Because practical training could not be provided to students, it was suspended until health measures were loosened. Thus, in addition to not being able to receive this classroom training by English-speaking external trainers, Cree students could not obtain practical training in the mining environment.

Pandemic health measures have forced the suspension of several programs in Cree communities in the territory including Mistissini. In addition, despite the mandatory testing and all the protective measures put in place at Renard mine to ensure the health and safety of all employees, several employees, worried about their families, preferred to leave and seek employment in their communities.

Stornoway, of course, was also affected by the effects of the pandemic and had to slow down the development program to focus on health and safety training. With the easing of pandemic measures, Stornoway accelerated the re-start of the development program beginning in January of 2022. With the collaboration of our committees, we are creating partnerships between the Chibougamau Vocational Training Centre and the Mistissini Learning Centre, so that Cree communities can receive this required training without having to move outside the territory.


In addition to development, which is an unparalleled tool for attraction and retention, Stornoway believes that the first step to successful retention of its employees is a successful welcome. This is especially true for Cree staff. Various programs have been set up in the community with our Cree partners and have achieved considerable success.

From the very beginning of Renard mine, it was obvious to us that it was important to combine our efforts with those of our Cree partners to achieve the desired results. Our hospitality program is appreciated by our employees because it has been adapted to their needs.

#### 4.1.1.1 Adapting to work schedule

As in previous years, 2021 has shown us once again that all of our staff, including our Cree workforce, appreciate the 14-14 split schedule. Furthermore, Stornoway is fully aware of the importance of employees having time off during the holiday season, and every year it adjusts the 14 on/14 off work schedule to 7 days on/ 7 days off during that time. Employees all appreciate this schedule because they'll be off for at least one of the holidays. Also, employees with more than one year of service are entitled to 160 or 168 hours of vacation depending on their schedule and can take some of this vacation time during the holiday period.

Since the Cree are all strongly attached to their ancestral culture, we needed to set up schedules that would allow them to continue practising traditional activities, such as berry picking, foraging, fishing, hunting, trapping, canoeing, pow-wows, hiking and so forth. These activities enable families to connect with the past and the traditional way of life. They require work schedules that provide flexibility and a balance between working life and the traditional way of life.

Although most of our Cree employees appreciate the staggered working hours, some parents with young children find it difficult to achieve a work/life balance and end up quitting after a few weeks. Apart from 2020 and 2021, completely irregular years due to the pandemic, previous years show that this issue is improving greatly.

This improvement is due to the fact that Stornoway is becoming increasingly well known within the communities, as well as to our partners' involvement in raising local people's awareness of how the company operates and the various mitigation measures in place, such as eligibility for 3 weeks of paid vacation after 1 year of service and changes to the Labour Standards Act, to allow workers a better work-life balance.

An employee may be absent from work for 10 days per year to fulfill obligations related to the care, health or education of their child or stepchild. They are also eligible for 5 days of leave, the first 16 hours of which are with pay, on the occasion of the birth or adoption of their child. If they meet the required conditions, they also benefit from the leave offered by the labour standards; paternity leave of 5 continuous calendar weeks, parental leave for a period of up to 52 calendar weeks, maternity leave of 18 calendar weeks, etc.

#### 4.1.1.2 Cree worker integration

The integration of all our workers has always been a key element for Stornoway. Although at the time of construction, Stornoway was delayed in the implementation of the project, it was in 2017 that the implementation of the majority of the programs could be carried out, including the Cree staff integration program.

All programs are scalable and include follow-ups and analyses that are updated as needed.

Our past experience in multicultural environments has taught us that semi-directed exit interviews are the ideal way of obtaining a true picture of job satisfaction from employees, along with their suggestions for improving the way we manage diversity in a multicultural setting.

Confidential surveys (figure 8.20) can thus help to know our weaknesses (especially for non-native personnel), but our experience in 2021 in conducting a confidential survey for Cree staff, we have shown that this type of method for better targeting our strengths and weaknesses is not optimal for them.

It must be remembered that for millennia, the Cree have always favoured gatherings in person to verbally transmit their satisfactions and grievances together as a community. In these types of meetings, everyone shares their views on what is working and what is not working with the assembly, and offers suggestions that are always taken into account by the Chief and councillors. For example, each year, the community councils organize an annual general meeting (''AGA'') that can last up to 3 days, and it is from this great meeting that the Chief and his council establish their objectives.

CONFIDENTIAL CREE WORKFORCE SATISFACTION SURVEY RESULTS

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***FOREWORD***

Last February, we prepared a confidential survey for the Cree employees of Mistissini. Through this survey, we wanted to target the different sectors that could affect the attraction and retention of our Cree employees and allow us to implement corrective initiatives or even policies.

The survey consisted of 41 questions associated with different themes:

- Employee Engagement and Satisfaction;
- Work-Family Balance;
- Personal and professional development;
- Salary and recognition;
- Relations with Stornoway authorities;
- Teamwork;
- Health and safety;
- Overall job satisfaction.

***METHODOLOGY***

The survey was sent to the entire Cree workforce in early March. At the beginning of April, we noticed that no Cree had responded to it.

Our Diversity and Integration Coordinator, who organizes recurrent meetings at the site or by videoconference with the groups of workers, inquired from them why the survey was not completed. It appears that the Cree's very rarely respond to surveys, preferring group discussions. It should be noted that this method has been used among the Cree's

**Figure 8.20 Excerpt from the confidential Cree labour survey in 2021**

Before the pandemic, we were holding these types of gatherings with our Cree employees. These meetings were often improvised, led by our Diversity and Integration Coordinator. This allowed us to target our strengths and weaknesses well. This approach will be reintroduced continuously in 2022, if the restrictions associated with the pandemic allow us to do so.

An essential element to improve our management systems is certainly the exit interview. Thanks to this, we can get feedback from the departing employee on their satisfaction and suggestions to foster an inclusive environment.

Tables 8.1 to 8.3 summarize some of the reasons for departures that appear on questionnaires given to employees leaving the company.

**Table 8.1 Choices about reasons for leaving - interview**

| Exit Interview Questionnaire (Reasons) |
| --- |
| Work-life balance |
| Lack of career advancement |
| Work environment |
| Employee benefits |
| Excessive workload |
| Salary conditions |
| Conflicts with co-workers |
| Company culture |
| Work hours |
| Lack of management leadership |
| Promotion opportunities offered by new company |
| Responsibilities/tasks not aligned with my skills |
| Career transition |
| Returning to school |
| Retirement |
| Annual vacation offering |

**Table 8.2 Other questions about reasons**

| Other Questions |
| --- |
| What will your role be in the new organization? |
| What could Stornoway have done to retain you? |
| What areas could Stornoway improve upon? |
| What positive aspects will you retain regarding your time at Stornoway? |
| Do you have any suggestions for improving less positive points? |
| Would you agree to return to work at Stornoway? |
| Would you recommend Stornoway to a friend? |

**Table 8.3 Selection of proposed answers**

| Selection of Answers |
| --- |
| Employee onboarding and integration |
| Employee benefits |
| Workload |
| Clear role and responsibilities |
| Internal communications |
| Work-life balance |
| Equipment–tools required for the job |
| Pay equity |
| Continuing education |
| Performance management |
| Career advancement opportunities |
| Recognition of my skills |
| Work relationships and environment |
| Compensation |
| Support from my supervisor |

Stornoway believes that employee retention is closely tied to successful integration, and that is especially true for Cree workers.

The steps initiated in 2020 were therefore maintained in 2021 in order to help us better cope with the pandemic:

- List of purchases of products and services to facilitate the opening of shops (retailers) in communities of interest;
- Implement screening and protective measures at airports, airplanes and the mine site;
- Encourage internal promotions by linking them to the development system;
- Improve partnerships with Cree organizations to better mentor new employees;
- Continuation of the continuous Cree Cultural Awareness Program for all employees (via videoconference);
- Facilitation of information sessions on health-related items;
- Meetings by videoconference or phone call with the Integration and Diversity Coordinator to better understand the issues experienced by some employees and to seek sustainable solutions;
- Create and share information modules to raise awareness of agreements among Stornoway managers.

### 4.1.1.3 Language of communication

We needed to address language-related issues. Indeed, despite the existence of a clear policy, its application within the working groups, particularly in the underground mine, became difficult. This has prompted us to review its application comprehensively.

We worked on ensuring that several Cree employees were part of all production teams and set up English language courses for supervisors who needed to improve their English language skills. And there were some Cree employees who enrolled in French language classes. We set up external e-learning programs based on the participants' availability. The diversity of the work teams also meant there were more opportunities to learn the two working languages used at the Renard mine.

In addition, from 2019 to the end of 2021, Stornoway worked to fulfill its obligation to establish a francization program that takes into account the Mecheshoo agreement. Indeed, persons eligible for the benefits of the James Bay and Northern Quebec Agreement, the Cree and Inuits, organizations created under the Agreement, and organizations comprized of a majority of eligible members (e.g. businesses) are not subject to the Charter of the French Language and they have the right to use their language in the territories covered by the Convention.

Because Stornoway is located in the territories of the Cree of Eeyou Istchee and hosts Cree members, Stornoway can use a bridge language in its communications to employees. As the Cree workforce uses English to communicate with Francophone staff, our policies and rules include the use of English as a bridge language for communication with our Cree employees and these elements are accepted by the Quebec Board of the French Language (Figure 8.21).

stornoway

Hourly Employee Handbook

**Section 3: LANGUAGE POLICY**

In compliance with the Charter of the French Language, Stornoway is committed to communicating mainly in French in its communications at the workplace. Except for the terms concluded in the Mecheshoo Agreement, a policy sets the rules to follow in regard to the French language as a qualification for hiring, promoting, and transferring personnel at Stornoway.

**3.1 Language – Hiring, Promotions, and Transfers**

The Company's senior management is responsible for establishing the criteria regarding hiring, promoting, and transferring personnel. These criteria include qualifications, skills, experience, and language (written and spoken).

Although the working language is French, the Company is committed to preventing barriers to hiring, promoting, and transferring employees who speak only French or English.

However, for supervisor positions and any other position requiring bilingual language skills (French and English), knowledge of French and English is mandatory.

**3.2 Written Employee Communications in Quebec**

All announcements, official Company policies and instructions, notices, in-house communications, and documents intended for the personnel with regard to hiring, promotions, and transfers are written in French or in a bilingual version when necessary.

Stornoway may implement specific measures to fill any language-related gap.

**3.3 Multicultural Environment**

Given Stornoway's multicultural environment, certain requirements regarding the use of either language recognized at the Company will be taken into consideration; however, employees working in the province of Quebec are guaranteed the right to work and communicate in French with their colleagues. The Company respects the right of individuals to speak the language of their choice in their private lives.

The Company wishes to encourage harmonious communication where cultural and linguistic diversity benefits all employees.

**3.4 Language of Radio Communication**

During radio communication, we ask our employees to use one or the other official languages, i.e. French or English, so that all employees may understand and to ensure their safety on the site at all times.

**Figure 8.21 Language policy**

### 4.1.1.4 Cree skills development and employment partnership

In 2018, at the request of our Cree personnel, Stornoway set up a program in partnership with Apatisiiwin Skills Development to facilitate effective integration of Cree employees in their new working environment. The program to promote Cree skills development and employability (https://apatisiiwin.ca/) continued in 2019 but had to be suspended indefinitely in 2018 and 2020 due to the pandemic (figure 8.22).

The objective of this three-year program is to retain Cree workers by having a job coach on hand to provide support daily. ASD coach Philip Piercey works in partnership with Stornoway's human resources department and Integration and Diversity Coordinator, taking on various roles with a view to increasing retention rates, including:

- Working with new employees, as well as employees who are having trouble performing their work or who are at risk of being terminated;
- Helping workers improve the process of preparing for work, such as arriving on time to catch a flight, understanding zero-tolerance policies and developing communication skills;
- Assisting supervisors with training and integrating Cree workers, especially helping them develop effective communication skills and increasing their understanding of key aspects of Cree culture such as family responsibilities;
- Developing individual training plans in collaboration with our training and development team for each Cree employee based on their skills and training opportunities.

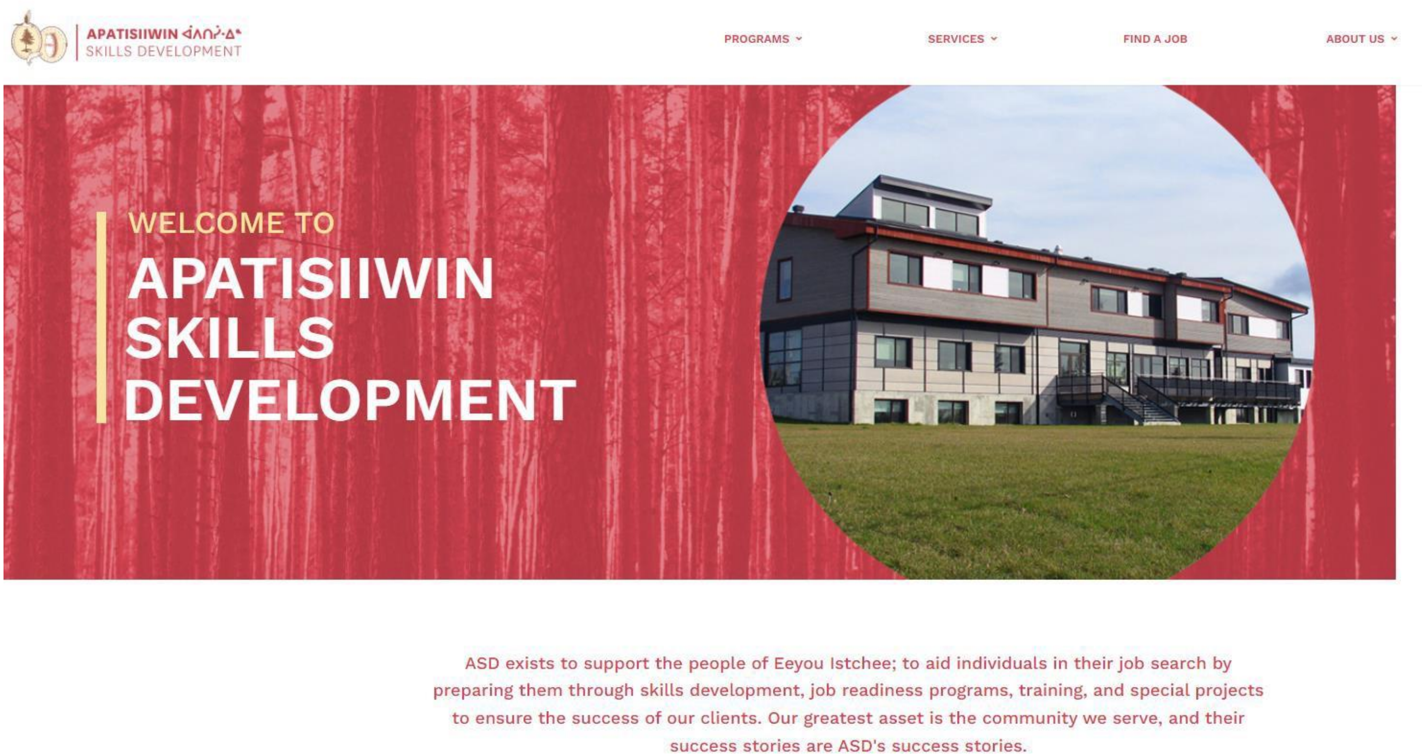


**Figure 8.22 "Apatisiiwin" webpage, Cree Skills Development and Employment Program**

As we all know, the Cree have a long history in Eeyou Istchee and they are a dynamic and diversified people whose population is growing quickly. The Cree are proud of their culture and most of them are keenly aware of their ancestral origins. For the Cree, preserving their cultural identity is essential, and has become a major, visible part of the Quebec landscape.

The Cree cultural awareness program "The road ahead..." (Figure 8.21) depicts real life as experienced by the Cree, who currently represent 8% of Stornoway's workforce. The program delves into Cree historical and contemporary characteristics, and encourages an openness toward cultural differences, and a positive updated vision of the Cree universe of yesterday and today. It implicitly combats prejudices and nurtures a more critical approach to prevailing ideas about the Cree people while fostering closer ties among the various cultures.

The program looks at the history of the Cree in addition to :

- Values and beliefs;
- Teachings;
- Rites and ceremonies;
- Gestures
- Language;
- The Indian Act;
- Regional administrative and political structures;
- The Mecheshoo Impact and Benefits Agreement (IBA) negotiations;
- Contents of the agreement;
- Thoughts on enhancing understanding of the Cree culture;
- Good advice to facilitate integration and retention.

These elements give managers guidance both for the integration of Cree employees and to better know them and thus foster cultural ties.

Launched in 2018, it was completely revised by the Host Community Relations Division to ensure it fit in with daily realities and it takes into consideration the needs expressed by employees and supervisors about the inclusion of cultural minorities. Since its redesign in 2019-2020, all employees already employed have been able to access the link to view this program (Figure 8.23).

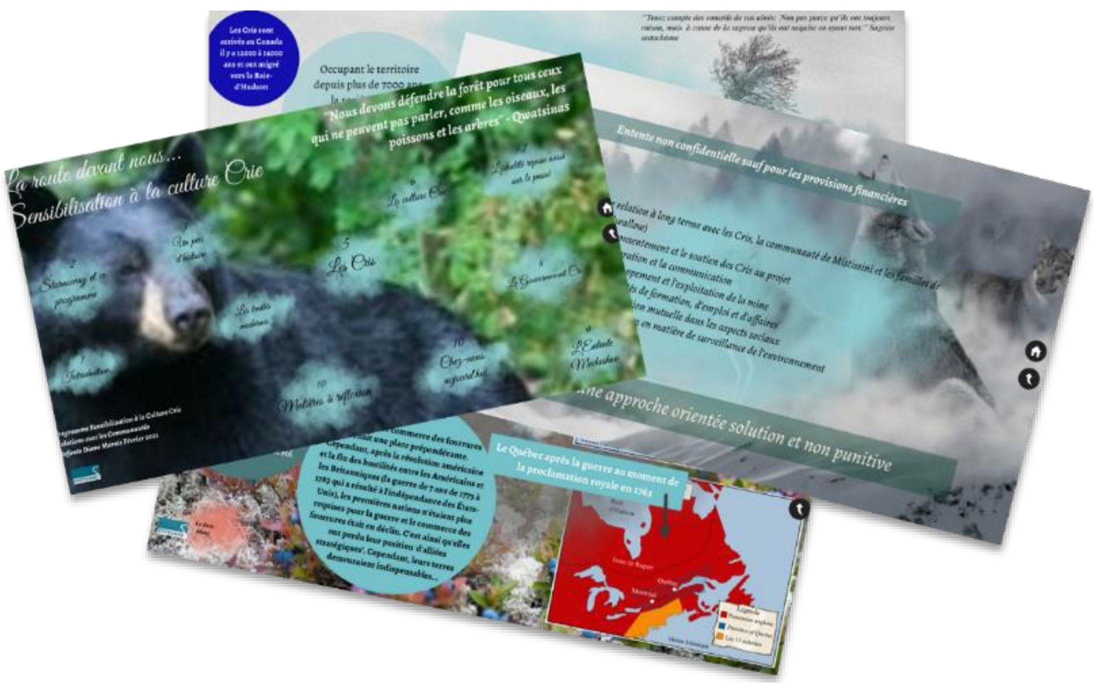


**Figure 8.23 Excerpts from the Cree Cultural Awareness Program**

As with most programs, the pandemic has severely restricted the dissemination of this program. The year 2022 will certainly give us the opportunity to offer this program properly and in person. We believe that presenting this program in person is important to enable exchanges between employees and presenters.

#### 4.1.1.5 Promoting integration and management of cultural differences

The first step in integrating and managing cultural differences is to deconstruct prejudices and stereotypes. In addition, since managers are the standard-bearers of a company's mission and values, we need to train our supervisors on the art of integrating and managing cultural differences within their groups.

Stornoway therefore ensures:

- Minority groups are represented on teams;
- The soundness of its employment systems, including policies, decision processes and the practices that impact every aspect of people's careers in the company;
- The development of a culture that values integration: behaviours including communication, informal social relationships, decision-making practices, standards, and so forth.

In addition, Stornoway positively influences its managers by:

- Putting integration-oriented logistics in place;
- Strengthening policies and procedures aligned with its integration values;
- Using training, which is at the heart of integration;
- Applying management and supervisory systems that focus on individual behaviours;
- Focusing on group strengths because groups influence individual behaviours at every level of the organization;
- Strengthening managers' buy-in for our values because that's what shapes our corporate culture;
- Mixing teams to forge bonds among the various cultural groups;
- Conducting exit interviews to learn what can be done to improve employee integration, development and retention.

Similarly, the Cree Cultural Awareness Program provides advice to all to ensure the elimination of prejudice, the deconstruction of stereotypes and the denial of discrimination, as well as to encourage the inclusion of all employees in one large team: The Stornoway Team (Figure 8.24).


**Figure 8.24 Excerpt from one section of the Cree Cultural Awareness Program**

#### *4.1.1.5.1 Onboarding program*

The onboarding program is an important element in the engagement of new employees and allows them to develop a sense of belonging to Stornoway (Figure 8.11). A mechanism was put in place to transmit essential information to new hires.

In this regard, one of the tasks of HR's Community Relations Division is to work with Renard mine's training team on integrating all employees. This division is actively involved in recruitment, in partnership with Apatisiiwin, and is working to develop an understanding among the Cree of how the mine works. It is also involved with the tallymen and informs personnel about the Mecheshoo agreement.

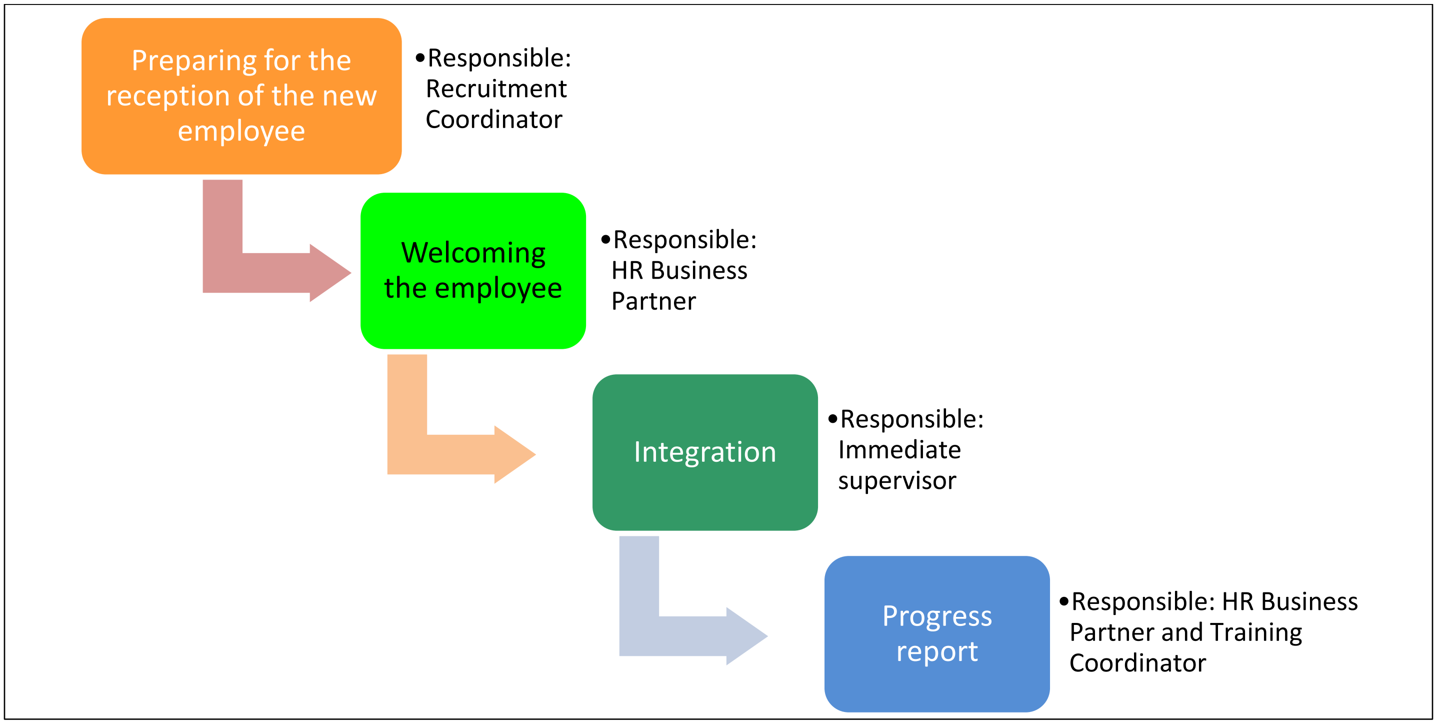


**Figure 8.25 Basics of the onboarding program**

A structured onboarding and integration approach impacts length of employment, employee involvement in Stornoway and their level of engagement with company values. We have observed that the more structured the onboarding process, the faster the new employee whether Cree or non-Cree reaches a satisfactory level of performance.

The Host Community Relations team works closely with the main managers at the mine and oversees integration and integration project monitoring efforts including onboarding and mentoring programs (photo 8.5). The team monitors mentoring, development activities and special diversity-related projects.

It also ensures that inclusion strategies are aligned with the company's responsibilities while providing advice, guidance and support to all managers in order to develop a better understanding of Cree culture.

In addition, the team is called upon to deliver general presentations to employees to promote best practices, and in collaboration with managers, develop initiatives to encourage employee training and advancement.

It assesses the representation of minorities in the organization and makes suggestions to increase the number of employees from these groups. It is called upon to work with all employees, but particularly with minorities in the organization and to address their concerns.

**Photo 8.5 Charlie Petawabano, Integration and Diversity Coordinator (left), and Diane Marois, Director, Organizational Development and Host Community Relations (right)**

#### *4.1.1.5.2 Development program*

To build a culture that promotes integration and diversity, Stornoway has sought inspiration in the history of the Northern Quebec region and drawn on lessons learned by diverse mining companies in the area, including the Troïlus mine, a mine that is a prime example of a successful integration of Cree workers and has served as an inspiration for Stornoway.

The Northern Quebec economy is primarily driven by natural resources including mining, forestry and hydroelectricity. These sectors of activity have long supported the economic activity of the region. The Crees and Jamesians share the territory and have been able to combine modern technologies and ancestral practices, making the region a unique place to live.

Over the years, the mines in the region have faced workforce recruiting and retention hurdles along with recurring fluctuations in metal prices, which naturally trigger rationalization of personnel.

The mining industry has had to deploy a number of tools and incentives along with integration and development systems for the acquisition, development and retention of their employees. Decades later these issues remain.

> *"It's not sufficient to reap the benefits of knowledge and expertise or harvest the fruit of people skills and transferable skills, we also need to share our knowledge and skills so that we all grow together!"*
>
> Jacques Salomé, Psychologist, Scientist and Sociologist

Considering all of this, Stornoway has established structures to promote a culture of integration and diversity through a continuous education system (hands-on, partner-based training).

This program continuously provides a workforce trained practically to work in a mining context. It also aims to attract a multicultural and diversified customers. It innovates by twinning education and mining industry requirements.

#### 4.1.1.5.3 *Multi-Disciplinary Integration*

The hierarchy of skills (soft skills, hard skills, and transferable skills) helps to ensure operational effectiveness and sustainability. Stornoway and the Training and Employment Committee are extremely proud to partner with organizations that train young people to take on tomorrow's trades in the region. Supporting education is a cherished value for the Stornoway team.

Starting from the principle that on-the-job training is an investment that benefits both the employee and the company, Stornoway has established and maintained a learning- and development-oriented culture. As of March 2015, Stornoway has gradually built up an ongoing training system offering continuous improvements.

The system promotes efficient, continuous and sustainable growth of the workforce. The training and development team is proud of the results achieved and ensures that the program is fully reinstated following the pandemic.


**Photo 8.6 Employee Stéphanie Dufour visiting the underground mine**

It was also determined that the success of efforts to integrate our Cree personnel is enhanced when employees serve as instructors. Based on past experience and comments made during exit interviews, the community relations team and trainers in partnership with managers of the major departments at the mine and the Host Community Relations team have been promoting the training of Cree employees for instructor positions.

Stornoway has put in place a management culture that promotes complementarity among communities, by taking different profiles and cultures into consideration.

It has also sought to ensure sound advancement for all employees through a development program that enables employees to choose the training they'd like on the basis of their profile, their past experience, their career aspirations and their personal objectives within Stornoway. Exit interviews have in fact shown that employees want the opportunity to learn new functions and achieve their career goals within Stornoway.

Indeed, it would appear that employees all have common goals: they seek to keep on growing and sharing what they've learned, be part of the decision process and be kept in the loop. It should be noted that since the launch of commercial production in 2017, we have observed that promoting Cree employees to key positions has eased the integration of many others into underground training programs and to joining the team of miners!

All these elements create fluid communication between Cree and non-Cree employees, promote retention through the matching of cultures and generations, and enable employees to better cope with the new facets of their work environment. They also optimize their individual performance, encourage synergy between colleagues and achieve or exceed expected productivity levels.

In all, our Cree staff won 31 promotions and transfers in 2021.

## 8.5 Land Use by M-11 Trapline Users and Tallymen

### 8.5.1 Scope of Monitoring

Mine site preparation and development work had the effect of making part of the territory unavailable for natural resources harvesting by M-11 trapline users.

As indicated in the impact assessment, a number of activities had the potential of causing nuisances that would make some animals avoid the construction and mine site, while causing inconvenience for land users. Monitoring big game and land use was therefore undertaken. Cree land users needed to alter their hunting, fishing and trapping customs by avoiding the mine area given the 1 km safety perimeter established around the mine and airport facilities.

Stornoway also committed to staying in constant communication with the tallymen to avoid seriously obstructing their traditional activities and to making any necessary arrangements to compensate for any potential or actual disturbances. The mitigation measures in place primarily aim to reduce the negative impacts on M11 trapline users' traditional activities.

Condition 5.1 of the Global CA specifies that the proponent is required to "monitor land use by M-11 trapline users" and "monitor conditions under which Cree use Lake Lagopede resources."

The objectives of monitoring land use are to:

- Update data collected before the construction and implementation of the Renard project (EBS and ESIA) regarding M-11 trapline users' hunting, fishing and trapping activities;
- Validate the impacts of construction work and mining activities on the hunting, fishing and trapping activities described in the ESIA;
- Apply indicators to document changes made by the project to facilities and activities tied to the use of M-11 trapline and Lake Lagopede;
- Identify the main reasons for any changes;
- Document discussions between the proponent and M11 trapline users concerning mitigation measures, including those promoting the gradual re-use of the mine site by the Crees;
- Record M11 trapline users' assessment of the various mitigation and enhancement measures applied by Stornoway to enable them to practise their traditional activities;
- Gather information on users' perception of the impacts along with their concerns and comments regarding the project and mining operations.

##### *8.5.1.1.1 Distribution of monitoring results*

The results of monitoring land use by M11 trapline users are presented to these trapline users at meetings of the Swallow family members. Information that can be distributed more widely will be identified at these meetings.

Under the Mecheshoo Agreement, relevant documents are filed and presented to the Environment Committee. Finally, in compliance with the instructions to the proponent in Condition 5.3 of the Global CA (December 4, 2012), some land use monitoring results for which consent has been granted by the M-11 trapline users may be distributed to other interested project stakeholders.

**Photo 8.7 Employees Isabelle Vallière and Stéphanie Dufour visiting the underground mine**

##### *8.5.1.1.2 Meetings with tallymen*

Activities involving tallymen were mostly held by videoconference or telephone. They were informed about the progress of the work, from operations to the mine, participated in various activities related to environmental management in their territories and received answers to their questions.

### 8.5.2 Land Access

Route 167, which was built by people from the region, is a vital link for the delivery of goods such as concrete, steel, fuel, piping, materials, mining vehicles many other components that are indispensable to Renard mine operations. The Route 167 extension built jointly by the MTQ (143 km) and Stornoway (97 km) has become a public road that everyone can use up to the mine gatehouse, which of course represents the boundary of the area strictly controlled for safety reasons. Other than the 1-km no-hunting zone around the mine and airport sites, members of the Swallow family can practice their traditional activities throughout the territory including along the road between the mine and the airport.

A Route 167 joint committee was set up by MTQ in 2014, a cooperative endeavor that made the highway safer and boosted emergency response on the road. To enhance awareness among stakeholders, Stornoway for its part, published notices regarding the safe use of the mine road in the media (Figure 8.17).

In the event of an incident, Stornoway immediately contacts local authorities to advise them of the situation so that they can convey the information to residents by way of radio broadcasts and social media. This process works well and helps prevent delays for land users.


**Figure 8.26 Safety announcement**

### 8.5.3 Comments, Perception of Impacts and Project-Related Concerns

Stornoway has always taken care to keep Sydney and Emerson Swallow, the two M-11 trapline tallymen, informed and to be responsive to their concerns.

As set out in the Mecheshoo Agreement, Stornoway is working on encouraging the development of Cree businesses, particularly the firms run by the tallymen's families.

In this regard, Stornoway is proud to have the following companies involved at the Renard site:

- *Kiskinchiish Camp Services* (Sydney Swallow), which provides cafeteria and janitorial services;
- Swallow-Fournier (Emerson Swallow), which is actively involved in civil construction work (modified processed kimberlite containment facility and sorting plant).

The involvement of Kiskinchiish Camp Services is aligned with the philosophy Stornoway advocated in the Mecheshoo Agreement. As the primary service provider, this company delivers essential services for the mine and has members of the Swallow family in its employ.

In 2021, Kiskinchiish served three meals a day to on average 253 workers on site. Kiskinchiish operates with about 70 employees, 80% of whom are Crees primarily from the Mistissini community.

Like Stornoway, Kiskinchiish must contend with a significant lack of personnel and hence faces staff retention issues. Stornoway is working closely with Kiskinchiish to minimize the impact of these issues.

Stornoway is extremely proud of the entrepreneurship sustained by the family and the success of this family business. For Sydney Swallow, this represents a long-term opportunity for family members as well as people from the community.

# 8.6 Local and Regional Economic Spinoffs

## 8.6.1 Scope of Monitoring

As indicated in the ESIA, during the operation phase, annual expenses to operate the Renard diamond mine were expected to be significant and most were to be incurred in the region and province.

In order to maximize the regional and more particularly local economic spinoffs (Mistissini, Chibougamau and Chapais), Stornoway, together with the Cree and Jamesians, has provided various terms and conditions relating to employment, training and the awarding of contracts. These terms and conditions are specified in the Mecheshoo Agreement signed with the Cree and in the Declaration of Partners signed with the Chibougamau and Chapais communities.

Condition 5.1 of the Global CA specifies that the proponent is required to monitor "the local and regional economic spinoffs" and "the goods and services contracts awarded to local firms."

The specific objectives of monitoring local and regional economic spinoffs are to:

- Use available information to update the portrait of the Cree and James Bay economy through changes in the main economic indicators;
- Describe the type and level of economic activities generated by the Renard diamond project;
- Establish the significance of economic spinoffs generated by the project, particularly in local and regional communities;
- Establish the significance of goods and services contracts awarded to local businesses;
- Evaluate the effectiveness of measures to maximize economic spinoffs described in the ESIA and proposed in the Mecheshoo Agreement or developed during the course of the project

#### *8.6.1.1.1 Distribution of Monitoring Results*

In accordance with the instructions provided to the proponent in Condition 5.3 of the Global CA (December 4, 2012), the results of the monitoring of local and regional economic spinoffs are filed and presented to the Renard Committee.

The same applies to the Renard Liaison Committee created by the Partnership Agreement signed with Chibougamau and Chapais municipalities. The results are also distributed to the Environment Committee, Environment Exchange Group, and local and regional Cree and non-Cree organizations whose objectives are to promote local, regional and provincial economic development.

#### *8.6.1.1.2 Impact on employment*

In terms of regional benefits, 106 Stornoway employees from our host communities (including 40 Cree employees) contributed, as at December 31, 2021, to generating annual benefits of more than $9.2 million in salaries for Mistissini, Chapais and Chibougamau.

$ 11,019,833

***Total salaries paid to 106 Stornoway employees from host communities (Cree and Mistissini, Chibougamau and Chapais)***

## 8.6.2 Goods and Services Contracts

It will be almost 3 years since Stornoway completed construction at the Renard mine site. Despite the many challenges faced over the last two years, Stornoway managed to stay the course and kept its objectives well in sight. Due to the strategic optimization of its expenses, the purchasing volume for the year 2020 has significantly decreased, but 2021 showed an appreciable increase.

#### *8.6.2.1.1 Distribution of Suppliers by Dollar Value*

As part of its sustainable development approach, Stornoway favours awarding contracts for the purchase of goods and services to competitive local businesses. Contract splitting and the negotiation of certain contracts on a mutual agreement basis have proven to be beneficial strategies for both local businesses and the Renard Mine.

Stornoway is therefore very proud to have relied on its business partners to successfully develop and operate its Renard Mine, which in turn has contributed positively to the growth of its host communities. In 2021, the daily workforce at the mine site averaged 253 workers, including those from Stornoway and contractors, of which an average of 9% were workers of Cree origin (Figure 8.27).

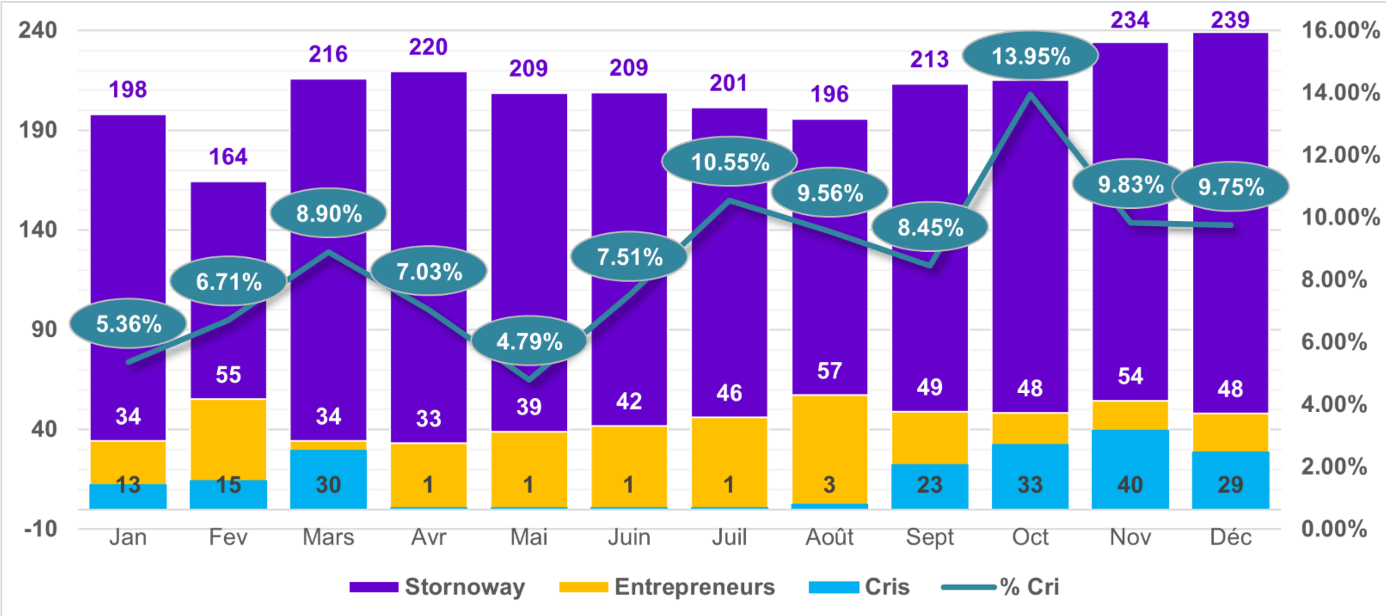


**Figure 8.27 Average monthly cree workforce including contractors at Renard mine in 2021**

The number of workers at the site peaked in November 2021 with an average of 289 workers on site each day.

## 8.6.3 Projects Funded by the Mistissini/ Renard Business Development Fund

Under the Mecheshoo Agreement, the Business Development Fund was set up when commercial production at the Renard mine began, i.e. as of January 1, 2017.

Every year Stornoway and Mistissini contribute equally to the Mistissini/Renard Business Development Fund established to support the start-up and development of Mistissini Cree businesses. The funding can be used to support the start-up or development of businesses in any sector of activity.

Funding applications are submitted directly by the applicants to the Mistissini Band Council, which manages the Fund. The Renard Committee then makes recommendations with regard to the award of funding to the various applicants.

In 2020-2021, a total of $100,000 (maximum of $100,000 per partner per Cree fiscal year) was awarded for 6 projects submitted to the Council of the Cree Nation of Mistissini.

A policy with regard to this program was put in place by the Mistissini community to establish a formal process for the applications.

In addition, a communications plan was deployed by the Cree partners in 2020 to inform Mistissini residents about the Mistissini/Renard Business Development Fund.

This fund enabled the community of Mistissini to create or renovate 6 companies in 2021:

- Fresh Tracks Transport – a subcontractor for the transport of wood chips, sawdust and bark;
- Flair Salon – women's haircuts and treatments (Figure 8.28);
- KB Barber Shop – men's haircuts and treatments (Figure 8.28);
- Nibiishii Corp – establishing and preventing risks in wildlife reserve territories;
- R&D Eenou Lumber – construction of a hardware store to replace the caravan;
- Mistissini Outfitting Camps – renovations of the outfitter buildings Osprey Lodge and Camp Louis-Joliet.

These elements also indirectly benefited the tallymen of the M-11 territory.

$123,439,177

***Invested in the purchase of goods and services, from suppliers from all over Quebec, including***

$21,630,448

***(17,5%) directly invested in the project host region (Cree, Chibougamau and Chapais)***

$100,000

***Awarded to 6 projects[2] submitted to the Council of the Cree Nation of Mistissini.***


**Figure 8.28 Cree partner business cards**

Stornoway is proud of the level of collaboration from stakeholders, who are also focused on finding ways to optimize the benefits generated by the Renard mine. It continues to have a significant daily impact on Cree and Jamesian stakeholders and contributes to the economic growth of the region.

## 8.7 Communications

Every year, Stornoway reviews its communications plan on the basis of the needs and issues that arose during the year.

The objective of the communications plan is to consolidate support from the local communities and decision makers and maintain their respect.

The plan is also a tool for reassuring regional stakeholders regarding Stornoway's commitment to maximizing local benefits generated by the project while minimizing environmental impacts. The plan aims to keep stakeholders well informed and minimize any possible misunderstandings while managing expectations appropriately.

Finally, the plan is designed to be responsive to concerns expressed by M-11 trapline. It was designed primarily to target stakeholders who are particularly influenced by mining activities (figure 8.30).

Special communications are therefore directed toward tallymen and their families, Renard mine employees and members of various committees set up under the Mecheshoo Agreement with the Cree, and the Partnership Agreement signed with Chibougamau and Chapais.

Included among the communications activities organized during this reporting period are:

- Quarterly meetings with the three Mecheshoo Agreement committees (Renard Committee, Education and Employment Committee, Environment Committee);
- Quarterly meetings with the Partnership Agreement Liaison Committee;

[1] *Under the Mecheshoo Agreement, the Mistissini/Renard Business Development Fund was initiated in 2017 and each year Stornoway and Mistissini jointly contribute to this fund to support the start-up and development of Mistissini Cree businesses (maximum $100,000 for each partner)*

- Presence of the Integration and Diversity Coordinator, Mecheshoo Agreement Implementation Officer, at the Stornoway office in Mistissini, along with the Director of Development and Community of Interest Relations, in order to meet the expectations of the members of the impacted communities and to ensure that employment benefits are maximized, hiring and retention are encouraged, and stakeholder development is ensured;
- Information meetings and presentations with employees at the mine site;
- Internal information channel broadcast on the Renard Mine corridor screens;
- Meetings with tallymen, including some of their family members, to keep them informed of the progress of construction and operation work and to take note of their concerns or questions;
- Interventions on the local radio stations of Mistissini and Chibougamau-Chapais in order to provide an update on employment opportunities at the mine or to announce upcoming events/activities in the communities
- Interventions with the Chief of the Council of the Cree Nation of Mistissini and the municipal authorities of Chapais and Chibougamau to provide an update on the condition of the work in progress and the local spin-offs and job opportunities at the mine.

The spirit of the Mecheshoo Agreement is based on a cooperative effort by the partners, and project implementation is the joint responsibility of Stornoway, Mistissini and the Eeyou Istchee Cree government (Figure 8.30).


**Figure 8.29 Communication plan title page**

Achieving the objectives, we have set together is contingent upon showing cultural respect, sharing differences and working together. Stornoway is proud to be contributing to the growth of the Mistissini community, the Crees of Eeyou Istchee and the Chibougamau and Chapais communities, by creating a hopeful future for young people in the community and making a difference for local families.

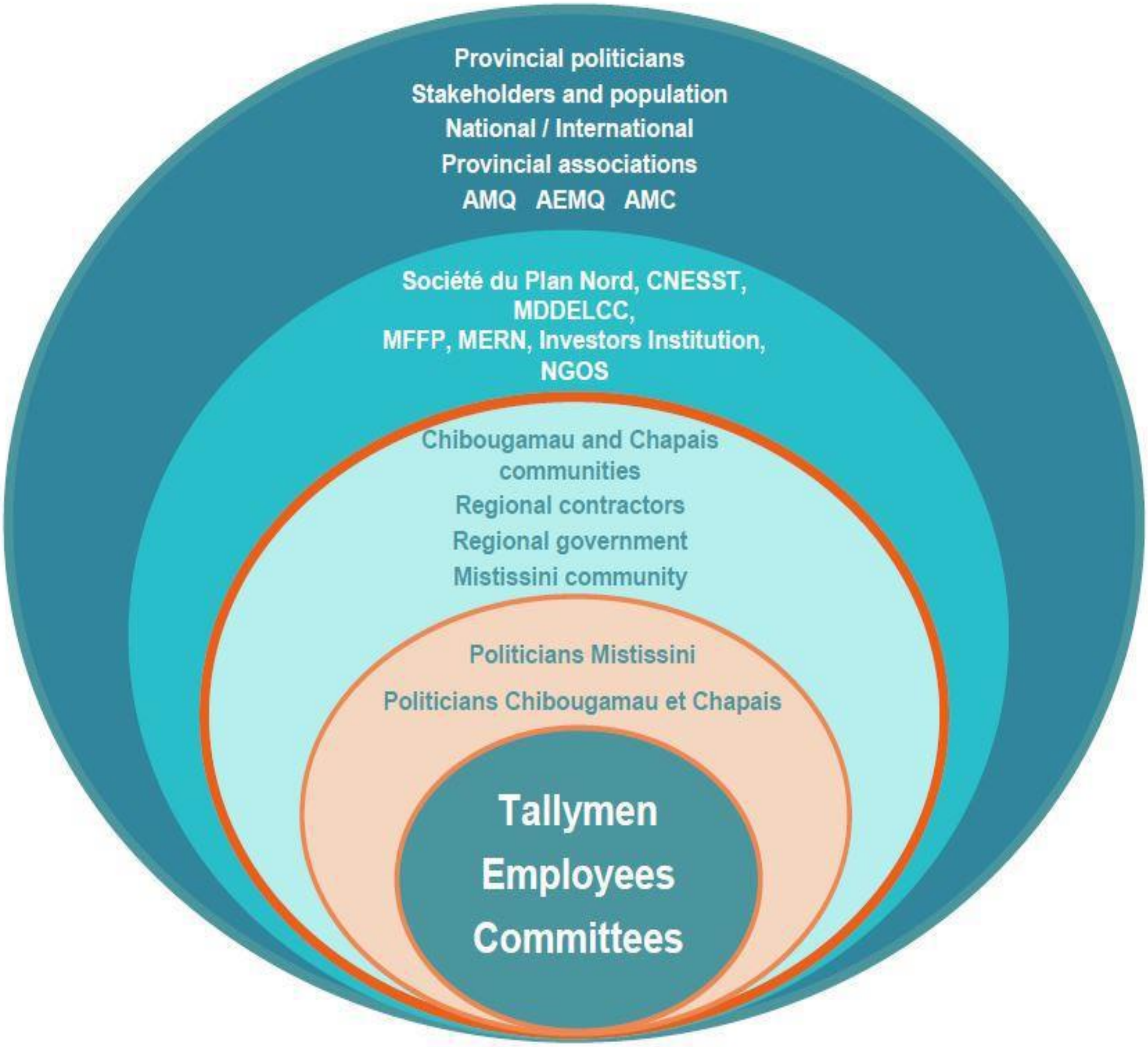


**Figure 8.30 Distribution of communications**

# APPENDIX 1

## REVIEW AND VALIDATION OF THE ENVIRONMENTAL AND SOCIAL MONITORING REPORT

Le 20 mai 2022

Madame Maryse Godin
Chef du Service Environnement
Les Diamants Stornoway (Canada) inc.
1111, rue St-Charles Ouest
Bureau 400, tour Ouest
Longueuil (Québec) J4K 5G4

N/Réf. : 061470.075

**Objet : Programme de suivi environnemental et du milieu social**
**Examen et validation du rapport de suivi 2021**

Madame,

À titre de responsable de projet pour Norda Stelo, de l'étude d'impact du projet diamantifère Renard et de l'assistance technique en environnement pour la mine Renard, les Diamants Stornoway (Canada) inc. m'ont fourni l'opportunité de réaliser un examen complet du rapport de suivi 2021.

À la lumière de cet examen et de ma connaissance des activités qui ont eu lieu et dans lesquelles j'ai été impliqué directement ou indirectement, je peux confirmer que les activités qui sont rapportées dans ce rapport ont bel et bien été réalisées et que les résultats du suivi reflètent bien ce qui a été documenté dans ce rapport. Je peux également attester que les mesures de prévention, de gestion des risques, d'atténuation et de compensation qui étaient prévues dans l'étude d'impact environnemental et social et qui ont été discutés avec les Cris et les autorités gouvernementales ont été mises en application.

L'équipe de Norda Stelo a été directement impliquée, et de façon soutenue, dans le développement et la mise en œuvre des études environnementales du projet Renard depuis le début du processus d'évaluation environnementale en 2010 jusqu'à aujourd'hui. Elle a donc été à même, de constater à travers ces activités, du respect des engagements de Stornoway envers les communautés d'accueil ainsi que de la mise en œuvre et de l'efficacité du système de gestion environnementale et sociale de la Mine Renard. En effet, au cours de l'année 2021, Norda Stelo a pu constater l'application des mesures prévues à travers :

- L'actualisation des cartes piézométriques des eaux souterraines;
- La réalisation de l'inventaire 2021 de la grande faune et des entrevues avec les maîtres de trappe;
- La mise à jour du programme de suivi environnemental, incluant l'actualisation du cadre réglementaire applicable à la mine en exploitation;

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**norda.com**

- Le support à l'analyse comparative des variantes de sites pour la nouvelle aire de confinement de la kimberlite usinée;
- L'assistance technique à Stornoway pour le cadrage et la préparation des demandes de permis et autorisations requis pour la nouvelle aire d'accumulation de la kimberlite usinée;
- La préparation d'un rapport d'interprétation du premier cycle de l'étude de suivi des effets sur l'environnement de la mine Renard.

Notre participation directe à ces activités et l'accès que nous avons eu aux données et résultats de suivis, nous ont permis de constater le travail de gestion environnementale réalisé par la Mine Renard en exploitation. Cela nous a également permis de valider la conformité avec le cadre réglementaire applicable, les conditions des autorisations fédérales et provinciales et du certificat d'autorisation (CA) global ainsi que les engagements pris envers les communautés d'accueil lors des consultations publiques et tables d'information et d'échange.

Les discussions auxquelles j'ai participé avec les représentants de la communauté crie de Mistissini ainsi que la stratégie d'embauche et d'approvisionnement déployée par Stornoway sont conformes aux engagements de la compagnie envers ces communautés dans l'Entente Mecheshoo et de la Déclaration des partenaires.

La diffusion publique de ce rapport de suivi est le reflet de l'approche de transparence de Stornoway depuis le début du développement du projet. J'encourage l'équipe de Stornoway à poursuivre cet excellent travail de respect de l'environnement et des communautés.

Veuillez recevoir, Monsieur, nos salutations distinguées.

Vital Boulé

Vital Boulé, M. Sc., Biologiste Responsable de projet
Directeur technique, Environnement Norda Stelo Inc.

# APPENDIX 2

## DEPOLLUTION ATTESTATION

### PART III – ATMOSPHERIC EMISSIONS

## SECTION 1 - ASPECTS GÉNÉRAUX

La présente partie de l'autorisation concerne les émissions atmosphériques et le bruit.

Tout équipement, système ou autre dispositif existant ou exigé dans la présente partie de l'autorisation, doit être maintenu en bon état de fonctionnement et fonctionner de façon optimale pendant les heures de production.

## SECTION 2 - POINTS D'ÉMISSION

Les principaux points d'émission ou de dégagement de contaminants dans l'atmosphère faisant l'objet d'une norme, d'une exigence de suivi, d'une exigence d'étude ou de toute autre exigence résultant de l'exploitation de l'établissement sont présentés ci-après au tableau 111-1.

Les numéros des points d'émission sont reportés sur des schémas à l'annexe 2 de la partie VII de l'autorisation (annexes 2-8.1 et 2-8.2).

## SECTION 3 - NORMES D'ÉMISSION

### 3.1 Normes d'émission réglementaires

Les normes réglementaires applicables aux points d'émission visées au paragraphe 1° du 1er alinéa de l'article 31.15 de la Loi sont présentées ci-après au tableau 111-1.

De plus, certaines normes d'application générale sont citées ci-dessous : Particules

En vertu de l'article 12 du RAA, les émissions de particules provenant du transfert, de la chute ou de la manutention de matières visées ne doivent pas être visibles à plus de 2 mètres du point d'émission.

En vertu de l'article 14 du RAA, les particules récupérées par un dépoussiéreur à sec doivent être manutentionnées, transportées, entreposées et disposées de façon à ce qu'aucune émission de particules ne soit visible à plus de 2 mètres du point d'émission.

Opacité

En vertu de l'article 16 du RAA, l'opacité des émissions grises ou noires dans l'atmosphère d'une source de contamination, autre que celles prévues à l'article 15 de ce règlement, ne doit pas, pour chacun de ses points d'émission, excéder 20%.

Cependant, pendant le fonctionnement d'une source de contamination, l'opacité des émissions peut excéder 20%, sans toutefois dépasser 40%, pendant une ou plusieurs périodes totalisant un maximum de quatre minutes par heure.

En outre, lors du démarrage d'un moteur fixe à combustion interne, l'opacité des émissions peut excéder 20% pendant une durée maximale de 4 minutes.

De même, lors de l'allumage d'un foyer de combustion ou du soufflage des tubes, l'opacité des émissions peut excéder 20%, sans toutefois dépasser 60%, pendant une durée maximale de 4 minutes.

Teneur en soufre dans les combustibles

En vertu de l'article 57 du RAA, la teneur en soufre dans un combustible fossile utiHsé dans un appareil de combustion ou dans un four industriel ne doit pas excéder :

1° 1,5% (masse/masse) en poids pour le mazout lourd; 2° 0,5% (masse/masse) en poids pour le mazout léger; 3° 1,5% (masse/masse) en poids pour le charbon;

4° 1,5% (masse/masse) en poids pour le coke; 5° 1,5% (masse/masse) en poids pour le brai.

En outre, dans le cas où les installations de l'exploitant d'un appareil de combustion ou d'un four industriel sont situées sur un territoire où le gaz naturel est accessible, cet exploitant doit utiliser comme combustible du mazout lourd dont la teneur en soufre est d'au plus 1% (masse/masse) en poids.

### 3.2 Normes d'émission supplémentaires

Il n'y a pas de norme supplémentaire applicable aux points d'émission et visée au paragraphe 3° du 1e<alinéa de l'article 27 de la Loi.

## SECTION 4- EXIGENCES DE SUIVI ET DE CONTRÔLE DES ÉMISSIONS

Les exigences de suivi réglementaires visées au paragraphe 4° du 1er alinéa de l'article 27 de la Loi et les exigences de suivi supplémentaires visées notamment au paragraphe 4 du 1er alinéa de l'article 27 de la Loi ainsi qu'au paragraphe 4° du 1er alinéa de l'article 31.15 de la Loi (référence à l'article 31.11 de la Loi) sont présentées dans les sections visées de la présente partie de l'autorisation et dans le tableau 111-1.

Toute donnée inscrite dans un registre ou autre document, enregistrée par un système de mesure et d'enregistrement en continu des émissions, recueillie, mesurée, calculée, utilisée ou fournie conformément à la présente autorisation doit être conservée par l'exploitant pendant une période minimale de 5 ans et disponible sur demande.

### 4.1 Suivi par échantillonnage

Lorsqu'un échantillonnage est effectué, il doit être effectué selon les modalités et les méthodes de référence prescrites dans la plus récente édition du *Guide d'échantillonnage* à *des fins d'analyses environnementales - Cahier 4 - ÉchantÎflonnage des émissions atmosphériques en provenance de sources fixes,* accessible sur le site Internet du CEAEQ. Notamment, les échantillonnages sont constitués d'au moins trois **essais** (TE) consécutifs. Les échantillons doivent être transmis pour analyse à un laboratoire accrédité en vertu de l'article 118.6 de la Loi.

Tout échantillonnage dolt faire l'objet d'un rapport d'échantillonnage effectué selon les modalités prescrites dans la plus récente édition du *Guide d'échantillonnage* à *des fins d'analyses environnementales - Cahier 4 - Échantillonnage des émissions atmosphériques en provenance de sources fixe.* Chaque rapport d'échantillonnage doit être accompagné par un écrit du signataire du rapport attestant que les prélèvements d'échantillons ont été faits en conformité avec, selon le cas, les règles de l'art applicables ou les exigences prévues au RAA, y compris celles du guide d'échantillonnage. Le rapport doit être transmis, sur support papier et électronique, au Ministère dans les 120 jours suivant la fin de la campagne d'échantillonnage. Si l'analyse a révélé un dépassement d'une valeur limite ou d'une autre norme d'émission fixée par le RAA, cet événement doit être mentionné dans le rapport ainsi que les mesures correctrices prises pour y remédier.

Les échantillonnages sont réalisés lors d'une opération normale de l'usine.

Pour chaque résultat d'analyse rapporté comme « non détecté », la limite de détection doit être consignée dans le certificat d'analyse. Les certificats d'analyse doivent être conservés pendant cinq ans.

### 4.2 Suivi par mesure en continu

Aucun suivi par mesure des émissions en continu n'est exigé dans cette autorisation.

### 4.3 Suivi par Inspection et registre

- Équipements d'épuration

Tous les dépoussiéreurs et épurateurs (secs ou humides) identifiés au tableau 111-1 sont l'objet d'inspections régulières.

Les dépoussiéreurs et les épurateurs à sec ayant une capacité de plus de 17 000 m³/h doivent être équipés de détecteurs de fuite passifs avant la fin du 24e mois de l'autorisation. En cas d'impossibilité technique, le titulaire devra aviser le Ministère.

La fréquence d'inspection est précisée au tableau 111-1 pour chaque équipement. La liste des indicateurs de performance à suivre est précisée au tableau 111-2 pour chaque équipement.

Les résultats des inspections (suivi des indicateurs de performance), ainsi que les interventions ou correctifs sont consignés dans un registre et conservés pendant cinq ans.

- **Parcs à résidus**

Le parc à résidus et les haldes à stériles feront l'objet d'inspections régulières pour les émissions diffuses.

La fréquence d'inspection est précisée au tableau 111-1 et les éléments à vérifier sont précisés au tableau 111-2.

Les résultats des inspections, ainsi que les interventions ou correctifs apportés sont consignés dans un registre et conservés pendant cinq ans.

- **Haldes à stériles et lieux d'entreposage du minerai**

Les haldes à stériles et les aires d'entreposage de minerai (halde à minerai temporaire et 2 piles de minerai (tout-venant et concassé)) feront l'objet d'inspections régulières pour les émissions diffuses.

La fréquence d'inspection est précisée au tableau Ill- 1. Les éléments à vérifier sont précisés au tableau 111- 2.

Les résultats des inspections ainsi que les interventions ou correctifs apportés sont consignés dans un registre et conservés pendant cinq ans.

### 4.4 Suivi par bilan

Un suivi des émissions par bilan est effectué pour le dioxyde de soufre et les particules, tel qu'indiqué ci-après.

- **Dioxyde de soufre (502)** :

Les émissions annuelles de S02 sont établies à partir de la consommation des combustibles fossiles et de leur teneur en soufre. Pour le bilan, tous les combustibles fossiles utilisés pour les activités de la mine seront pris en compte. Ceci inclut les combustibles fossiles utilisés par les sources fixes et les sources mobiles. Pour chaque source fixe et chaque catégorie de sources mobiles, le bilan des combustibles devra contenir les informations ci-dessous :

- Identification du combustible;
- Utilisation du combustible (spécifier s'il s'agit de sources fixes ou mobiles et distinguer les consommations);
- Caractéristiques du combustible :
  - o Le pourcentage de soufre sur base sèche (%);
  - o Le pouvoir calorifique supérieur (MJ/kg);
  - o La quantité utilisée par année;
  - o La quantité de soufre en équivalent S02 (kg/an).

- **Particules** :

Les émissions annuelles de particules seront quantifiées à partir de facteurs d'émission. Ces facteurs d'émission seront déterminés à l'aide des résultats de caractérisation des émissions atmosphériques ou provenant de la littérature (exemple : USEPA AP 42, Fifth edition, Compilation of Air Pollutant Emission Factors, Volume 1 : Stationary Point and Area Sources).

Pour le bilan, toutes les sources de particules seront prises en compte, c'est-à-dire autant les sources fixes (cheminées, ventilateurs, dépoussiéreurs, etc.) que les sources d'émission diffuses (parcs, haldes, voies de circulation, etc.).

### 4.5 Transmission des données de suivi

Les données de suivi sont transmises annuellement au Ministère dans un rapport couvrant la période allant de janvier à décembre, avant le 1e, avril de l'année qui suit (les rapports d'échantillonnage et les certificats d'analyse sont joints, le cas échéant).

## SECTION 5 - CALCUL DES ÉMISSIONS

### 5.1 Généralités

Pour un paramètre donné, l'émission est établie en multipliant le débit d'émission mesuré ou estimé par la concentration obtenue par échantillonnage ou estimation. Le taux d'émission correspond à l'émission exprimée par unité de production.

Tous les calculs et les paramètres de calcul des émissions sont conservés pendant cinq ans.

### 5.2 Calcul des émissions et évaluation du respect des normes

Tel que stipulé à l'article 199 du RAA, les valeurs limites d'émission et les autres normes d'émission établies au regard d'une source de contamination sont respectées si les conditions suivantes sont satisfaites :

- la moyenne arithmétique des trois résultats des mesures prises au cours d'une même campagne d'échantillonnage effectuée est inférieure ou égale à ces valeurs limites ou normes;
- au moins deux de ces résultats sont inférieurs à ces valeurs limites ou normes;
- aucun de ces trois résultats n'excède de plus de 20% ces valeurs limites ou normes.

Une norme peut s'appliquer à un seul point d'émission ou à un ensemble de points d'émission, comme précisé au tableau 111-1.

#### 5.2.1 Cas où la norme s'applique à un seul point d'émission (RAA, art. 10)

La norme s'applique à chaque point d'émission. La norme de 30 mg/m$^3$R du RAA s'applique.

#### 5.2.2 Cas où la norme s'applique à un ensemble de points d'émission (RAA, art. 9)

La norme s'applique à l'ensemble d'un procédé, celui-ci pouvant comprendre plusieurs points d'émission.

Pour chaque procédé assujetti à l'article 9 du RAA, un découpage du procédé, une identification de tous les points d'émission et des sources associées, ainsi qu'une sélection des points à échantillonner sont établis.

Le taux d'émission correspond à l'émission exprimée par unité de production.

### 5.3 Calcul des émissions aux fins de rapport

Les charges annuelles rejetées seront établies à l'aide des bilans annuels prévus à la section 4.4.

## SECTION 6 - ONDES SISMIQUES ET BRUIT

Les exigences de suivi applicables aux émissions d'ondes sismiques et de bruit sont des exigences supplémentaires visées aux paragraphes 2.2° et 6° du premier alinéa de l'article 31.13 de la Loi et sont présentées ci-après.

La localisation de la station de mesure du bruit et d'ondes sismiques est reportée sur un schéma à l'Annexe 2 de la partie VII de l'autorisation (annexe 2-8.1). La station de mesures du bruit et des ondes sismiques et les critères applicables sont présentés aux tableaux 111-3 et 111-4.

### 6.1 Suivi des émissions d'ondes sismiques

Les données à collecter à chaque dynamitage sont la date et l'heure du dynamitage, la vitesse de vibration, les fréquences de vibration au sol, les pressions d'air, le schéma de sautage, les coordonnées géographiques du point de mesure et l'utilisation d'un pare- éclat et ses conditions d'utilisation (notamment le type de sautage, le type de pare-éclats, la distance, etc..). Ces données doivent être consignées dans un registre conservé sur place. Le registre doit être conservé au moins deux ans et disponible sur demande.

Une calibration du sismographe doit être effectuée une fois par année et la preuve de cette calibration doit être conservée au registre.

Par ailleurs, lors des activités de sautage, l'établissement doit prendre les mesures adéquates pour:

- contrôler et limlter les émissions de poussières, les vibrations et les projections;
- empêcher toute projection au-delà des limites de propriétés sur lesquelles l'établissement détient les droits d'exploitation.

L'établissement doit donc, notamment, appliquer une procédure de mise en œuvre des bonnes pratiques de dynamitage. Cette procédure, adaptée au site, doit être mise à jour régulièrement et signée par un ingénieur, membre de l'Ordre des ingénieurs du Québec.

### 6.2 Suivi des émissions de bruit

La méthode de référence pour la mesure du bruit, comprenant notamment les caractéristiques techniques des appareils de mesures, la vérification annuelle de la précision des appareils et les relevés sonores, devra être conforme à la version la plus récente de la note d'instruction NI-98-01 sur le bruit.

Les données de suivi devront être disponibles sur demande.

## SECTION 7 - AUTRES CONDITIONS D'EXPLOITATION

D'autres conditions d'exploitation applicables à l'établissement et visées au paragraphe 3" du 1é<alinéa de l'article 27 de la Loi sont présentées ci-après.

**Condition 10:** Contrôle des émissions de poussières: L'exploitant minimise la production de poussière générée par ses opérations par l'utilisation d'eau, d'abat-poussières normés BNQ, de tapis lors des sautages ou par toute autre méthode appropriée.

**Condition 11** : Traitement des sols contaminés par biopiles : Des mesures de concentration des COV de la sortie d'air seront effectuées quatre à cinq fois par année. Si des COV sont détectés, le charbon activé du système de traitement sera changé. Les données de suivi des émissions de COV de la plateforme de traitement des sols contaminés doivent être colligées en registre. Le registre doit être conservé pendant 5 ans et être disponible pour consultation par le Ministère.

## SECTION 8 - ÉTUDES

Aucune étude n'est prévue dans le cadre de cette autorisation.

Tableau 111-1 : Points d'émission - Normes d'émissions - Exigences de suivi

| | Points d'émission | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| **Opération/procédé** | **No** | **Description** | **Sources** | **Capacité / Description de l'épuration** |
| **Extraction du minerai** | **PT-2 PT-3** | Cheminées à remblai (R9) | Remblai des chantiers souterrains | Aucune épuration |
| | **PT-4 PT-5 PT-6** | Cheminées à remblai (R4) | Remblai des chantiers souterrains | Aucune épuration |
| | **PED-2** | Émissions diffuses | Halde à stériles Manutention et rejet du stérile | Arrosage par temps sec |
| | **PED-3** | Émissions diffuses | Halde à mort-terrain Manutention et rejet du mort-terrain | Arrosage par temps sec |
| | **PED-4** | Émissions diffuses | Haldes à minerai Manutention et entreposage temporaire du minerai | Aucune épuration |
| | **PED-5** | Émissions diffuses | Fosse R2 et R3 Opératlons de forage, dynamitage et manutention {minerai, stériles et mort-terrain) | Aucune épuration Utilisation de tapis pour limiter les émissions de poussières lors du dynamitage |
| | **PED-6** | Émissions diffuses | Fosse R-65 Opérations de forage, dynamitage et manutention {minerai, stériles et mort-terrain) | Aucune épuration Utilisation de tapis pour limiter les émissions de poussières lors du dynamitage |

| Exiqences | | | |
|---|---|---|---|
| 5 | 6 | 7 | 8 |
| **Paramètre** | **Norme réglementaire** | **Norme supplémentaire** | **Exigences de suivi** |
| Particules | 30 mg/m$^3$R {RAA, art. 10) | Aucune | Aucune |
| Particules | Non visibles à plus de 2 m du point d'émission {RAA, art. 12) {transfert, chute et manutention) | Aucune | Inspection hebdomadaire |

Tableau 111- 1 : Points d'émissions - Normes d'émissions - Exigences de suivi

| | Points d'émission | | | | Exigences | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **Opération/ procédé** | **No** | **Description** | **Sources** | **Capacité / Description de l'épuration** | **Paramètre** | **Nonne réglementaire** | **Nonne supplémentaire** | **Exigences de suivi** |
| **Traitement du minerai** | **PT-1** | Émissions diffuses | Silo de rechargement de l'usine de traitement du minerai<br>Déchargement du minerai tout-venant concassé pour l'alimentation de l'usine | Aucune épuration | Particules | Non visibles à plus de 2 m du point d'émission (RAA, art. 12)<br>(transfert, chute et manutention) | Aucune | Aucune |
| | **PT-7** | Émissions diffuses | Alimentation du concasseur primaire<br>Déchargement du minerai pour l'alimentation du concasseur primaire | Aucune épuration | | | | |
| | **PEP-3** | Cheminée du concasseur primaire | Concasseur primaire concassage et transfert du minerai) | Dépoussiéreur à manches Wheelabrator Jet III 1012<br>Capacité : 14 272 $m^3/h$ | Particules | 30 $mg/m^3R$ (RAA, art. 10) | Aucune | Inspection hebdomadaire de l'épurateur et tenue d'un registre |
| | **PEP-4** | Cheminée | Concassage et transfert de minerai (points de transfert et convoyeurs dans le secteur de l'usine abritant le concasseur à cône et les rouleaux broyeurs è haute pression (HPGR)) | Dépoussiéreur par voie humide<br>AirPol Flooded-wall<br>Capacité : 26 504 $m^3/h$ | | | | |
| | **PEP-5** | Recirculation de l'air traité | Installation de manutention du ferrosilicium (FeSi) | Dépoussiéreur à manches Donaldson Filtration DFO 2-8<br>Capacité : 3 636 m3/h | Particules | 30 $mg/m^3R$ (RAA, art. 10) | Aucune | Inspection mensuelle de l'épurateur et tenue d'un registre |

# PARTIE III-ÉMISSIONS ATMOSPHÉRIQUES ET BRUIT

| | Points d'émission | | | | Exigences | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Opération/ **procédé** | **No** | **Description** | **Sources** | **Capacité / Description de l'épuration** | **Paramètre** | **Norme réglementaire** | **Norme supplémentaire** | **Exigences de suivi** |
| | **PEP-6** | Cheminée | Circuit de récupération et de triage des diamants (section rouge de l'usine : analyseur par rayons X, cribles de classement, épurateurs aux UV, boîtes à gant, séchoirs et trémies) | Dépoussiéreur à manches Donaldson Filtration DFO **4-24**<br>Capacité : 13 840 m$^3$/h | Particules | 30 mg/m$^3$R (RAA, art. 10) | Aucune | Inspection hebdomadaire de l'épurateur et tenue d'un registre |
| | | Cyclone | Trieuse primaire (1er stage) | Marque : Donaldson Co. inc.<br>Modèle : Model 24<br>Capacité : 5 945 m$^3$/h | Particules | 30 mg/m$^3$R (RAA, art. 10) | Aucune | Inspection hebdomadaire et tenue d'un registre |
| | | Cyclone | Trieuse primaire (2$^8$ stage) | Marque : Donaldson Co. inc.<br>Modèle : Model 24<br>Capacité : 5 945 m$^3$/h | Particules | 30 mg/m$^3$R (RAA, art. 10) | Aucune | Inspection hebdomadaire et tenue d'un registre |
| | | Cyclone | Première trieuse secondaire (1er stage) | Marque : Donaldson Co. inc.<br>Modèle : Madel 24<br>Capacité : 9 545 m$^3$/h | Particules | 30 mg/m$^3$R (RAA, art. 10) | Aucune | Inspection hebdomadaire et tenue d'un registre |
| | | Cyclone | Deuxième trieuse secondaire (1er stage) | Marque : Donaldson Co. inc.<br>Modèle : Model 24<br>Capacité : 5 945 m3/h | Particules | 30 mg/m$^3$R (RAA, art. 10) | Aucune | Inspection hebdomadaire et tenue d'un registre |
| | | Cyclone | Troisième trieuse secondaire (2e stage) | Marque : Donaldson Co. inc.<br>Modèle : Model 24<br>Capacité : 5 945 m3/h | Particules | 30 mg/m$^3$R (RAA, art. 10) | Aucune | Inspection hebdomadaire et tenue d'un registre |

Tableau 111- 1 : Points d'émissions - Normes d'émissions - Exigences de suivi

| | Points d'émission | | | | Exigences | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Opération/ procédé | No | Description | Sources | Capacité / Description de l'épuration | Paramètre | Norme réglementaire | Norme supplémentaire | Exigences de suivi |
| Traitement du minerai | PED-1 | Émissions diffuses | AKUM<br>Rejet de la kimberlite usinée et érosion éolienne de la pile | Aucune épuration<br>Arrosage par temps sec ou abat-poussières normés<br>Recouvrement par une couche de protection (voir partie IV)<br>Revégétalisation progressive | Particules | Non visibles à plus de 2 m du point d'émission<br>(RAA, art. 12)<br>(transfert, chute et manutention) | Aucune | Inspection mensuelle |
| | PED-7 | Émissions diffuses | Pile d'entreposage du minerai tout-venant<br>Manutention et entreposage du minerai tout-venant | Aucune épuration<br>Gicleurs à eau utilisés au besoin | | | | |
| | PED-8 | Émissions diffuses | Pile de minerai tout-venant concassé<br>Déchargement du minerai tout-venant pour entreposage temporaire | Aucune épuration<br>Gicleurs à eau utilisés au besoin | | | | |
| Opérations minières | PEP-7 | Huit cheminées à la centrale électrique au gaz naturel | Huit génératrices<br>cinq fonctionnent simultanément | Aucune épuration<br>Caterpillar G3520CIM **de** 2,055 MW au gaz naturel chacune | **Particules** | Fonction puissance (art. 64 et+) | Aucune | Aucune |
| | | | | | **Oxydes d'azote (NO.)** | Selon la puissance du moteur et le combustible utilisé (RAA, art. 52) | | |
| | PEP-8 | Chauffage de la mine souterraine | Brûleurs au gaz naturel | Modèle : APX 15<br>Capacité totale : 135 MM btu/h | **Particules** | Fonction puissance (art. 64 et+) | Aucune | Échantillonnage 1x/3 ans |
| | | | | | **Oxydes d'azote (NO.)** | Selon la puissance du moteur et le combustible utilisé (RAA, art. 52) | | |

**Tableau 111-1 : Points d'émissions - Normes d'émissions - Exigences de suivi**

| | Points d'émission | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| **Opération/ procédé** | **1 No** | **Description** | **Sources** | **Capacité/ Description de l'épuration** |
| **Opérations minières** | **PED-9** | Emissions diffuses | Voies de circulation non pavées (chemins de halage et autres) | Aucune épuration Ulilisa !on d'abat-. poussIeres au besoin |
| | 1 **PED-10** | Emissions diffuses | Plateforme de gravier pour entreposage des matériaux, le statîonnement de la machinerie, l'implantation des bâtiments, etc. | Aucune épuration Utilisation d'abat-poussières au besoin |
| **Plateforme traitement sols contaminés** | **PEP-9** | Cheminée(s) (inexistante en ce moment) | Plateforme de traitement des sols contaminés {biorestauration en piles des sols contaminés, secteur LEET) | Filtres à charbon activé (2 barils en série) |

| Exigences | | | |
|---|---|---|---|
| 5 | 6 | 7 | 8 |
| **Paramètre** | **Norme réglementaire** | **Norme supplémentaire** | **Exigences de suivi** |
| Particules | Non visibles à plus de 2 m du point d'émission (RAA, art. 12) (transfert, chute et manutention) | Aucune | Inspection mensuelle |
| COV | Si des COV sont détectés à la sortie du 1er baril de charbon activé, le 1er baril sera remplacé par le second et un nouveau baril sera installé à la suite. | | Voir la condition 11 à la section 7. Mesure 4 à 5 fois par année Suivi pour détecter la présence de COV. |

**Tableau 111- 2** : **Indicateurs proposés pour le suivi des émissions**

| LISTE NON LIMITATIVE DES INDICATEURS DE PERFORMANCE | | PARC A RÉSIDUS, HALDES A STÉRILES ET LIEUX D'ENTREPOSAGE DU MINERAI |
|---|---|---|
| **Épurateur à sec / dépoussiéreur** | **Épurateur humide** | |
| • détecteurs de fuites passifs (résidus dans les éprouvettes);<br>• pressions différentielles aux éléments filtrants **(Ap};**<br>• temps entre deux décolmatages;<br>▪ pression d'air comprimé au décolmatage;<br>▪ position du volet;<br>• état des vannes solénoïdes (son);<br>▪ état de la courroie du ventilateur (visuel);<br>• fuites à la cheminée (visuel). | • perte de charge **(pressions** différentielles) à travers l'épurateur incluant l'éliminateur de gouttelettes; pression des liquides<br>• d'épuration mesurée à l'entrée de la conduite d'amenée (débit du liquide d'épuration recirculé);<br>• débit des liquides d'épuration mesuré à l'entrée de la conduite d'amenée (débit du liquide d'épuration recirculél. | • Présence d'érosion éolienne;<br>• Poussières visibles à plus de 2 mètres. |

**Tableau 111- 3 : Station de surveillance du bruit**

| N° de la station | Localisation | Description de l'équipement | Niveau sonore Maximum (dBA.) | | Fréquence et type de suivi |
|---|---|---|---|---|---|
| | | | Jour 7h-19h | Nuit 1'9h-7h | |
| SOR1 | A la limite des aires du complexe d'habitation et de services<br>Coordonnées géodésiques :<br>52° 48' 36.360" N<br>72° 11' 56.400" 0 | Sonomètre | Selon la note d'instructions 98-01 sur le bruit | | 1x/année<br>Relevé sur 24 h<br>Selon le protocole de la note d'instructions 98-01 |

Tableau III- 4 : Station de surveillance des ondes sismiques

| N° de station | localisation | description. de l'équipement | Limite des heures de sautage | | Nor:me<br>Fréquence des vibrations au sol (Hertz) | Vitesse maximale permise (mm/s) | Fréqpence et type de suivi· |
|---|---|---|---|---|---|---|---|
| SOR1 | A la limite des aires du complexe d'habitation el de services<br>Coordonnées géodésiques :<br>52° 48' 36.360" N<br>72° 11' 56.400" 0 | Sismographe | Aucune limite des heures de sautage | Vitesse maximale des vibrations permises au sol | s 15<br>>15 et ≤ s20<br>> 20 et S 25<br>> 25 et ≤ S30<br>> 30 et ≤ S35<br>> 35 et ≤ S40<br>>40 | 12,7<br>19,0<br>23,0<br>30,5<br>33,0<br>38,0<br>50,0 | Lors de chaque opération de sautage<br><br>(mine à ciel ouvert et mine souterraine) |
| | | | | | Seuil maximal des Pressions d'air | | |
| | | | | Seuil maximal des pressions d'air | 12BdB | | |

# APPENDIX 3

# NOTES ON SURFACE WATER QUALITY CRITERIA AND RECOMMENDATIONS

**Appendix 3 Notes on water quality criteria and recommendations**

a Stratification thermique : Les apports thermiques ne devraient pas modifier la stratification thermique et les dates d'inversion d'origine des eaux réceptrices. Température moyenne hebdomadaire maximale : Les apports thermiques ne devraient pas porter la température des eaux réceptrices au-delà de la température moyenne hebdomadaire maximale. Exposition à court terme à une température a extrême : Les apports thermiques devraient être tels que les expositions à court terme aux températures maximales ne soient pas dépassées. Les expositions ne devraient être ni de longueur ni de fréquence nuisant aux espèces importantes.

b Concentration minimale acceptable d'oxygène dissous :
premiers stades du cycle biologique = 6,0 mg/l
autres stades du cycle biologique = 5,5 mg/l
pour le biote d'eau froide : premiers stades du cycle biologique = 9,5 mg/l
autres stades du cycle biologique = 6,5 mg/l

c L'augmentation maximum de 8 NTUs du niveau de teneurs de fond naturelles pour une exposition à court terme (par exemple, période 24-h). L'augmentation moyenne maximum de 2 NTUs du niveau de teneurs de fond naturelles pour une exposition à plus long terme (par exemple, période 30-jours). L'augmentation maximum de 8 NTUs du niveau de teneurs de fond naturelles n'importe quand quand les niveaux de teneurs de fond naturelles sont entre 8 et 80 NTUs. Ne doivent pas augmenter plus de 10 % de niveaux des teneurs de fond naturelles quand le teneur de fond naturelle est 80 NTUs.

d L'augmentation maximum de 25 mg/l des niveaux des teneurs de fond naturelles pour n'importe quelle exposition à court terme (par exemple, période 24-h). L'augmentation moyenne maximum de 5 mg/l des niveaux des teneurs de fond naturelles pour des expositions à plus long terme (par exemple, entrées durant entre 24 h et 30 jours). L'augmentation maximum de 25 mg/l des niveaux des teneurs de fond naturelles à tout moment quand les niveaux de teneurs de fond naturelles sont entre 25 et 250 mg/l. Ne devrait pas augmenter plus de 10 % des niveaux des teneurs de fond naturelles quand la teneur de fond naturelle est > 250 mg/l.

e Le Cadre d'orientation pour le phosphore est pour développer les recommandations pour le phosphore (ne fournit pas des conseils sur d'autres nutriments d'eau douce). Il fournit des gammes de déclenchement pour le phosphore total (s'il vous plaît, consultez le feuillet d'information Cadre d'orientation pour le phosphore pour plus d'information): Ultra-oligotrophe <0,004 mg/l Oligotrophe 0,004 à 0,01 mg/lMésotrophe 0,01 à 0,02 mg/l Méso-eutrophe 0,02 à 0,035 mg/lEutrophe 0,035 à 0,1 mg/lHypereutrophe > 0,1 mg/l

f 0,005 mg/l à un pH <6,5 et 0,1 à un pH ≥6,5.

g La RCQE pour le cuivre est fonction de la dureté de l'eau. Lorsque la dureté de l'eau est de 0 à <82 mg de $CaCO_3$/l, la RCQE est de 0,002 mg/l.

h La RCQE pour le nickel est fonction de la dureté de l'eau. Lorsque la dureté de l'eau est de 0 à ≤60 mg de $CaCO_3$/l, la RCQE est de 0,025 mg/l.

i La RCQE pour le plomb est fonction de la dureté de l'eau. Lorsque la dureté de l'eau est de 0 à ≤60 mg de $CaCO_3$/l, la RCQE est de 0,001 mg/l.

j Un pH de 6,0 à 9,5 est exigé à l'effluent dans la directive sur les mines et la majorité des règlements du Ministère sur les rejets industriels. Cette exigence satisfait l'objectif de protection du milieu aquatique.

k

| Intervalle de pH | Effet |
|---|---|
| 3,0 – 3,5 | Il est peu vraisemblable qu'un poisson puisse survivre plus de quelques heures dans cet intervalle bien qu'il soit possible de trouver certaines plantes et certains invertébrés à des pH inférieurs. |
| 3,5 – 4,0 | Cet intervalle est létal aux salmonidés. Il existe des indications montrant que la chatte de l'est, la tanche, la perche fluviatile et le brochet peuvent survivre dans cet intervalle, vraisemblablement après une période d'acclimatation à des concentrations non létales légèrement plus élevées, mais la limite inférieure de cet intervalle peut encore être létale à la chatte de l'est. |
| 4,0 – 4,5 | Vraisemblablement nocif aux salmonidés, à la tanche, à la brème, à la chatte de l'est, à la dorade et à la carpe commune qui ne sont pas acclimatés à de faibles pH, bien que leur résistance dans cet intervalle augmente avec leur taille et leur âge. Les poissons peuvent s'acclimater à ces valeurs, mais de la perche, la brème, la chatte de l'est et le brochet, seul ce dernier peut se reproduire. |
| 4,5 – 5,0 | Vraisemblablement nocif aux oeufs et à l'alevin des salmonidés, ainsi qu'aux adultes particulièrement dans des eaux douces contenant de faibles concentrations de calcium, de sodium et de chlorure. Peut être nocif à la carpe commune. |
| 5,0 – 6,0 | Nocivité improbable pour toutes les espèces, à moins que la concentration de l'anhydride carbonique libre soit supérieure à 20 mg/l ou que l'eau contient des sels de fer fraîchement précipités sous forme d'hydroxyde ferrique dont la toxicité exacte est inconnue. La limite inférieure de cet intervalle peut être nocive aux salmonidés non acclimatés si les concentrations de calcium, de sodium et de chlorure sont faibles ou si la température de l'eau est basse, et peut aussi être nuisible à la reproduction de la chatte de l'est. |
| 6,0 – 6,5 | Vraisemblablement non nocif aux poissons à moins que la concentration de l'anhydride carbonique libre dépasse 100 mg/l. |
| 6,5 – 9,0 | Non nocif aux poissons, bien que la toxicité d'autres poissons puisse être modifiée par des changements à l'intérieur de cet intervalle. |
| 9,0 – 9,5 | Vraisemblablement nocif aux salmonidés et à la perche fluviatile, si cet intervalle persiste. |
| 9,5 – 10,0 | Létal aux salmonidés sur une longue période, mais tolérable sur une courte période. Peut être nocif aux stades de développement de certaines espèces. |
| 10,0 – 10,5 | Tolérable par la chatte de l'est et les salmonidés sur une courte période, mais létal sur une longue période. |
| 10,5 – 11,0 | Rapidement létal aux salmonidés. Une exposition prolongée à la limite supérieure de cet intervalle est létale à la carpe, à la tanche, à la dorade et au brochet. |
| 11,0 – 11,5 | Rapidement létal à toutes les espèces. |

**Appendix 3 Notes on water quality criteria and recommendations *(continued)***

l Cette concentration est une concentration maximale acceptable (CMA) définie pour l'eau potable.

m En eau limpide(*), le critère de qualité est défini par une augmentation moyenne maximale de 2 uTN par rapport à la valeur naturelle ou ambiante (non influencée par une source ponctuelle affectant la turbidité de l'eau, par une pluie importante ou par la fonte) selon le contexte.En eau turbide(*), le critère de qualité est défini, soit : (en révision) - par une augmentation maximale en tout temps de 8 uTN par rapport à la valeur ambiante lorsque celle-ci est de 8 à 80 uTN; - par une augmentation de 10 % par rapport à la valeur ambiante lorsque celle-ci est supérieure à 80 uTN mesurée à un moment donné.Ces critères de qualité s'appliquent aux eaux douces (dulçaquicoles), estuariennes et marines.(*) Les termes "eau limpide" et "eau turbide" réfèrent à la portion d'un hydrogramme où les concentrations de matières en suspension sont respectivement basses (<25 mg/L) et élevées (>25 mg/L) ) (Caux et al., 1997). Les teneurs peuvent être élevées en raison des caractéristiques naturelles du milieu (par exemple, dans la zone de turbidité maximale du Saint-Laurent) ou, périodiquement, en raison des conditions climatiques.

En eau limpide(*), le critère de qualité est défini par une augmentation maximale de 8 uTN par rapport à la valeur naturelle ou ambiante (non influencée par une source ponctuelle affectant la turbidité de

l'eau, par une pluie importante ou par la fonte) selon le contexte.Ce critère de qualité s'applique aux eaux douces (dulçaquicoles), estuariennes et marines.(*) Le terme "eau limpide" réfère à la portionn d'un hydrogramme où les concentrations de matières en suspension sont basses (<25 mg/L) (Caux et al., 1997). Les teneurs peuvent être élevées en raison des caractéristiques naturelles du milieu (par exemple, dans la zone de turbidité maximale du Saint-Laurent) ou, périodiquement, en raison des conditions climatiques.

o La sensibilité d'un milieu à l'acidification varie avec l'alcalinité :
Sensibilité Concentration (mg de $CaCO_3$/L)
élevée ------------ < 10
moyenne -------10-20
faible ------------- > 20

p En eau limpide(*), le critère de qualité est défini par une augmentation moyenne maximale de 5 mg/L par rapport à la concentration naturelle ou ambiante (non influencée par une source ponctuelle de matières en suspension, par une pluie importante ou par la fonte) selon le contexte. En eau turbide(*), le critère de qualité est défini soit : (en révision) - par une augmentation maximale en tout temps de 25 mg/L par rapport à la concentration ambiante lorsque celle-ci est de 25 à 250 mg/L; - par une augmentation de 10 % par rapport à la concentration ambiante lorsque celle-ci est supérieure à 250 mg/L mesurée à un moment donné.Ces critères de qualité s'appliquent aux eaux douces (dulçaquicoles), estuariennes et marines.(*) Les termes "eau limpide" et "eau turbide" réfèrent à la portion d'un hydrogramme où les concentrations de matières en suspension sont respectivement basses (<25 mg/L) et élevées (>25 mg/L) (Caux et al., 1997). Les concentrations peuvent être élevées en raison des caractéristiques naturelles du milieu (par exemple, dans la zone de turbidité maximale du Saint-Laurent) ou, périodiquement, en raison des conditions climatiques.

q En eau limpide(*), le critère de qualité est défini par une augmentation maximale de 25 mg/L par rapport à la concentration naturelle ou ambiante (non influencée par une source ponctuelle de matières en suspension, par une pluie importante ou par la fonte) selon le contexte. Ce critère de qualité s'applique aux eaux douces (dulçaquicoles), estuariennes et marines.(*) Le terme "eau limpide" réfère à la portion d'un hydrogramme où les concentrations de matières en suspension sont basses (<25 mg/L) (Caux et al., 1997). Les teneurs peuvent être élevées en raison des caractéristiques naturelles du milieu (par exemple, dans la zone de turbidité maximale du Saint-Laurent) ou, périodiquement, en raison des conditions climatiques.

r Cette valeur correspond au déficit maximal tolérable en oxygène pour la vie aquatique à une température estivale moyenne de 21°C.

s Le critère de qualité pour l'azote ammoniacal varie avec le pH et la température. Les valeurs données sont les plus restrictives en considérant le pH et la température de l'eau mesurés sur le site du projets Renard entre 2002 et 2010.

t La présence d'azote ammoniacal à des concentrations plus élevées peut compromettre l'efficacité de la désinfection.

u Au-delà de cette concentration, les propriétés organoleptiques ou esthétiques de l'eau de consommation pourront être altérées.

v Certains facteurs influencent l'effet potentiel du phosphore. Les principaux facteurs physiques généralement mentionnés sont : le type de substrat, la profondeur, la transparence et la température de l'eau, la vitesse du courant et l'ombrage. Ces caractéristiques ne sont pas prises en compte par les critères de qualité. C'est pourquoi il faut utiliser judicieusement les critères de qualité du phosphore selon le milieu évalué. Les critères de qualité suivants peuvent être utilisés pour évaluer la détérioration d'un lac. Ces critères de qualité ne doivent toutefois pas servir à évaluer les charges de phosphore qui peuvent être rejetées.- Pour les lacs oligotrophes dont la concentration naturelle est ou était de moins de 0,01 mg/L, le critère de qualité est défini par une augmentation maximale de 50 % par rapport à la concentration naturelle sans dépasser 0,01 mg/L.- Pour limiter l'eutrophisation des lacs dont la concentration naturelle se trouve ou se trouvait entre 0,01 et 0,02 mg/L, le critère de qualité est défini par une augmentation maximale de 50 % par rapport à la concentration naturelle, sans dépasser 0,02 mg/L. Ces critères de qualité s'appliquent en période sans glace.0,03: Ce critère de qualité vise à limiter la croissance excessive d'algues et de plantes aquatiques dans les ruisseaux et les rivières. Cette valeur protectrice pour les cours d'eau, n'assure pas toujours la protection des lacs en aval.

w Ce critère de qualité est en révision. Cette valeur est établie à partir des effets toxiques et ne tient pas compte des effets indirects d'eutrophisation.

x Cette concentration est une concentration maximale acceptable (CMA) définie pour l'eau potable. La concentration totale en nitrates et nitrites ne doit pas dépasser 10 mg/L.

y Les concentrations permissibles en nitrites augmentent avec les concentrations en chlorures du milieu aquatique. La valeur donnée est pour une concentration en chlorures inférieure à 2 mg/l.

z Ce critère de qualité est qualifié de provisoire. Ce critère de qualité a été calculé à partir de données de toxicité pour de faibles duretés (≤ 120 mg de $CaCO_3$/l).

A Cette concentration est une concentration maximale acceptable (CMA) définie pour l'eau potable. Il est toutefois recommandé d'ajuster la concentration de fluorures à 1,0 mg/L, soit le niveau optimal pour lutter contre la carie dentaire. Une concentration de 1,2 mg/L doit être maintenue aux endroits où la moyenne annuelle des températures maximales quotidiennes est inférieure à 10 °C.

B Ce critère de qualité s'applique aux eaux dont la dureté est < 100 mg/L et dont la concentration en chlorures est < 5 mg/L.

C Au-delà de cette concentration, les propriétés organoleptiques ou esthétiques de l'eau de consommation pourront être altérées. Une concentration supérieure à 500 mg/L de sulfates peut avoir un effet laxatif sur certaines personnes.

D Ce critère de qualité a été défini pour des eaux de **faible dureté (< 10 mg/L)** et dont le **pH est d'environ 6,5**. Lorsque le milieu aquatique ne s'approche pas de ces conditions, ce critère ne doit pas être utilisé. Lorsque le critère est utilisé, les **données d'eau de surface doivent être corrigées** pour réduire la fraction non biodisponible du métal associée aux particules. Un facteur de correction de 0,66 est utilisé pour les données d'eau de surface ayant une concentration en matières en suspension < 5 mg/L. Un facteur de correction de 0,33 est utilisé pour les données d'eau de surface ayant une concentration en matières en suspension ≥ 5 mg/L. Un critère de qualité propre au site peut aussi être déterminé au cas par cas. Certaines eaux de surface de bonne qualité peuvent présenter des teneurs naturelles plus élevées que le critère de qualité de l'eau. Dans une telle situation, les teneurs naturelles doivent être considérées comme la valeur de référence plutôt que le critère de qualité.

E Il ne devrait pas y avoir d'effets toxiques à cette concentration si le pH se maintient entre 6,5 et 9,0.

«En raison des possibilités limitées d'utiliser les données obtenues en expérimentation animale comme modèle pour l'homme et de l'incertitude entachant les données humaines, il est impossible de déterminer une valeur guide reposant sur des arguments sanitaires. Néanmoins, l'optimisation des procédés de coagulation utilisant des agents coagulants à base d'aluminium dans les installations deF traitement de l'eau de boisson a conduit à la définition de valeurs limites pratiques: 0,1 mg/l ou moins dans les grandes installations de traitement de l'eau et **0,2 mg/l ou moins** dans les petites installations de traitement de l'eau.» (OMS 2004)

G La sensibilité d'un milieu à l'acidification varie avec la concentration en calcium :
Sensibilité Concentration (mg/L)
élevée ------------ < 4
moyenne -------4-8
faible ------------- > 8

H Les critères pour certains métaux varient en fonction de la dureté. Les critères ont été calculés pour une dureté de moins de 10 mg de $CaCO_3$/l.

I Ce critère de qualité a été défini à partir d'un problème esthétique cutané nommé argyria. Cette valeur est définie pour l'eau potable.

J Les critères de qualité de l'U.S.EPA, qu'ils s'appliquent aux eaux douces, saumâtres ou salées, ont été définis à partir de données sur l'arsenic III, mais s'appliquent ici à l'arsenic total, ce qui signifie que la toxicité de l'arsenic III et V est considérée comme étant égale et additive.

K Cette concentration est une concentration maximale acceptable (CMA) définie pour l'eau potable. Il s'agit de la concentration d'arsenic qui représente un risque sanitaire « essentiellement négligeable ». Santé Canada défini le terme « essentiellement négligeable » comme étant une plage allant d'un nouveau cas de cancer de plus que le niveau de fond pour 100 000 personnes à un nouveau cas de cancer de plus que le niveau de fond pour 1 million de personnes (p. ex., 10-5 à 10-6) au cours de la durée d'une vie.
Ce critère est utilisé dans un contexte de prévention de la contamination de l'eau de surface, c'est pourquoi il diffère de la norme d'eau potable. Certaines eaux de surface de bonne qualité peuvent contenir des concentrations naturelles plus élevées que le critère de qualité.

L Ce critère de qualité équivaut à un niveau de risque d'un cas de cancer supplémentaire pour une population d'un million d'individus exposés. Ce critère de qualité s'applique à la forme inorganique seulement. Critère de qualité intérimaire.

M Cette concentration est une concentration maximale acceptable (CMA) définie pour l'eau potable.

N La toxicité du cuivre diminue lorsque la concentration en carbone organique dissous est élevée (U.S.EPA, 1998).

O Au-delà de cette concentration, les propriétés organoleptiques ou esthétiques de l'eau de consommation pourront être altérées.

P Ce critère de qualité est qualifié de provisoire. Ce critère de qualité pourrait ne pas être protecteur pour l'éphémère (*Ephemerella subvaria* ) si cette espèce est aussi sensible que certaines données l'indiquent. Avant d'être comparées à ce critère de qualité, les données de qualité d'eau de surface doivent être corrigées pour réduire la fraction du métal non biodisponible associée aux particules. Un facteur de correction de 0,5 est utilisé sur les données d'eau de surface ayant une concentration en matières en suspension < 10 mg/L. Un facteur de correction de 0,33 est utilisé sur les données d'eau de surface ayant une concentration en matières en suspension ≥ 10 mg/L. Certaines eaux de surface de bonne qualité peuvent contenir des teneurs naturelles plus élevées que le critère de qualité. Dans ces situations, les teneurs naturelles doivent être considérées comme la valeur de référence plutôt que le critère de qualité. Un critère de qualité propre au site peut aussi être déterminé au cas par cas.

Q Au-delà de cette concentration, les propriétés organoleptiques ou esthétiques de l'eau de consommation pourront être altérées. Certaines eaux de surface de bonne qualité peuvent avoir des concentrations naturelles plus élevées.

R Cette valeur est définie pour l'eau potable.

S Ce critère de qualité est basé sur une consommation de 15 grammes de poisson, mollusque et crustacé par jour. Ce critère de qualité inclut le méthylmercure.

À partir de données présentées dans U.S.EPA (1976b), le Ministère opte pour un critère de qualité opérationnel de 10 µg/L pour les hydrocarbures pétroliers. D'autres critères existent pour les différents types de produits pétroliers.

U Ce critère de qualité sert à éviter l'altération du goût ou de la couleur du poisson.

Ce critère de qualité est applicable à l'eau brute destinée à l'approvisionnement en eau potable lorsque cette eau fait l'objet d'un traitement par filtration. Il permet d'éviter la mise en place de procédés

V de traitement supplémentaires. Ce critère de 200 UFC/100 ml (ou 150 bactéries E. coli/100 ml) s'applique à la moyenne arithmétique des échantillons qui doit correspondre à la moyenne mobile la plus élevée des résultats obtenus pendant 12 mois consécutifs, établie à partir d'une période de référence d'au moins 36 mois.

W Toute diminution ou augmentation artificielle de la température ne doit pas:
- modifier la température de l'eau sur tout un tronçon de rivière ou une portion de lac avec pour résultat le déplacement prévisible ou la modification des populations aquatiques présentes ou potentielles;
- altérer certaines zones sensibles localisées, telle une frayère;
- tuer les organismes vivants à proximité d'un rejet.

De plus, le milieu ne doit pas subir de changements brusques de température occasionnés, par exemple, par un arrêt subit d'un rejet thermique en saison froide.

X Les concentrations en oxygène dissous ne devraient pas être inférieures aux valeurs suivantes:

| | Concentration d'oxygène dissous | | | |
|---|---|---|---|---|
| | Biote d'eau froide | | Biote d'eau chaude | |
| Température (°C) | % Saturation | mg/L | % Saturation | mg/L |
| 0 | 54 | 8 | 47 | 7 |
| 5 | 54 | 7 | 47 | 6 |
| 10 | 54 | 6 | 47 | 5 |
| 15 | 54 | 6 | 47 | 5 |
| 20 | 57 | 5 | 47 | 4 |
| 25 | 63 | 5 | 48 | 4 |

Dans les eaux habitées par des communautés biologiques sensibles, la présence d'un stress physique ou chimique additionnel peut nécessiter l'utilisation de limites plus contraignantes.
Dans les eaux de l'hypolimnion, la concentration naturelle en oxygène dissous est parfois plus faible que les concentrations mentionnées ci-haut. Cet état ne doit pas être aggravé par l'ajout de matières biodégradables qui causeront une baisse d'oxygène dans le milieu.

Y Ce critère de qualité est qualifié de provisoire. Ce critère de qualité s'applique aux eaux de dureté variant de 20 à 100 mg/L ($CaCO_3$).

aa Comme cette substance nécessite une grande quantité d'$O_2$ pour être dégradée, il faut s'assurer, pour protéger la vie aquatique, que le critère de qualité pour l'oxygène dissous est aussi respecté.

# APPENDIX 4

LETTER FROM DFO, MAY 18, 2018
CESSATION OF MONITORING
Route 167 Nord, Lots C and D

Pêches et Océans Canada | Fisheries and Oceans Canada

Gestion des écosystèmes
Région du Québec

Ecosystems Management
Quebec Region

Classif. sécurité / Security

Le 18 mai 2018

**Par courriel seulement**

Votre réf. / Your ref.

Notre réf. / Our ref.
10-HQUE-LZ3-00032

Monsieur Martin Boucher
Directeur, Développement durable
Les Diamants Stornoway (Canada) inc.
1111, rue Saint-Charles Ouest
Bureau 400, Tour Ouest
Longueuil (Québec) J4K 5G4

**Objet: Suivis, Projet de construction de ponts et ponceaux, desserte routière, route 167 nord, Monts Otish, lot C et lot D (km 143 à 240)**

Monsieur,

Le Programme de protection des pêches de Pêches et Océans Canada (le Programme) a complété l'analyse des suivis associés au projet indiqué en rubrique, à partir des informations qui nous ont été fournies dans les documents cités ci-dessous :

- Correspondance de Benjamin Jacob (Les Diamants Stornoway Canada inc) à Mélissa Karen Bruneau (Les Diamants Stornoway Canada inc). 16 mai 2018. Rapport de suivi additionnel 2016 du libre passage du poisson dans certains ponceaux de la route 167 Nord. Mémo. Quatre pages et annexes.
- Les Diamants Stornoway (Canada) inc. Mars 2018. Projet de compensation – Route 167 nord Rapport de suivi 2017. 24 pages et annexes.

Nous sommes d'avis que les suivis effectués démontrent que les aménagements ont permis d'atteindre les objectifs à la satisfaction du Programme.

Les termes de l'autorisation 2013-011 émise le 12 avril 2013 pour les travaux de construction de ponts et ponceaux de la route 167 nord vers les Monts Otish sur les lots C et D (km 143 à 240) ont été respectés. Nous considérons ce projet comme terminé.

Pour toute question, n'hésitez pas à communiquer avec Marie-Pierre Veilleux par téléphone au 418-775-0895, par télécopieur au 418-775-0658 ou par courriel à Marie-Pierre.Veilleux@dfo-mpo.gc.ca.

Veuillez agréer, Monsieur, mes salutations distinguées.

Marie-Pierre Veilleux
Biologiste, Protection des pêches - Examens réglementaires
c. c. Mélissa Karen Bruneau, Surintendante Environnement, Les Diamants Stornoway

Canada

850, route de la Mer, Mont-Joli (Québec) G5H 3Z4
Tél.: 418-775-0895, téléc.: 418-775-0658, Courriel: Marie-Pierre.Veilleux@dfo-mpo.gc.ca

# APPENDIX 5

## HSS-3.6 PROCEDURE
## WILD ANIMALS

| | Nom/Name | Fonction/Function | Signature | Date |
|---|---|---|---|---|
| Préparé par/Prepared by: | Benjamin Jacob | Biologiste / Biologist | | 13/08/2017 |
| Révisé par/Revised by: | Raphaël Duchesne | Coordonnateur SST<br>OHS Coordinator | | 14 décembre 2020/December 14, 2020 |
| Approuvé par/Approved by: | Claude Fortin | Surintendant SST/ OHS superintendant | | 14 décembre 2020/December 14, 2020 |

## 1.0 Objet

Cette procédure a pour objectif de communiquer les lignes directrices en matière de pratiques sécuritaires en présence d'animaux sauvages, en particulier des ours noirs, pouvant se retrouver près des sites d'opération de la Société Les Diamants Stornoway (SWY). Elle traite de la prévention, de l'identification des risques et de l'intervention en cas de rencontre importune.

## 1.0 Subject

This procedure aims to communicate the guidelines regarding safe practices in presence of wild animals, particularly black bears, near operation sites of Stornoway Diamonds Corporation (SWY). It relates to prevention, risk identification, and intervention in the event of an unwelcome encounter.

## 2.0 Portée

Cette procédure s'applique à l'ensemble des employés et entrepreneurs ayant à intervenir sur les sites de SWY.

## 2.0 Scope

This procedure applies to all employees and contractors having to work on SWY sites.

## 3.0 Définitions

Dans le cadre de cette procédure, les mots, termes, acronymes ou abréviations suivants sont définis comme suit :

## 3.0 Definitions

As part of this procedure, the following words, terms, acronyms or abbreviations are defined as follows:

| Mots, termes, acronymes ou abréviations | Définition | Words, terms, acronyms and abbreviations | Definition |
|---|---|---|---|
| Dispositif de répulsion sonore | Dispositif émettant un son qui aura pour effet de faire fuir l'animal sauvage. Il peut s'agir d'un sifflet, d'une sirène, d'une cloche ou d'un "Bear Banger" consistant en un dispositif émettant une détonation.<br>Ce dispositif informe par la même occasion les autres membres du personnel à proximité. | Sound repellent device | A device that emits a sound that will effectively scare away wild animals. It can be a whistle, siren, bell or "Bear Banger" with a detonation device.<br>This device will also inform the personnel nearby of the presence of an animal. |
| Dispositif de répulsion visuelle | Dispositifs émettant une lumière comme celle d'une lampe de poche ou un Mini Flare (fusée éclairante) qui, lorsqu'activé, produit des étincelles semblables à celles d'un feu d'artifice. En période de sècheresse, ce dernier dispositif peut présenter un risque d'incendie de forêt. | Visual repellent device | Light-emitting device such as a flashlight or a Mini Flare that produces sparks similar to fireworks when activated. In times of drought, the latter device may present a forest fire risk. |
| Dispositif de répulsion actif | Dispositif à propulsion gazeuse de poivre de Cayenne pouvant atteindre une distance prédéterminée. | Repellent device | Device used to project gaseous Cayenne pepper that can reach a pre-established distance. |

## 4.0 RÔLES ET RESPONSABILITÉS

En plus des rôles et des responsabilités globaux prévus à la procédure-cadre du système de gestion HSS (HSS 1.1), la présente procédure prévoit des rôles et des responsabilités spécifiques pour les intervenants suivants :

### 4.1 Vice-président opérations

- S'assure que ses gestionnaires sont au fait des exigences de la présente procédure et de son application au niveau des opérations.

### 4.2 Vice-président ressources humaines

- S'assure que les gestionnaires sont au fait des exigences de la présente procédure et de son application au niveau des opérations.

### 4.3 Surintendant SST

- Révise la procédure;
- S'assure que la formation sur la prévention et l'utilisation des techniques d'intervention en présence d'animaux sauvages est transmise à tous les intervenants.

### 4.4 Coordonnateur SST

- S'assure que les dispositifs de répulsion sonores et actifs sont installés par les services surface sont installés aux endroits stratégiques au printemps et retirés à l'automne.

### 4.5 Superviseur mine surface

- Installe les dispositifs de répulsion sonores et actifs aux endroits stratégiques au printemps et retirés à l'automne tel que précisé sur le plan d'installation.

### 4.6 Agent de sûreté

- Effectue sur une base quotidienne des observations terrain et relève et documente toute activité impliquant des animaux sauvages;
- Rapporte au service de sûreté l'information sur les zones où la présence d'animaux sauvages a été remarquée;
- Avise le gérant en devoir sur la pagette #111 et par radio pour tout le personnel de la présence d'un ours dans le secteur de la mine.

## 4.0 ROLES AND RESPONSIBILITIES

Within the overall roles and responsibilities established in the Main HHSMS Procedure (HSS 1.1), the specific roles and responsibilities of the various stakeholders are the following:

### 4.1 Vice-President, Operations

- Ensures that managers are familiar with the requirements of this procedure and its application at the operational level.

### 4.2 Vice-President, Human Resources

- Ensures that managers are familiar with the requirements of this procedure and its application at the operational level.

### 4.3 OHS Superintandant

- Review the procedure;
- Ensures that training on prevention and the use of intervention techniques in the presence of wild animals is shared will all stakeholders.

### 4.4 OHS Coordinator

- Ensures that sound and active repulsion devices are installed by surface services are installed at strategic locations in the spring and removed in the fall.

### 4.5 Mine surface supervisor

- Installs sound and active repulsion devices at strategic locations in the spring and removed in the fall as specified on the installation plan.

### 4.6 Security officer

- Makes daily field observations and records and documents all activities involving wild animals.
- Reports to the safety service with information regarding areas where wild animals have been observed.
- When a bear is observed in and around the mine area, informs the manager on duty by pager on #111 and all staff by radio.

**4.7 Surintendant**

- S'assure que ses gestionnaires sont au fait de la présente procédure et de son application dans le cadre du travail;
- Informe le service de sûreté de tout incident ou situation pouvant compromettre la sécurité du personnel à cause de la proximité d'animaux sauvages.

**4.8 Superviseur**

- S'assure que les membres de son personnel sont au fait de la présente procédure;
- S'assure que son personnel dispose des équipements et accessoires pour se protéger lorsqu'il effectue des travaux en zones isolées;
- Communique à tous ses employés les secteurs d'activités où la présence d'animaux sauvages a été constatée;
- S'assure que les mesures préventives mises en place sont respectées au cours de l'activité de travail.

**4.9 Employé**

- Participe aux séances de formation sur l'application de la présente procédure et les mesures de prévention applicables;
- Respecte les mesures de prévention établies et les moyens de contrôle prescrits;
- Lors de déplacement hors campement ou du site s'assure de disposer des équipements ou du matériel nécessaire advenant la rencontre d'animaux sauvage;
- Rapporte à son supérieur immédiat toute observation d'animaux sauvages à proximité du camp et du site minier Renard.

**4.10 Entrepreneur**

- S'assure que ses gestionnaires et employés sont au fait de la présente procédure;
- S'assure que ses superviseurs fournissent les équipements et accessoires nécessaires pour intervenir advenant une rencontre fortuite avec un animal sauvage;
- S'assure que soit communiquée toute observation de la présence d'animaux sauvage dans les zones de travail;
- Rapporte au chargé de projet tout problème découlant de l'application de la présente procédure.

**4.7 Superintendant**

- Ensures that managers are familiar with this procedure and its application in work operations.
- Informs the security service in the event of an incident or a situation involving the presence of wild animals that could compromise staff safety.

**4.8 Supervisor**

- Ensures that staff members are familiar with this procedure.
- Ensures that staff has equipment and accessories to protect themselves when working in isolated areas.
- Informs all employees of areas where wild animals have been observed.
- Ensures that the appropriate preventive measures are respected during work activities.

**4.9 Employee**

- Participates in training sessions on the application of this procedure and applicable preventive measures.
- Respects established preventive measures and prescribed control measures.
- Ensures that they have the necessary equipment or material in the case of an encounter with a wild animal during travel outside of camp.
- Reports all observations of wild animals near the camp and the Renard mine site to their immediate supervisor.

**4.10 Contractor**

- Ensures that managers and employees are familiar with this procedure.
- Ensures that supervisors provide the necessary equipment and accessories to intervene in the case of a chance encounter with a wild animal.
- Ensures to communicate all observations of wild animals in and around work areas.
- Informs the project manager if a problem were to arise with the application of this procedure.

## 5.0 PROCESSUS

Afin d'assurer la sécurité des employés, des entrepreneurs et des visiteurs, des mesures de prévention et d'intervention sont établies pour composer avec la présence d'animaux sauvages et particulièrement celle d'ours noirs. Ces mesures s'appliquent de différentes façons et à différentes fréquences dans le but premier de prévenir les accidents potentiels. L'ensemble des moyens de prévention et les mécanismes de communication développés visent à réduire les risques de présence d'animaux sauvages en périphérie des zones de travail et d'hébergement. Les étapes suivantes doivent être mises en place pour assurer la sécurité individuelle et collective des intervenants sur le site de SWY.

### 5.1 Prévention

Les installations sont situées dans un territoire sauvage où la faune caractéristique de ces régions abonde. Les activités d'exploration, de construction et par la suite d'opération sont venues perturber cet environnement. Règle générale, l'activité humaine dans un secteur éloigne les animaux sauvages. Cependant les dérangements apportés à leurs habitudes alimentaires par l'activité humaine combinés à la présence de nouvelles sources de nourriture potentielle attirent les animaux sauvages, particulièrement lorsque leur nourriture habituelle se fait rare.

Des mesures de prévention ont été établies afin de réduire l'attrait des animaux sauvages pour les sites d'hébergement et de construction. Voici certaines informations qui permettront de mieux comprendre le mode de vie de ces animaux. Il peut cependant y avoir des variantes comportementales selon les circonstances.

#### 5.1.1 Ours noir

Des ours noirs ont été observés sur site de la mine Renard aux abords du campement et sur les rives du lac Lagopède, mais plus particulièrement au Lieu d'Enfouissement En Tranchée (L.E.E.T.). Une attention particulière doit donc être portée à ces animaux qui dans certaines circonstances peuvent compromettre la sécurité des travailleurs.

Quelques observations sur les ours noirs:

- La période de l'année où ils sont le plus actifs est de mai à novembre;
- Règle générale les ours noirs n'attaquent pas les humains, mais une attention est toujours requise, car exceptionnellement ils peuvent toujours attaquer;
- Même si les attaques et blessures par un ours sont rares, il est essentiel de se rappeler que :

## 5.0 PROCESS

To ensure the safety of employees, contractors, and visitors, preventive and response measures are established to deal with the presence of wild animals, particularly black bears. These measures can be applied in various ways and at various times with the goal of preventing potential accidents. All prevention and communication means that have been developed aim to reduce the risk of the presence of wild animals around the work and lodging areas. The following steps must be implemented to ensure the individual and collective safety of those at the SWY site.

### 5.1 Prevention

The facilities are located in a wild area where wildlife typical of the region is abundant. Exploration, construction, and operation activities disturb that environment. As a general rule, wild animals tend to keep away from human activity in an area. However, disturbances in their dietary habits as a result of human activity and the presence of new potential sources of food attract wild animals, especially when their usual food sources become scarce.

Prevention measures have been established to reduce wild animal attraction at the lodging and construction sites. The information below provides a better understanding of the lifestyles of these animals. However, behavioural variations can occur depending on the situation.

#### 5.1.1 Black Bears

Black bears have been observed on the Renard Mine site around the camp and on the shores of Lake Lagopède, particularly near the trench landfill. Special attention should be paid to these animals, because they are capable of compromising worker safety in certain situations.

Here are a few observations regarding black bears:

- They are most active from May to November;
- Generally, black bears do not attack humans, but vigilance is always required because they can occasionally attack;
- Although bear attacks and resulting wounds are rare, remember the following:
  - Bears are easily attracted to the areas where humans live;

  - Les ours sont facilement attirés par les endroits où l'humain vit;
  - Ils sont attirés par les vidanges, les oiseaux, la nourriture pour animaux domestiques, l'odeur de graisse et de résidus de nourriture sur un BBQ;
  - Ces sources de nourriture non naturelles pour eux les incitent à se rapprocher des sites d'activité humaine;
  - Si l'ours a du succès, il reviendra encore et encore;
  - Il perdra progressivement sa peur naturelle de l'être humain et fréquentera régulièrement les lieux où l'être humain vit, habite ou travaille.
- La présence d'ourson peut rendre la mère très protectrice et modifier son comportement habituel; cela peut présenter un danger supplémentaire pour l'humain.
- Les ours noirs attaquent rarement, mais son comportement peut être influencé par différents facteurs tels que mâle ou femelle, en période de reproduction ou femelle avec ses oursons, ours adulte avec territoire établi, son état physique (âgé, blessé) finalement le type d'expérience que l'ours a eue dans le passé avec les humains. Par conséquent les ours ne sont pas entièrement prévisibles.
- Plusieurs raisons poussent un ours à devenir menaçant ou à attaquer un humain et se résument comme suit:
  - Certains ours n'ont plus peur des humains, car ils sont habitués à eux;
  - L'ours est surpris ou approché de trop près et ne sent coincer ou menacer;
  - La femelle et ses oursons sont approchés de trop près;
  - Un ours défend une source de nourriture abondante;
  - Un ours est blessé, est souffrant ou affamé;
  - Un ours considère un humain comme une proie;
- Un ours qui se tient sur ses pattes arrière n'est pas agressif, mais tente plutôt de chercher à identifier une odeur ou vérifier si vous représentez une menace pour lui.

### 5.2 Précaution et mesures de sécurité

Des mesures de sécurité sont en place pour prévenir les incidents avec les animaux sauvages et particulièrement les ours noirs. Autour du campement, une clôture électrique est en place pour donner une décharge non mortelle à tout animal qui tenterait de franchir le périmètre sécurisé. Une attention particulière doit être portée pour ne pas venir en contact avec celle-ci ou de

  - They are attracted by garbage, birds, pet food, and the smell of fat and food residue on grills;
  - These unnatural sources of food encourage them to approach areas of human activity;
  - If a bear is successful, it will return again and again;
  - The bear will progressively lose its fear of people and regularly frequent areas where people live and work.
- The presence of a cub can make the mother very protective and change her usual behaviour; this can be an additional threat to humans.
- Black bears rarely attack, but their behaviour can be influenced by various factors such as their sex, whether or not it is mating season, whether a female has cubs or not, whether it is an adult bear with an established territory, a bear's physical condition (old, wounded), and its previous experiences with humans. As a result, bears are unpredictable.
- There are several reasons that could motivate a bear to threaten or attack a person, such as the following:
  - Some bears no longer fear humans because they are used to them;
  - A bear is surprised or approached too closely and feels cornered or threatened;
  - A female and her cubs are approached too closely;
  - A bear is defending an abundant food source;
  - A bear is wounded, suffering, or hungry;
  - A bear considers a person to be prey;
- A bear standing on its hind legs is not aggressive. It is trying to identify a smell or determine whether you are a threat to it.

### 5.2 Precautions and Safety Measures

Safety measures are in place to prevent accidents with wild animals, especially black bears. Around the camp, an electric fence is in place, which will give a nonlethal shock to any animal that tries to cross the safety perimeter. Special attention must be paid not to come into contact with the fence or damage it with vehicle or construction equipment.

l'endommager avec un véhicule ou équipement de construction.

Des dispositifs de répulsion sont disponibles et les personnes circulant en dehors des zones protégées doivent avoir de ces moyens sur soi.

Des bornes de sécurité sont installées sur le site et contienne des dispositifs de répulsion sonore, visuelle et active. Ces dispositifs sont complémentaires aux dispositifs de répulsion personnelle cités au paragraphe précédent.

#### 5.2.1 Nourriture

Les mesures suivantes doivent être respectées:

- La nourriture doit être consommée dans les salles à manger du complexe d'hébergement;
- Toute nourriture sortie pour la pause du matin ou de l'après-midi doit être rangée dans un lieu sécuritaire et à l'abri des animaux sauvages;
- Tout déchet de nourriture ou excédant de nourriture sortie des aires de repas prévus doit être rapporté au camp pour être disposé dans les contenants appropriés;
- Tout déchet du camp doit être conservé dans un local approprié et dans des contenants prévus à cet effet;
- Les déchets de nourriture enfouis en tranchée doivent être recouverts le plus rapidement possible.

#### 5.2.2 Petits animaux

Même s'il peut sembler inoffensif de nourrir les plus petits animaux tels les écureuils ou les lièvres, il est important de s'en abstenir et de leur bloquer l'accès aux réserves de nourriture, car ces petits animaux sont des sources d'alimentation pour les animaux sauvages plus gros tels que le renard, le loup et l'ours noir. De plus, ces animaux peuvent être porteurs de la rage. Une prolifération de plus petits animaux peut accroitre la présence de leurs prédateurs et il est par conséquent interdit de les nourrir.

#### 5.2.3 Comportement sécuritaire

La présence d'êtres humains sur des territoires sauvages requiert des précautions particulières pour assurer sa propre sécurité et ne pas compromettre celle des autres membres de l'équipe. Les règles suivantes doivent être observées :

- Ne pas nourrir ou tenter d'approcher un ours ou un ourson;
- Ne pas tenter de prendre de photos ou de vidéos si vous êtes à découvert;
- Comprendre le comportement de l'ours noir et les moyens de reconnaitre sa présence dans son secteur de travail;

Bear repellents are available and individuals travelling outside of the protected areas must have repellents with them.

Safety markers are installed at the site and contain noisemakers, visual repellents, and active repellents. These repellents are in addition to the personal repellents mentioned above.

#### 5.2.1 Food

The following measures must be respected:

- Food must be eaten in the cafeterias of the housing complex;
- All food taken out during the morning or afternoon breaks must be put away in a safe place that is inaccessible to wild animals;
- All food waste and excess food taken out of the designated meal areas must be returned to the camp and disposed of in appropriate containers;
- All camp waste must be kept in an appropriate place and in the containers provided for that purpose;
- Food waste in the trench landfill must be covered as quickly as possible.

#### 5.2.2 Small Animals

Although it can seem harmless to feed small animals, such as squirrels and hares, it is important to refrain from doing so and to prevent their access to food reserves because these small animals are sources of food for larger wild animals, such as foxes, wolves, and black bears. In addition, small animals can carry rabies. Proliferation of small animals can increase the presence of their predators. Therefore, feeding them is prohibited.

#### 5.2.3 Safe Behaviour

The presence of humans in wild areas requires specific precautions to ensure individual safety without compromising the safety of other team members. The following rules must be observed:

- Do not feed or attempt to approach a bear or bear cub;
- Do not try to take photos or video if you are in the open;
- Understand black bears' behaviour and the ways to recognize their presence in your work area;
- Learn techniques for prevention, for using the available repellents, and for appropriately reacting in the case of a chance encounter with a bear;

- Apprendre les techniques pour prévenir, pour utiliser les moyens de répulsion disponibles et pour réagir adéquatement advenant la rencontre fortuite d'un ours;
- Toujours être en alerte, garder les yeux ouverts et être à l'écoute de son entourage; Effectuer fréquemment un tour d'horizon pour déceler la présence d'ours;
- Prendre toutes les précautions nécessaires avec la nourriture et les déchets de nourriture. Utiliser le plus possible des contenants résistant aux ours et sécuriser le couvercle en tout temps;
- Lors de travaux, repérer dans votre secteur la borne de sécurité identifiée où se trouve des dispositifs de répulsion sonore tel que sifflet, sirène à air comprimé, "Bear banger" et dispositif de répulsion actif tel que bonbonne de poivre à air comprimé. Une fois utilisé, il faut qu'il soit remplacé pour assurer la sécurité des autres utilisateurs potentiels;
- Lors de déplacement à l'extérieur du campement ou du secteur protégé par une clôture électrique,
    - toujours être accompagné d'au moins une personne;
    - avoir des dispositifs de répulsion sur soi;
    - avoir au moins un moyen pour communiquer avec la sûreté et le superviseur;
    - le soir, avoir également une lampe de poche en bonne condition;
- Lors de déplacement hors site, s'assurer d'informer quelqu'un de la direction du déplacement et du lieu de travail prévu. Advenant une modification, en cours de route en aviser son superviseur;
- Si un ours est en vue dans votre secteur, ne pas l'approcher et contacter immédiatement votre responsable et le service de sûreté pour l'en informer et communiquer votre localisation;
- Utiliser au besoin un sifflet, une sirène ou "Bear banger" pour éloigner l'ours.

#### 5.2.4 Information et communication

Afin de tenir le personnel informé de la présence et de l'activité d'animaux sauvages et particulièrement d'ours noirs, des moyens de communication seront mis en place tels que:

- Un communiqué sera publié lors de rencontre hebdomadaire ou quotidienne de santé et sécurité;
- Des séances d'information seront données aux gestionnaires et une formation sera donnée pour tous les employés sur la faune et les animaux dangereux se trouvant dans les secteurs de travail.

- Always be aware, keep your eyes open, and listen to your surroundings, frequently scan the area to detect the presence of any bears;
- Take all necessary precautions with food and food waste. As much as possible, use bear-proof containers and keep them tightly closed at all times;
- During work, identify the safety marker containing noisemakers such as whistles, sirens, "Bear Bangers," and active repellents such as pepper-based bear spray. After use, the repellents must be replaced to ensure the safety of other potential users;
- When travelling outside of the camp or area protected by electric fencing,
    - always travel with at least one other person;
    - have repellents with you;
    - have at least one way of communicating with security and your supervisor;
    - at night, also have a flashlight in good condition;
- When leaving the site, ensure that you inform someone of the direction in which you are travelling and of the planned work location. In the event of a change, inform your supervisor along the way;
- If you see a bear in your area, do not approach it, and contact your supervisor and the security service immediately to inform them of the situation and your location;
- If necessary, use a whistle, a siren, or a "Bear Banger" to keep the bear at a distance.

#### 5.2.4 Information and Communication

The following communication measures will be implemented to keep personnel informed of the presence and activity of wild animals, particularly black bears:

- A statement will be released during the weekly or daily safety and security meeting;
- Information sessions will be held for managers, and training regarding wildlife and dangerous animals found in the work area will be provided for all employees.

**5.3 Intervention en présence d'un ours**

Malgré la mise en place des mesures de sécurité visant à réduire la présence d'ours ou d'animaux sauvages aux abords du camp, du site de travail et de construction, des incidents peuvent survenir.

Des bornes de sécurité contenant des dispositifs de répulsion additionnelle sont disponibles sur le site. Lors de son usage, celui-ci doit être rapporté au service surface pour être remplacé.

Compte tenu du niveau d'imprévisibilité d'un ours il n'y a pas qu'une méthode de réagir en sa présence. Advenant une rencontre avec un ours, les mesures suivantes sont recommandées:

**5.3.1 Si l'ours est loin et ne semble pas avoir constaté votre présence**

- Reculez lentement sans faire de bruit sans le regarder directement dans les yeux. Lorsque vous êtes à l'abri, contactez immédiatement votre responsable et le service de sûreté, en mentionnant votre localisation;
- Suivez les directives qui vous seront transmises par votre responsable et/ou le service de sûreté;
- La reprise des activités sera permise qu'avec l'autorisation de votre supérieur une fois que l'ours aura quitté les lieux et que des moyens additionnels auront été pris pour assurer la sécurité du personnel.

**5.3.2 Si l'ours semble avoir constaté votre présence**

- Identifiez-vous comme un humain;
- Agitez lentement les bras et parlez lentement sans le regarder directement dans les yeux;
- Reculer lentement sans lui montrer le dos, faites un détour pour s'éloigner du secteur où il se trouve;
- Si vous ne pouvez rebrousser chemin, rester immobile et attendez sans bouger, laissez-lui de la place. NE LE COINCEZ PAS. Lorsque l'ours s'éloignera, quittez lentement le secteur. NE PAS COURIR;
- Lorsque vous serez à l'abri, contactez immédiatement votre responsable et le service de sûreté, en mentionnant votre localisation;
- Suivez les directives qui vous seront transmises par votre responsable et/ou le service de sûreté;
- La reprise des activités sera permise qu'avec l'autorisation de votre supérieur une fois que l'ours aura quitté le secteur et que des moyens additionnels auront été pris pour assurer la sécurité du personnel.

**5.3 Response in the Presence of a Bear**

Despite the safety measures implemented to reduce the presence of bears or wild animals surrounding the camp and the work and construction site, incidents could happen.

Safety markers containing additional repellents are available at the site. After use, repellents must be returned to the surface service for replacement.

Given the unpredictability of bears, there is no single way to react in their presence. If you encounter a bear, the following measures are recommended:

**5.3.1 If the bear is far away and does not seem to have noticed you**

- Back away slowly without making noise and without making eye contact. When you are in a safe location, contact your supervisor and the security service immediately and inform them of your location;
- Follow the instructions given to you by your supervisor and/or the security service;
- You may only continue your activities with the authorization of your supervisor once the bear has left the area and additional measures have been taken to ensure personnel safety.

**5.3.2 If the bear seems to have noticed you**

- Identify yourself as a human;
- Wave your arms slowly and speak slowly without making direct eye contact;
- Back away slowly without turning your back to the bear and take a different route to keep away from the area where the bear is located;
- If you are unable to turn back, stay where you are and wait without moving, giving the bear space. DO NOT CORNER THE BEAR. When the bear has gone away, slowly leave the area. DO NOT RUN;
- When you are in a safe location, contact your supervisor and the security service immediately and inform them of your location;
- Follow the instructions given to you by your supervisor and/or the security service;
- You may only continue your activities with the authorization of your supervisor once the bear has left the area and additional measures have been taken to ensure personnel safety.

**5.3.3 Si l'ours a constaté votre présence et s'approche vers vous**

- Demeurez debout solidement et éloignez-vous lentement;
- Demeurez calme;
- S'il continue à avancer vers vous, distrayez le en laissant tomber un sac un objet (qui ne peut être utilisé comme moyen de défense ex. rame, hache, etc.). Ne jetez de la nourriture qu'en dernier recours, car les ours seront plus exigeants et plus menaçants pour les prochaines personnes qu'il rencontrera par la suite sachant qu'il peut avoir de la nourriture facilement.
- Prenez votre dispositif de répulsion sonore et/ou visuelle et soyez prêt à l'utiliser (sifflet ou sirène, lampe de poche ou fusée éclairante, mini flare ).
- Lorsque l'ours quitte le secteur, quittez lentement le secteur. NE PAS COURIR;
- Lorsque vous êtes à l'abri, contactez immédiatement votre responsable et le service de sûreté, en mentionnant votre localisation;
- Suivez les directives qui vous seront transmises par votre responsable et/ou le service de sûreté;
- La reprise des activités sera permise qu'avec l'autorisation de votre supérieur une fois l'ours aura quitté le secteur et que des moyens additionnels auront été pris pour assurer la sécurité du personnel.

**5.3.4 Si vous surprenez un ours et qu'il se montre agressif**

L'ours est pris de court et agit par réflexe de défense. Même si l'ours vous fait des menaces vous pouvez encore désamorcer cette agressivité en vous éloignant doucement, en lui parlant et en laissant tomber un article devant vous. <u>À ce stade, montrez-vous le moins menaçant possible.</u>

**5.3.5 Si l'ours vous suit de façon insistante ou fonce sur vous sans peur.**

L'ours qui prend un humain en chasse se montre insistant et menaçant. Il émet des sons contrairement au jeune ours curieux. Dans cette situation extrême, il est préférable de faire face à l'ours. Les actions suivantes sont indiquées:

- Essayer de l'intimider à votre tour en:
  - paraissant dominant;
  - cognant des objets l'un contre l'autre,
  - haussant la voix,
  - agitant vigoureusement les bras, votre manteau, une branche ou votre sac au-dessus de votre tête ou sautez pour avoir l'air plus grand

**5.3.3 If the bear has noticed you and approaches you**

- Remain standing solidly and get away slowly;
- Remain calm;
- If the bear continues to come toward you, distract it by dropping an object (do not use an object that could be used for defence, such as an oar, axe, etc.) from a bag. Only throw food as a last resort because the bear will be more aggressive and threatening toward the next person it encounters, knowing that it can obtain food easily.
- Take out your noisemaker or visual repellent (whistle, siren, flashlight, signal flare, or mini flare) and prepare to use it.
- When the bear has left the area, slowly leave the area. DO NOT RUN;
- When you are in a safe location, contact your supervisor and the security service immediately and inform them of your location;
- Follow the instructions given to you by your supervisor and/or the security service;
- You may only continue your activities with the authorization of your supervisor once the bear has left the area and additional measures have been taken to ensure personnel safety.

**5.3.4 If you surprise a bear who then becomes aggressive**

The bear has been taken off guard and will react with a reflex for self-defence. Even if the bear threatens you, you can relieve the aggressiveness by backing away gently while speaking to the bear and dropping an object in front of you. <u>At this stage, appear as unthreatening as possible.</u>

**5.3.5 If the bear follows you insistently or charges you fearlessly**

A bear chasing a human is insistent and threatening. It makes noises different from those of a young, curious bear. In this extreme situation, it is preferable to face the bear. The following actions are recommended:

- Try to intimidate the bear by:
  - appearing dominant;
  - banging objects together;
  - raising your voice;
  - waving your arms, your coat, a branch or your bag vigorously over your head or jumping to appear taller.

Cette intimidation fonctionnera si l'ours a encore peur des humains. Si ce dernier ne semble pas intimidé et qu'il se dirige toujours vers vous, faites-lui face et défendez-vous. Utilisez vos poings, des roches, un bâton, une rame, une hache pour vous défendre. Réfugiez-vous derrière un obstacle, roche ou arbre, utilisez cet obstacle comme bouclier.

Si vous pouvez monter dans un arbre, faites-le. Même si cette technique ne fait pas l'unanimité et qu'un ours peut aussi monter, elle a sauvé des vies.

Selon certaines affirmations de faire le mort serait une technique. Selon la nature de la situation et le comportement de l'ours qui peut être variable tel qu'expliqué à la section 3.1.1, l'ours demeure imprévisible. Si l'ours voyait en la présence de l'humain une menace ou un envahisseur, le fait de faire le mort désamorcera la situation, car il n'a plus rien à craindre de vous. Cependant s'il s'agit d'un ours prédateur, le fait de faire le mort ne changera rien, bien au contraire lui facilitera la tâche.

**5.4 Abatage de l'animal**

Il est interdit d'abattre un ours importun sur la seule base qu'il se promène sur le site minier. L'article 67 de la loi sur la conservation et la mise en valeur de la faune (RLRQ, c C-61.1) stipule qu'il est interdit de tuer un animal s'il peut être effarouché.

> *Article 67 .Une personne ou celle qui lui prête main-forte ne peut tuer ou capturer un animal qui l'attaque ou qui cause du dommage à ses biens ou à ceux dont elle a la garde ou est chargée de l'entretien lorsqu'elle peut effaroucher cet animal ou l'empêcher de causer des dégâts.*
>
> *Nul ne peut abattre ou capturer un animal qui cause du dommage aux biens ou qui doit être déplacé pour des fins d'intérêt public, sauf aux conditions déterminées par règlement du ministre.*

Stornoway doit faire preuve de diligence raisonnable et prouver que tous les moyens ont été utilisés pour effaroucher l'animal et qu'il y a eu une dégradation de la situation avant d'abattre l'animal. Par exemple, l'ours est devenu agressif suite à plusieurs tentatives d'effarouchement. L'annexe A présente les lignes directrices à suivre avant de considérer l'abattage d'un animal.

La tâche d'abattre l'animal devra être confiée en premier lieu au maitre de trappe. Si ce dernier n'est pas au site et qu'il est impossible de le contacter, la demande pourra être faite à un de ses fils. Advenant, qu'aucun membre de la famille du maitre de trappe n'est au site et qu'il est impossible de les contacter, la tâche d'abattre l'animal

This intimidation will work if the bear is still afraid of humans. If the bear does not seem intimidated and continues to come after you, face it and defend yourself. Use your fists, rocks, a stick, an oar, or an axe to defend yourself. Get behind an obstacle, rock, or tree, and use the obstacle as a shield.

If you can climb a tree, do so. Even though this technique does not always work and bears can also climb, it has saved lives.

Some assert that playing dead can be an acceptable technique. According to the situation and the bear's behaviour, which can be variable, as explained in Section 3.1.1, bears can be unpredictable. If the bear sees the human as a threat or an invader, playing dead can diffuse the situation because the bear will no longer have anything to fear from you. However, if the bear is predatory, playing dead will only make its attack easier.

**5.4 Killing an animal**

It is forbidden to kill an unwelcome bear on the sole basis that it was on the mine site. Article 67 of the *Act Respecting the Conservation and Development of Wildlife* (RLRQ, c C-61.1) stipulates that it is forbidden to kill an animal if it can be frightened away.

> *Article 67. No person nor anyone lending him assistance may kill or capture an animal attacking him or causing damage to his property or property under his care or maintenance unless he is unable to frighten the animal away or prevent it from causing damage.*
>
> *No person may kill or capture an animal that causes damage to property or must be moved in the public interest, except on the conditions determined by regulation of the Minister.*

Stornoway must use due diligence and prove that all means were taken to frighten the animal and that the situation escalated before the animal was killed. For example, the bear had become aggressive following several attempts at frightening it. Appendix A presents guidelines to consider before killing an animal.

The task of killing an animal should first be entrusted to the tallyman. If he is not on site and is unreachable, the task can be delegated to one of his sons. In the case where none of the tallyman's family members are on site and that it is impossible to contact them, the task of killing the animal can be entrusted to someone designated by the security service.

pourra être accomplie par une personne désignée par la Sureté.

L'abattage d'un ours noirs est une activité à déclaration obligatoire (article 68 de la loi C61.1). Un agent de la faune doit être contacté dans les plus brefs délais. S'il est impossible de contacter un agent de la faune, un appel doit être logé à SOS braconnage. Voici les coordonnées pour contacter un agent de la faune et SOS braconnage :

- Agent de la faune (bureau de Chibougamau) : 418-748-7744
- SOS Braconnage : 1 800 463-2191

Si l'ours noir est abattu par le maitre de trappe ou un membre de sa famille, l'animal leur appartient. Si l'animal est abattu par toute autre personne, il appartient aux agents de la faune. L'ours mort ne peut être disposé au LEET et ne peut être donné ou vendu même au maitre de trappe. L'agent de la faune décidera du moyen d'en disposer.

Un rapport d'évènement décrivant l'abattage de l'ours devra être remis à l'agent de la faune sur demande.

Tout manquement à cette procédure peut entrainer une amende ou une poursuite judiciaire de la part du Ministère de la Forêt, de la Faune et des Parcs.

Il est à noter que l'utilisation d'une cage pour capturer et relocaliser un ours importun n'est pas considérée pour l'instant.

Pursuant to Article 68 of the Act C61.1, one must declare having killed a black bear. A wildlife officer must be contacted as soon as possible. If it is impossible to reach a wildlife officer, SOS Braconnage must be called. Here are the phone numbers for both:

- Wildlife officer (Chibougamau office): 418-748-7744
- SOS Braconnage: 1 800 463-2191

If the bear is killed by the tallyman or a member of his family, the animal belongs to them. If the animal is killed by anyone else, it belongs to wildlife authorities. The bear cannot be disposed of in the trench landfill and cannot be given or sold, even to the tallyman. The wildlife officer will decide how to dispose of the animal.

An event report describing how the animal was killed must be provided to wildlife authorities when requested.

Not following this procedure may result in a fine or legal action by the Ministère de la Forêt, de la Faune et des Parcs.

It must be noted that the use of a cage to capture and relocate an unwelcome bear is not an option that can be considered at the moment.

### 5.5 Rapport d'incident et enquête

Tout incident impliquant un animal sauvage devra être investigué en utilisant le rapport d'enquête et d'analyse d'incident (HSS 1.10.F03) tel que prévu à la procédure HSS 1.10. Les conclusions et des mesures de prévention additionnelles seront établies et communiquées à l'ensemble des employés.

### 5.5 Incident Report and Investigation

Any incident involving a wild animal must be investigated using the Incident Investigation and Analysis Report (HSS 1.10.F03) as indicated in Section 9.0. Additional conclusions and prevention measures will be set and communicated to all employees.

### 5.6 Mesures disciplinaires

Le travail en territoire sauvage comporte des risques pour la sécurité du personnel. Les mesures de prévention et les méthodes visant à réduire les risques sont mises en place et doivent être appliquées avec beaucoup de rigueur. Le non-respect de ces règles peut entrainer des situations qui pourraient mettre en danger la vie de la personne ne respectant pas ces règles et exposer inutilement la vie des autres employés.

Par conséquent, le non-respect des mesures de prévention et règles exposées à la procédure, le vol de dispositif de répulsion des bornes de sécurité sur le site entrainera des mesures disciplinaires pouvant mener à un renvoi immédiat du site.

### 5.6 Disciplinary Measures

Working in a wild area has risks for personnel safety. Prevention measures and methods to reduce risks are implemented and must be rigorously applied. Non-compliance with the rules can lead to situations where the non-compliant person's life is in danger and the lives of other employees are unnecessarily endangered.

As a result, non-compliance with the preventive measures and rules listed in this section or theft of repellents from the safety markers on the site will lead to disciplinary measures that could include immediate removal from the site.

| **6.0 Audit de la procédure et mise à jour** | **6.0 Audit procedures and updates** |
|---|---|
| Cette procédure peut être auditée selon le calendrier des audits prévu à la procédure HSS 1.17. Advenant un besoin d'apporter des changements, ceux-ci seront effectués selon la procédure HSS 1.1.1 précitée avec les approbations appropriées. | This procedure can be audited according to the audit calendar under the HSS 1.17 procedure. Should it be necessary to make changes, they will be made according to the HSS 1.1.1 procedure with the appropriate approvals. |

## 9.0 Historique des révisions – Revision history

| Révision/ Revision | Date | Par/By | Objet de la modification | Description of modification |
|---|---|---|---|---|
| A | 30/05/2014 | D Dufresne | Préparation de la première version | Preparation of first version |
| B | 31/05/ 2014 | D Dufresne | Révision du texte corrigé et adoption des modifications apportées | Verification of corrected text and approval of modifications |
| C | 4/06/2014 | D Dufresne | Révision après commentaires et révision documentation. | Review after comments and review of documentation |
| D | 5/06/2014 | D Dufresne | Finalisation suite aux commentaires | Final touches following comments |
| 0 | 16/06/2014 | D Dufresne | Approbation de la procédure | Approval of procedure |
| 1 | 14/8/2017 | M.Lafrenière | Mise à jour de la procédure | Update of procedure |
| 2 | 31-03-2019 | C. Fortin | Mise à jour de la procédure | Update of procedure |
| 3 | 14-12-2020 | C. Fortin | Révision complète avec les changements de titres dans la section 4 | Complete revision with title changes in section 4 |

Appendix A – Force Use Guidelines (**Wolf, Bear or other)**

| Deconditioning | Person Responsible | Workers' response | Note | Tools |
|---|---|---|---|---|
| | | Yell<br>Wave your arms<br>Bang stones together<br>Let the animal react<br>Do not run<br>Contact the security agent<br>Document and send an email to the Environment Team | Make sure you keep a safe distance.<br>Scare the animal peacefully; bang stones, use foghorn, siren<br>Ensure that the animal always has an escape path while avoiding confrontation (100m) | Banging stones, foghorn |
| LEVEL 2 Maximum of 2 interventions | ALL EMPLOYEES, VISITING CONTRACTORS | Avoid the animal's perimeter,<br>DO NOT scare the animal | Announce to the radio that a (bear or wolf) has been sighted and specify the location<br>Observe the behavior of the animal | Bang stones together, use repellant<br>Foghorn |
| LEVEL 3 | Environment Team | Replace level 2 with a more aggressive method of scaring and capture<br>Depending on the severity of the event or if no progress is observed, it may be necessary to act more quickly and progress to level 4 | | Scaring flare BEAR CAGE MOVING THE CAPTURED BEAR<br>Note: It is strictly forbidden to use flares near LNG and powder kegs). |
| EVACUATE WORKERS FROM THE INTERVENTION AREA | | | | |
| LEVEL 4 | Environment team – Manager on Duty | Level 4, killing the animal, is required when an animal presents a high risk (judged case-by-case) or when none of the lower-level deconditioning methods have yielded satisfactory results.<br>The manager on duty must contact tallyman Sydney Swallow or Emerson.<br>In the absence of the tallyman or when they cannot be reached, The environment technician contacts the wildlife officer. | | PRESENCE OF FIREARMS |
| | SAFETY FRAMEWORK | LAST RESORT:<br>In the absence of the tallyman or when they cannot be reached, ONLY A WILDLIFE OFFICER CAN authorize killing the animal.<br>As an emergency measure or to preserve life, the safety officer and the manager on duty may make the decision to slaughter the animal. | | PRESENCE OF FIREARMS |

| | |
|---|---|
| NOTE | If an animal is killed by the tallyman, they may take the carcass and no declaration is required. |
| | Any slaughter of a bear by a Stornoway employee must be reported to the MFFP. At Level 4, the MFFP will dictate what needs to be done with the killed animal.<br>It is the responsibility of the security department to demonstrate to the Ministry that all deconditioning steps were followed. |
| | The Environment Department must be informed by email of each deconditioning step. |
| | During the night from 9:30 p.m. to 06:00 a.m., no firing of any flares or any type of cartridge should be carried out near the dormitories. |

# APPENDIX 6

## DESCRIPTIONS OF THE CHARACTARISTICS OF THE NESTING BOXES

| | |
|---|---|
| **Nom de la station** | AVR01 |
| **Localisation** | Dans une plaine inondable d'un tributaire secondaire du lac Lagopède |
| **Point GPS** | 52° 48' 05,1" |
| | 72° 13' 20,9" |
| **Secteur** | Renard |
| **Caractéristiques** | Type de support: Le nichoir est installé sur un mélèze à 1,8 mètre du sol. L'orientation de l'ouverture est Sud-Est. Type d'environnement: marais de ruisseau. Situé à 8 mètres du plan d'eau |
| **Fréquence** | À la fin de l'été (septembre) après le départ des canards |
| **Paramètres** | Formulaire de suivi ENVS-3.3.11 F05 : identification de l'espèce ayant nichée, nombre d'oeufs non éclos, présence de coquilles et de plumes, nombre de membranes coquillères, présence de dépressions ou de jeunes morts au centre des copeaux. |
| **Accès à la station** | Embarcation moteur, motoneige/raquette (entretient hivernal) |
| **Équipement et matériels requis** | Appareil photo et GPS pour le suivi et pailli de cèdre pour l'entretien annuel qui consiste à vérifier l'état des nichoirs et les réparer au besoin, nettoyer les nichoirs (remplacer le pailli de cèdre). |

| | |
|---|---|
| **Nom de la station** | AVR02 |
| **Localisation** | Entre la baie ouest et la baie nord du lac Lagopède |
| **Point GPS** | 52° 48' 54,6"<br>72° 13' 02,4" |
| **Secteur** | Hibou |
| **Caractéristiques** | Type de support: Le nichoir est installé sur un pin gris à 2,5 mètres du sol. L'orientation de l'ouverture est Nord-Ouest. Type d'environnement: Lacustre côte exposée. Situé à 6 mètres du plan d'eau |
| **Fréquence** | À la fin de l'été (septembre) après le départ des canards |
| **Paramètres** | Formulaire de suivi ENVS-3.3.11 F05 : identification de l'espèce ayant nichée, nombre d'oeufs non éclos, présence de coquilles et de plumes, nombre de membranes coquillères, présence de dépressions ou de jeunes morts au centre des copeaux. |
| **Accès à la station** | Embarcation moteur, motoneige/raquette (entretient hivernal) |
| **Équipement et matériels requis** | Appareil photo et GPS pour le suivi et pailli de cèdre pour l'entretien annuel qui consiste à vérifier l'état des nichoirs et les réparer au besoin, nettoyer les nichoirs (remplacer le pailli de cèdre). |

| | |
|---|---|
| **Nom de la station** | AVR03 |
| **Localisation** | Baie Est du lac Lagopède |
| **Point GPS** | 52° 47' 52,3" |
| | 72° 12' 29,4" |
| **Secteur** | Renard |
| **Caractéristiques** | Type de support: Le nichoir est installé sur une épinette à 2 mètres du sol. L'orientation de l'ouverture est Nord-Ouest. Type d'environnement: Lacustre marais côtier . Situé à 15 mètres du plan d'eau |
| **Fréquence** | À la fin de l'été (septembre) après le départ des canards |
| **Paramètres** | ayant nichée, nombre d'oeufs non éclos, présence de coquilles et de plumes, nombre de membranes coquillères, présence de |
| **Accès à la station** | Embarcation moteur, motoneige/raquette (entretient hivernal) |
| **Équipement et matériels requis** | Appareil photo et GPS pour le suivi et pailli de cèdre pour l'entretien annuel qui consiste à vérifier l'état des nichoirs et les réparer au besoin, nettoyer les nichoirs (remplacer le pailli de cèdre). |

| | |
|---|---|
| **Nom de la station** | AVR04 |
| **Localisation** | Lac F3293 |
| **Point GPS** | 52° 49' 25,4"<br>72° 13' 21,8" |
| **Secteur** | Hibou |
| **Caractéristiques** | Type de support: Le nichoir est installé sur une épinette à 2,5 mètres du sol. L'orientation de l'ouverture est Nord. Type d'environnement: Lacustre: côte exposée . Situé à 4 mètres du plan d'eau |
| **Fréquence** | À la fin de l'été (septembre) après le départ des canards |
| **Paramètres** | nichée, nombre d'oeufs non éclos, présence de coquilles et de plumes, nombre de membranes coquillères, présence de dépressions |
| **Accès à la station** | VTT ou motoneige/raquette (entretient hivernal) |
| **Équipement et matériels requis** | Appareil photo et GPS pour le suivi et pailli de cèdre pour l'entretien annuel qui consiste à vérifier l'état des nichoirs et les réparer au besoin, nettoyer les nichoirs (remplacer le pailli de cèdre). |

| | |
|---|---|
| **Nom de la station** | AVR05 |
| **Localisation** | Lac F3297 |
| **Point GPS** | 52° 49' 52,8"<br>72° 11' 01,5" |
| **Secteur** | Renard |
| **Caractéristiques** | Type de support: Le nichoir est installé sur une épinette à 2,5 mètres du sol. L'orientation de l'ouverture est Nord-Ouest. Type d'environnement: Riverain: marais de ruisseau. Situé à 15 mètres du plan d'eau |
| **Fréquence** | À la fin de l'été (septembre) après le départ des canards |
| **Paramètres** | Formulaire de suivi ENVS-3.3.11 F05 : identification de l'espèce ayant nichée, nombre d'oeufs non éclos, présence de coquilles et de plumes, nombre de membranes coquillères, présence de dépressions ou de jeunes morts au centre des copeaux. |
| **Accès à la station** | VTT ou motoneige/raquette (entretient hivernal) |
| **Équipement et matériels requis** | Appareil photo et GPS pour le suivi et pailli de cèdre pour l'entretien annuel qui consiste à vérifier l'état des nichoirs et les réparer au besoin, nettoyer les nichoirs (remplacer le pailli de cèdre). |

| | |
|---|---|
| **Nom de la station** | AVR06 |
| **Localisation** | Dans le tributaire principal du lac F3301 |
| **Point GPS** | 52° 48' 45,7" |
| | 72° 10' 44,1" |
| **Secteur** | Renard |
| **Caractéristiques** | Type de support: Le nichoir est installé sur une épinette à 2,3 mètres du sol. L'orientation de l'ouverture est Sud-Ouest. Type d'environnement: Riverain: marais de ruisseau. Situé à 30 mètres du plan d'eau |
| **Fréquence** | À la fin de l'été (septembre) après le départ des canards |
| **Paramètres** | Formulaire de suivi ENVS-3.3.11 F05 : identification de l'espèce ayant nichée, nombre d'oeufs non éclos, présence de coquilles et de plumes, nombre de membranes coquillères, présence de dépressions ou de jeunes morts au centre des copeaux. |
| **Accès à la station** | À pied, en VTT ou en motoneige l'hiver |
| **Équipement et matériels requis** | Appareil photo et GPS pour le suivi et pailli de cèdre pour l'entretien annuel qui consiste à vérifier l'état des nichoirs et les réparer au besoin, nettoyer les nichoirs (remplacer le pailli de cèdre). |

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| **Nom de la station** | AVR07 |
| **Localisation** | Petie baie cloitrée près du bassin nord du lac Lagopède |
| **Point GPS** | 52° 48' 40,2" |
| | 72° 12' 37,4" |
| **Secteur** | Renard |
| **Caractéristiques** | Type de support: Le nichoir est installé sur une épinette à 2,5 mètres du sol. L'orientation de l'ouverture est Sud-Est. Type d'environnement: Lacustre: côte exposée. Situé à 6 mètres du plan d'eau |
| **Fréquence** | À la fin de l'été (septembre) après le départ des canards |
| **Paramètres** | Formulaire de suivi ENVS-3.3.11 F05 : identification de l'espèce ayant nichée, nombre d'oeufs non éclos, présence de coquilles et de plumes, nombre de membranes coquillères, présence de dépressions ou de jeunes morts au centre des copeaux. |
| **Accès à la station** | Embarcation moteur (été), motonei ou raquette (hiver) |
| **Équipement et matériels requis** | Appareil photo et GPS pour le suivi et pailli de cèdre pour l'entretien annuel qui consiste à vérifier l'état des nichoirs et les réparer au besoin, nettoyer les nichoirs (remplacer le pailli de cèdre). |

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| **Nom de la station** | AVR08 |
| **Localisation** | Ilot de végétation à l'embouchure de l'affluent principal du lac Lagopède. |
| **Point GPS** | 52° 49' 18,9" |
| | 72° 12' 41,5" |
| **Secteur** | Renard |
| **Caractéristiques** | Type de support: Le nichoir est installé sur un mélèze à 2,5 mètres du sol. L'orientation de l'ouverture est Sud-Est. Type d'environnement: Riverain: marais de ruisseau. Situé à 10 mètres du plan d'eau |
| **Fréquence** | À la fin de l'été (septembre) après le départ des canards |
| **Paramètres** | Formulaire de suivi ENVS-3.3.11 F05 : identification de l'espèce ayant nichée, nombre d'oeufs non éclos, présence de coquilles et de plumes, nombre de membranes coquillères, présence de dépressions ou de jeunes morts au centre des copeaux. |
| **Accès à la station** | Embarcation moteur ou Waders (été), motoneige ou raquette (hiver) |
| **Équipement et matériels requis** | Appareil photo et GPS pour le suivi et pailli de cèdre pour l'entretien annuel qui consiste à vérifier l'état des nichoirs et les réparer au besoin, nettoyer les nichoirs (remplacer le pailli de cèdre). |

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| **Nom de la station** | AVR09 |
| **Localisation** | Tributaire secondaire du lac F3295 |
| **Point GPS** | 52° 49' 30,2" |
| | 72° 11' 50,6" |
| **Secteur** | Renard |
| **Caractéristiques** | Type de support: Le nichoir est installé sur une épinette à 2,5 mètres du sol. L'orientation de l'ouverture est Sud-ouest. Type d'environnement: Riverain: marais de ruisseau. Situé à 12 mètres du plan d'eau |
| **Fréquence** | À la fin de l'été (septembre) après le départ des canards |
| **Paramètres** | Formulaire de suivi ENVS-3.3.11 F05 : identification de l'espèce ayant nichée, nombre d'oeufs non éclos, présence de coquilles et de plumes, nombre de membranes coquillères, présence de dépressions ou de jeunes morts au centre des copeaux. |
| **Accès à la station** | VTT et à pied (été), motoneige ou raquette (hiver) |
| **Équipement et matériels requis** | Appareil photo et GPS pour le suivi et pailli de cèdre pour l'entretien annuel qui consiste à vérifier l'état des nichoirs et les réparer au besoin, nettoyer les nichoirs (remplacer le pailli de cèdre). |

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| **Nom de la station** | AVR10 |
| **Localisation** | Lagune du lac Lagopède derrière le centre culturel Cri et le site d'entreposage du GNL |
| **Point GPS** | 52° 48' 20,7" |
| | 72° 12' 21,6" |
| **Secteur** | Renard |
| **Caractéristiques** | Type de support: Le nichoir est installé sur un mélèze à 2,5 mètres du sol. L'orientation de l'ouverture est Sud-Est. Type d'environnement: Palustre: marais ouvert. Situé à 5 mètres du plan d'eau |
| **Fréquence** | À la fin de l'été (septembre) après le départ des canards |
| **Paramètres** | Formulaire de suivi ENVS-3.3.11 F05 : identification de l'espèce ayant nichée, nombre d'oeufs non éclos, présence de coquilles et de plumes, nombre de membranes coquillères, présence de dépressions ou de jeunes morts au centre des copeaux. |
| **Accès à la station** | À pied (été), motoneige ou raquette (hiver) |
| **Équipement et matériels requis** | Appareil photo et GPS pour le suivi et paillli de cèdre pour l'entretien annuel qui consiste à vérifier l'état des nichoirs et les réparer au besoin, nettoyer les nichoirs (remplacer le pailli de cèdre). |

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