PROJECT NO.: 201-12362-00

JAMES BAY LITHIUM MINE PROJECT

ANSWERS TO THE FOURTH INFORMATION REQUEST RECEIVED FROM THE MELCC AS PART OF THE ENVIRONMENTAL REVIEW OF THE PROJECT

MARCH 2022

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GALAXY LITHIUM (CANADA) INC.

PROJECT NO.: 201-12362-00
DATE: MARCH 2022

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WSP. 2022. *JAMES BAY LITHIUM MINE PROJECT. ANSWERS TO THE FOURTH INFORMATION REQUEST RECEIVED FROM THE MELCC AS PART OF THE ENVIRONMENTAL REVIEW OF THE PROJECT.* REPORT PREPARED FOR GALAXY LITHIUM (CANADA) INC. 134 PAGES AND APPENDICES.

FOREWORD

As part of the review of the Environmental Impact Assessment (EIA) for the James Bay Lithium Mine project the *Ministère de l'Environnement et de la Lutte contre les Changements climatiques* (MELCC) submitted a request for additional information on April 18, 2019. A second series of questions and comments was received from the MELCC on December 2019 and a third one on September 2020. Finally, a fourth list of questions and comments was received from the MELCC on January 21, 2022, following the submittal of the second version of the EIA in July 2021.

This document aims to respond to the fourth series of questions and comments from the MELCC. It is the tenth addendum to the EIA of this project, the first addendum being the one submitted to the CEAA as part of the concordance phase (in February 2019), the second to the MELCC in July 2019, the third to the CEAA in response to the first series of official questions (in September 2019), the fourth and fifth (in December 2019 and January 2020, respectively) in order to provide more details on the responses provided in the third addendum, the sixth to the MELCC in response to the second series of questions and comments (in May 2020), the seventh to the CEAA in response to their second information request (1st part) in June 2020, the eighth to the CEAA in response to their complementary information request of August 16, 2021, the nineth to the CEAA (in January 2022) to answer the third information request.

In this report, the MELCC's questions and comments are presented in a box and **in bold type** to easily distinguish them in the text from the answers provided. A code and a number are associated with each of the questions or comments (QC4-1, QC4-2, etc.) and with each of the answers provided (A-QC4-1, A-QC4-2, etc.) in order to facilitate any follow-up. Finally, the appendices supporting the answers to each of the questions or comments are also numbered according to the code and number to which they refer (A-QC4-1, A-QC4-2, etc.).

NOTE TO THE READER

This document was translated from the original French version. Therefore, the French version constitutes the official version. In case of conflict of interpretation between the English and French versions, the French version prevails.

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1 RESTORATION PLAN

QC4-1	**The rehabilitation and restoration plan (hereinafter restoration plan) presented in Appendix D of the *Environmental Impact Assessment, Version 2* (WSP, 2021) does not comply with the request of the Administrator (ref: QC2-21, QC3-11). The project proponent was asked to submit a complete restoration plan, drafted in accordance with the applicable regulatory requirements (Mining Act) and those of the *Guide de préparation du plan de réaménagement et de restauration des sites miniers au Québec* and submit a copy, for information, to the Provincial Administrator.** **The proponent indicates that in due course, it will officially submit a complete restoration plan to the Ministry of Energy and Natural Resources (MERN) for evaluation and approval, i.e., as soon as the environmental authorizations have been obtained and before the first works at the mine site are carried out. The full restoration plan submitted for approval must be made public in the public register of real and immovable mining rights, for information and public consultation purposes pursuant to the environmental impact assessment and review procedure provided for in the Environment Quality Act (section 101, Mining Act). Thus, the proponent must submit to the Provincial Administrator, for information, a copy of the rehabilitation and restoration plan as submitted to the MERN in accordance with the Mining Act and the terms set out in the Guide.**

A-QC4-1:

The latest version of the complete restoration plan, drafted in accordance with applicable regulatory requirements (Mining Act) and the "*Guide de préparation du plan de réaménagement et de restauration des sites miniers au Québec"* was prepared by WSP in December 2021. This complete restoration plan has been provided, to the MERN and in both English and French and in both electronic and paper format to the Provincial Administrator of the James Bay and Northern Quebec Agreement and sub-Minister of Environment and Climate Change (MELCC) and MELCC's Industrial, Mining, Energy and Northern Projects Environmental Assessment Directorate (*Direction de l'évaluation environnementale des projets industriels, miniers, énergétiques et nordiques*) in December 2021.

Paper copies of the French version of this restoration plan (WSP, December 2021) were sent to the MERN's Mining Sites Restoration Directorate (*Direction de la restauration des sites miniers*) in Val d'Or, in January 2022.

The closure plan has recently been updated, following the addition of a membrane in the road design. The amended version will be sent in early April 2022 to the MERN's *Direction de la restauration des sites miniers;* the MELCC's representatives will be notified of the sending.

It should be noted that this modification will not lead to any modifications to the feasibility study 43-101.

2 FEASIBILITY STUDY

QC4-2	**The project as presented is not accompanied by a feasibility study. The last publicly filed technical report was completed for a preliminary economic assessment (March 2021). This document would not be satisfactory for obtaining a mining lease. As mentioned previously (ref: QC2-55, QC3-30), the feasibility study is also required to ensure that the project will not be significantly modified during the environmental assessment process and that the impacts analyzed are those with the potential to occur. The proponent must file a feasibility study in good and due form.**

A-QC4-2:

The Environmental Impact Assessment that was submitted in July 2021 is based on the Preliminary Economic Assessment (PEA) (GMining Services, March 2021). One of the objectives of the impact assessment is to improve the design of the project on the basis of the assessed impacts, by avoiding or reducing the impacts that cannot be avoided. Thus, the EIA was used to develop the technical study that followed the PEA. The feasibility study, finalised in January 2022, presents essentially the same project as in the PEA, with some improvements based, namely, on the impact assessment.

The link to access the feasibility study (GMining Services, 2022) via the SEDAR website was sent to the Project Manager of the MELCC Industrial, Mining, Energy and Northern Projects Environmental Assessment Directorate in January 2022. The link is as follows: https://www.sedar.com/homepage_en.htm. The document is registered under the name of Allkem; it's size is 19 Mb.

QC4-3	**In QC-2 of the first series of questions and comments document, the proponent was asked to present how the possibility of processing the concentrate on Eeyou Istchee Baie-James territory had been assessed, as well as the processing possibilities elsewhere in Quebec. In the *Environmental Impact Assessment, Version 2* (WSP, 2021), the proponent indicates that it will wait until the appropriate time to carry out a market economic opportunity analysis for the processing of lithium in Quebec. The promoter must indicate immediately if he is considering the possibility of secondary processing in Quebec.**

A-QC4-3:

We are currently evaluating the possibility of a secondary transformation in Quebec. With the aim of increasing the involvement of local communities and reducing the project's footprint due to the long distances to transport the concentrate, a preliminary techno-economic study is underway to evaluate the possibility of transforming spodumene concentrate into lithium sulphate in Matagami. Preliminary report is expected in July 2022. Lithium sulphate is an interim secondary transformation product in the value chain. The main challenge is related to the high temperature required to "convert" spodumene. We are working with Energir to evaluate new liquefied natural gas transport solutions. At this stage, no decision has been made on a possible secondary transformation in Quebec.

3 TAILINGS STORAGE AREAS

QC4-4	**Locations for tailings storage areas must be approved under section 41 of the Mining Act. It is for the moment impossible to comment on this subject, because no request has been filed in this regard and no geological condemnation report has been filed as part of the impact study of the project. The proponent must submit an application to this effect and a geological condemnation report so that the sites intended for the tailings accumulation areas can be approved under Section 241 of the Mining Act.**

A-QC4-4:

GLCI is currently conducting the field work for the geological condemnation report. As soon as the report is completed (scheduled for the first quarter of 2022), it will be submitted to the MERN in April 2022 to comply with the requirements of sections 240 and 241 of the Mining Act. GLCI is in communication with the MERN's *Direction du développement et du contrôle de l'activité minière* for this purpose among others.

QC4-5	**In light of the results of the tests that were carried out on the mine tailings and presented in the document *Environmental Impact Assessment, Version 2* (WSP, 2021), the mine tailings are considered to be leachable and, consequently, they are not low risk.** **In the update of the geochemical characterization presented in section 4.7 and in the restoration plan presented in Appendix D of the *Environmental Impact Assessment, Version 2* (WSP, 2021), the proponent concludes that the Tailings and waste rock are still considered low risk. According to all of the characterization results, including the kinetic column tests, the waste rock and tailings should rather be considered as leachable. Each time mine tailings are deposited in the accumulation area, the tailings will leach for a variable period, depending on the parameters, from a few weeks to a few months. The leaching process for all the tailings deposits will therefore take place over the estimated period of mining operations, i.e. 18.5 years. Added to this is the number of weeks or months of leaching depending on the analytical parameter. For example, for copper, the last volume of tailings that will be deposited on the accumulation area will leach up to about 6 months after the end of mining operations, which brings the leaching period to about 19 years.** **Based on this information, the promoter must:** • **Use the Quebec *Guide de caractérisation des résidus miniers et du minerai*[1], as part of ore and tailings characterization work. This document makes it possible to determine the procedures for the geochemical and environmental characterization of mine tailings and ore;** • **present the exhaustive results (in absolute value and not in percentage) of the column tests as well as the report and the conclusions of the experts who carried out these tests. Without this crucial information, it is difficult to assess other aspects of the project such as mine tailings management and mine wastewater treatment.;** • **reconsider the design criteria based on the requirements for leachable tailings presented in Directive 019 on the mining industry (hereinafter Directive 019);** • **make changes to the project to take into account the leachable nature of the waste rock and tailings in its concept for the restoration of the accumulation areas presented in Appendix D;**

[1] Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC), 2020. *Guide de caractérisation des résidus miniers et du minerai*. Québec. 52 pages. Disponible en ligne: https://www.environnement.gouv.qc.ca/Industriel/secteur-minier/guide-caracterisation-minerai.pdf

- **describe the planned monitoring of the actual behavior of tailings and waste rock, in order to continue the study of the geochemical behavior of leachable tailings and waste rock under conditions representative of reality. These follow-ups should make it possible to validate the initial restoration concept and/or modify it during subsequent revisions of the restoration plan;**
- **ensure that the first version of the restoration plan and the associated financial guarantee take into account the presence of leachable tailings and waste rock.**

A-QC4-5:

It is important to note that although the environmental impact study and the restoration plan mention that the tailings are at low risk, they have nevertheless always been considered as leachable. The expression "at low risk" does not correspond to the definition of MELCC. By low risk, the authors were referring to the fact that the tailings were not classified as high risk. We have taken good note of your remarks for our next deliverables. Nevertheless, it should be noted that the entire project was designed based on the geochemical characterization results of the ore, tailings and waste rock, therefore as being leachable materials.

The geochemical characterization of tailings and waste rock was initiated in 2018 when the *Guide de caractérisation des résidus miniers et du minerai* did not yet exist. The methodology that was used during the characterization is the one that was then commonly used in mining projects and well accepted by the authorities. The geochemical characterization program was largely based on the MEND Guide which still serves as a reference for geochemistry in Canada. Given all the tests that have already been carried out as part of this characterization, we consider that it is not necessary to repeat the characterization work. We consider that the study submitted to the MELCC is complete and complies with the standards used by consulting firms in 2018.

The exhaustive results in absolute value are presented in the appendix of the reports prepared as part of the project (see Appendices C, D, E, F of the *Étude spécialisée sur la géochimie* carried out by WSP, July 2018; appendix C of the report Résultats des essais cinétiques en colonnes carried out by WSP, June 2019; appendix C of the report Résultats des essais cinétiques en colonnes – minerai et diabase carried out by WSP, March 2020) and are presented again here, in Appendix A-QC4-5. As for the conclusions of the experts who carried out these tests, these are not available. Unlike other laboratories such as the URSTM, the SGS laboratory, responsible for carrying out the tests, does not provide any expert report accompanying the results. The characterization reports were nevertheless written by experts from WSP who have considerable expertise in the field.

Galaxy (GLCI) confirms that the design criteria were considered based on the requirements for leachable tailings presented in the *Directive 019 sur l'industrie minière* (GMining Services, 2022; Golder, 2021). In addition, we confirm that the leachable nature of the waste rock and tailings was considered in its restoration concept for the accumulation areas presented in Appendix D of the Environmental Impact Study – version 2. However, in order to take into account the leachable nature of the tailings, appropriate management of the tailings generated in the last years of operation has been added to the restoration plan. The following options are offered:

1 Plan the location of the last 6 months of waste rock storage, in the order of 460,000 m^3, in the off-pit section of the northeast pile, near a ditch that relates to the site water management system, to allow the capture of runoff water and management before revegetation. Water monitoring would take place over a period of 6 months + a validation period of 1-2 months in order to validate that the waste rock is no longer leachable and that the restoration work on this pile can be undertaken. It is possible that the anticipated water treatment period will be extended if the pile leachate turns out to have concentrations above the applicable criteria.

2 Encapsulate waste rock from the last 6 months, in the spirit of section 2.9.2 of the Directive 019 (D019) promoting the reduction of the footprint in tailings management under an environmental protection strategy and a reduction in the impacts of the long-term accumulation area. The concept then consists of storing the tailings (minimum week -28 to -14 for example) so that they are leached over a minimum period of 14 weeks and their water managed. Thereafter, store the waste rock from the last 6 months of operation of the pit, juxtaposed and cover it at least with one meter (1 m) of waste rock stored nearby whose leaching period has expired. This option would make it possible to control leaching in the short term and would require additional tests to demonstrate it.

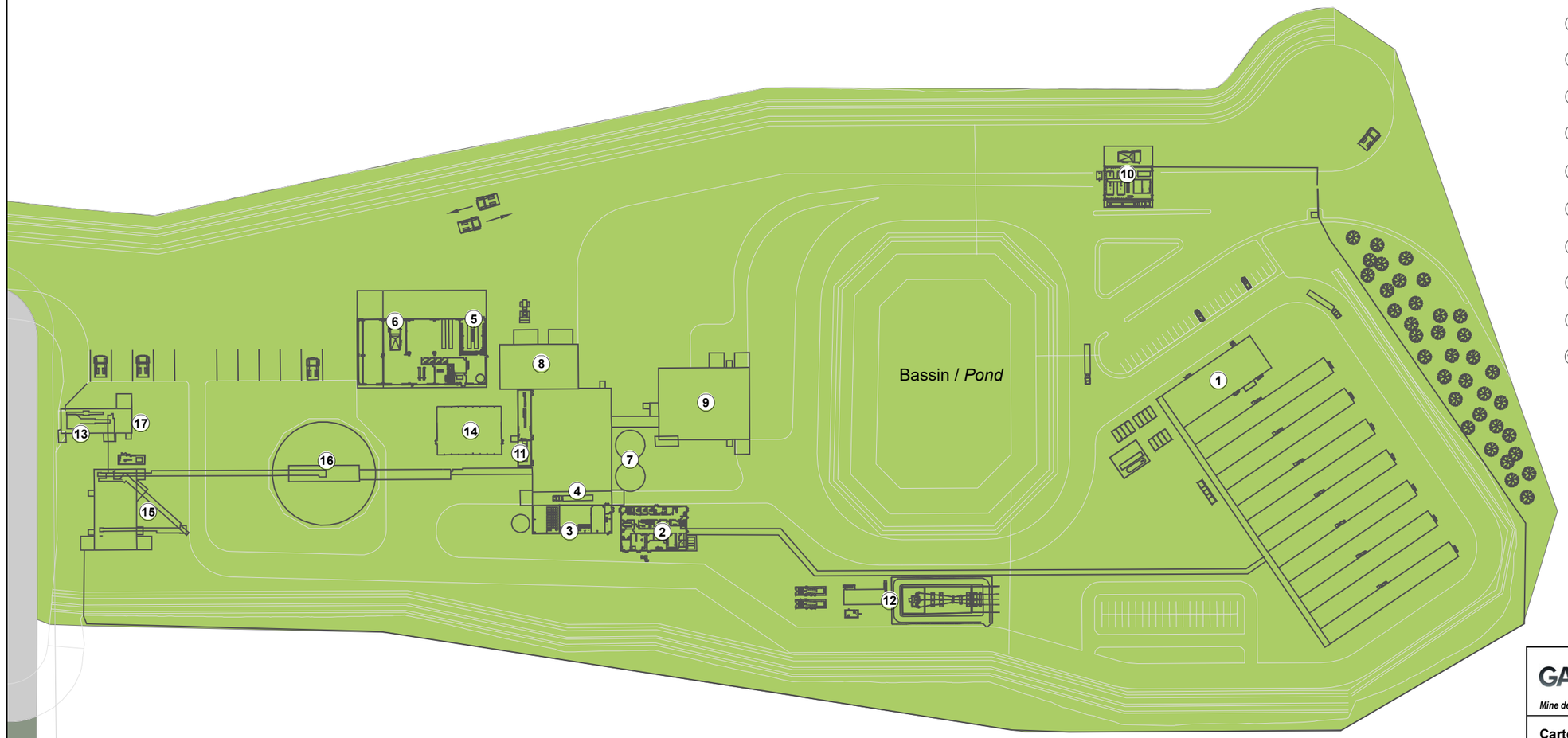
Changes were also made to the restoration plan to take into account the installation of a geomembrane and the use of waste rock for the construction of haulage roads. Restoration costs have also been adjusted accordingly.

Finally, in order to assess the variability of the geochemical characteristics of waste rock and tailings that will be produced during operations, GLCI will develop a geochemical monitoring program based on the criteria of Directive 019 (D019) as well as on the procedures for characterization of the materials contained in the new *Guide de caractérisation des résidus miniers et du minerai* (Characterization Guide) issued by the MELCC in 2020. Since the redesign of D019 will take into account the interpretation elements of the Characterization Guide, the monitoring program will be strongly inspired by this guide while taking into consideration the criteria of D019. The monitoring program will be an evolving program since it can be adapted according to the results obtained and the variability of the geochemical characteristics of the materials sampled. The monitoring program will be reassessed after the first year of monitoring and subsequently every two years or following regulatory changes. It could also be that certain elements are left out if they do not provide relevant information for the management of materials. Any changes made to the program will be discussed with those responsible for the file at the MELCC before they are implemented.

QC4-6	**Section 2.8 of Directive 019 states that "when the enriched ore or concentrate has the same characteristics as leachable, acid-generating or high-risk tailings (see Appendix II), the storage, loading and unloading of enriched ore or concentrate must be carried out under shelter and on a sealed surface and equipped with a leaching water recovery system. » As the run-of-mine is considered to be leachable, the proponent must indicate how it intends to ensure compliance with Directive 019 with regard to the storage of the concentrated ore at the exit of the processing plant under cover.**

A-QC4-6:

Directive 019 is met as the concentrate will be stored in a building. On the Map 4-2 of the EIA (WSP, 2021), shown below, Building 9 is dedicated to the concentrate. Inside this building, the concentrate will be loaded directly into trucks for its transport to the transfer centre in Matagami.



1. Campement, Cuisine, Réception / *Camp/Kitchen/Reception*
2. Bâtiment administratif, Clinique, Laboratoire / *Administrative Building, Clinic, Assay Lab*
3. SMD / *DMS*
4. SMD / *DMS*
5. Atelier et station de lavage des camions / *Truck Shop and Wash Bay High Section*
6. Atelier mécanique pour camion (future) / *Truck Shop – future*
7. Réservoir / *Tank*
8. Chargement des résidus / *Tailing Loading*
9. Manutention du concentré / *Concentrate Handling*
10. Station de pompage , station-service / *Pump house, fuel station*
11. Chambre électrique SMD / *DMS Electrical Room*
12. Chambre électrique principale / *Main Electrical Room*
13. Bâtiment de concassage / *Crushing Building*
14. Entrepôt / *Warehouse*
15. Concassage secondaire / *Secondary Crushing*
16. Pile de minerai et aire de chargement / *Ore Reclaim and Stock Pile*
17. Chambre électrique - concassage / *Crushing Electrical Room*

GALAXY

Mine de lithium Baie-James / James Bay Lithium Mine

Carte / *Map* 4-2
Aménagement du secteur industriel et administratif /
Industrial and Administrative
Area General Arrangement

0 25 50 m
UTM, fuseau 18, NAD83

Juillet / *July* 2021

Dessin : A. Masson
Approbation : C. Martineau
201-12362-00_c4-2_wspT305_processing_210630.mxd

wsp

QC4-7	**In section 4.8.3 of the *Environmental Impact Assessment, Version 2* (WSP, 2021), it is mentioned that the ore stockpile will have a "minimum capacity of 20,000 tonnes (in bulk)", while in the plan view of Figure 4-14 it is mentioned "50,000 tons stockpile/ pile de minerai". The proponent must specify the capacity of the ore stockpile.**

A-QC4-7:

The ore stockpile will have a capacity of 20,000 tonnes. The 50,000 tonnes on Figure 4-14 is an error.

QC4-8	**In section 6 of the document "*Tailing, Waste Rock, Overburden and Water Management Facility Preliminary Engineering Design*" (Golder, 2021), it is mentioned that additional work and tests must be carried out in order to finalize the design elements. The points of interest in the context of this assessment are those mentioned in points 3 to 11, and point 16 of section 6 of the Golder (2021) report. The proponent must provide the results for each of the points mentioned above and specify what the impacts of these results will be on the project, in particular on the accumulation areas.**

A-QC4-8:

It is important to note that the additional work and tests mentioned in Golder's (2021) *Tailing, Waste Rock, Overburden and Water Management Facility Preliminary Engineering Design* were proposed at the economic feasibility study stage of the project. Since then, some aspects have been reviewed, integrated or abandoned. In October 2021, for the feasibility study of the project, Golder produced the document *Tailing, Waste Rock, Overburden and Water Management Facility Front End Engineering Design*, presented in Appendix A-QC4-8-1. The latter document takes into account the additional work and tests that have been carried out.

As for the points of interest of Golder's report (2021) cited in the question, they are identified here:

- "*In-situ permeability tests of the overburden soils and bedrock beneath the WRTSFs to conform compliance with Quebec Directive 19 and water management plan assumptions*": these tests were conducted by SNC-Lavalin in winter 2021. The results served as inputs to the hydrogeology model conducted by WSP in 2021.
- "*Develop a groundwater model to evaluate potential impacts of the WRTSFs on the local environment*": The hydrogeology model was developed by WSP. The report is presented in Appendix J of the *Environmental Impact Study – Version 2* (WSP, 2021).
- "*Tailings laboratory testing to determine the filterability (dewatering) and geotechnical characteristics*": The available information allows an adequate evaluation of the material for the currently planned layout mode. Additional testing has not been conducted as the tailings separation project is delayed. A specific application for authorisation will be submitted if the project is reactivated.
- "*Additional tailings and waste rock geochemical characterization to determine acid generation potential and metal leaching in accordance with Quebec Directive 19*": It was agreed not to carry out additional geochemical characterization. The geochemical characterization results presented as part of the EIA (WSP, 2021) are considered complete.
- "*Optimization and further evaluation of the proposed WRTSFs and construction staging based on the findings of the geotechnical site investigations*": Part of the work was done by integrating new data from the investigation that ended in the winter of 2021. Further optimization work (e.g. a more detailed deposition sequence per semester or quarter) will be carried out in 2022 during the detailed engineering study.

- "*Further refinement of the site wide water balance*": This work was conducted at the feasibility stage and will continue at the detailed engineering stage.
- "*Optimize the locations and designs of the WMPs*": This is planned at the detailed engineering design stage.
- "*Hazard assessment to determine the Consequence Classification of the WRTSF slopes and WMP dykes in accordance with CDA guidelines*": This is planned at the detailed engineering design stage.
- "*A dam breach and inundation study to support the WMP dam classification*": This is planned at the detailed engineering design stage.
- "*Water treatment requirements for effluent discharge from the NWMP*": The water quality modelling was conducted and presented in Appendix B of the EIA (WSP, 2021) and a technical note was subsequently produced to account for the deposition of the diabase into the waste rock piles. This technical note is presented in Appendix A-QC4-8-2.

QC4-9	**Co-disposal or co-storage tailings and waste rock management techniques are generally better suited to mixing waste rock and low-risk tailings. As the tailings are considered leachable, the proponent must provide details of the management method that will be selected with the related conceptual elements, at least the anticipated flow regime of infiltration water, the anticipated degree of water saturation , anticipated circulation of oxygen, etc.**

A-QC4-9:

The overall objective of the waste rock storage facilities design is to protect regional groundwater and surface water resources during short- and long-term (post-closure) operations, and to achieve effective restoration upon mine closure. The co-deposition of dried tailings and waste rock offers several advantages including the following:

- An embankment of waste rock draining freely and not retaining water at the heart of the storage facility (i.e., no water saturation is expected).
- Waste rock backfill areas that improve the physical stability of the storage facility slopes.
- Acceleration of consolidation and improvement of the shear resistance of fine residues.
- Reduction of the risk of dam failure and discharge of confined residues.
- Reduction of the total footprint of mine waste disposal facilities.
- Reduction of desiccation, dust emission or other forms of tailings erosion through encapsulation in waste rock.

As mentioned in the July 2021 EIA, the slope will include 8.75 m benches for an average resulting slope of 2.3H:1V and berms of at least 5 m. At the top, the slope will be gentle in order to avoid the formation of ponds and prevent water erosion.

Tailings and waste rock will be stored upstream of the peripheral waste rock backfill in alternating layers to promote drainage towards the outside of the pile (Figure 4-9 of the Environmental Impact Assessment, *version 2* (WSP, 2021)).

A waste rock drainage layer at least 2.5 m thick will be provided at the base of the piles to facilitate the flow of water to the collector ditches on the periphery.

Transition layers of selected/treated waste rock followed by coarse tailings will be placed above the base waste rock drainage layer and on the slopes upstream of the peripheral waste rock dam in tailings storage areas to ensure filter compatibility and prevent migration of fine tailings into peripheral ditches.

For tailings layers, the area immediately upstream of the waste rock backfill slope will be composed of coarse residues, in order to provide an adequate foundation for the future elevation of the embankment slope and to act as a filter for fine residues, with fine and coarse residues being stored within this area.

Waste rock and tailings piles are designed to promote drainage, not to retain water. Therefore, the ridges of tailings and waste rock layers must be levelled at a 2% slope towards the perimeter to promote flow and prevent water accumulation.

It is planned that the deposition of the tailings will be carried out by bulldozers that spread them in thin layers, followed by compaction using a smooth drum vibrating compactor. Every 5 m thick of tailings will be covered with a 5 m thick layer of waste rock, in order to prevent tailings from accumulating and maintain an overall free drainage property and overall slope stability.

During the restoration of the waste rock piles, layers of overburden and topsoil available in the overburden and peat storage facility and suitable for revegetation will be placed on the surface of the materials and then vegetated using sprayed seeding; thus, minimizing the circulation of oxygen.

4 WATER MANAGEMENT

To the answers to questions QC3-9 and QC3-10, the proponent does not demonstrate that it will set up a treatment plant for the final effluent equipped with the best available treatment technology economically achievable (BAT), as soon as the start of operations. The mine water management proposed by the proponent is not acceptable for a new mining project. This water management goes against the objective of gradually reducing industrial discharges until the support capacity of the receiving environment is reached (compliance with environmental discharge objectives (EDO)). No recent mining project in Quebec has been authorized without an active mine wastewater treatment plant.

QC4-10	**Considering that the project involves the establishment of a new establishment and considering the information presented above, the proponent must set up a final effluent treatment plant equipped with the BAT from the start of operation to reduce contaminant loads that may exceed EDOs. It must at least be able to treat suspended solids, ammoniacal nitrogen (from explosives), C10-C50 as well as metals that will leach according to the results of the kinetic tests.**

A-QC4-10:

It is planned to install a temporary water treatment plant (WTP) during the construction phase, which will be converted into a permanent treatment plant for the operation phase, to treat the site's runoff that will be transported into the North Water Management Basin. The water in the North Basin will be treated at the WTP before being discharged to the environment. Monitoring of the quality of the pond water and effluent will be carried out on a regular basis to ensure compliance of the water discharged into the receiving environment.

The WTP will be upgraded at the beginning of the operation phase in order to:

- to increase the treatment capacity of the WTP in view of the increase in the volumes of contact water to be managed;
- ensure treatment of new contaminants identified in the water quality modelling as exceeding standards.

This WTP will be equipped with the best available and economically feasible treatment technology (BAT) in order to minimally treat suspended solids, ammoniacal nitrogen as well as metals, including arsenic, which will be in concentrations above the applicable standards. The C10-C50 will be treated at the exit of the workshops by a water-oil separator. The water will be sent to the main basin and floatation barriers will be installed at the entrance of the WTP. The C10-C50 will still be analyzed at the exit of the WTP. If a problem is identified, a check-up and adjustment of the separators would then be carried out to ensure that there are no emulsions at the output and that the effluent meets the requirements of D019.

QC4-11	**In view of the changes made to the project and the new information provided, the EDOs applicable to the final effluent have been updated. The following items are appended to this document:** • **Appendix 1: EDO determination parameters for this project;** • **Appendix 2: Table presenting the 2021 EDOs;** • **Appendix 3: Toxicity tests associated with the final effluent monitoring program.**

The proponent must use the 2021 EDOs to compare the results of the modeling of the waters of the North Management Basin to the EDOs according to the method described in the *Lignes directrices pour l'utilisation des objectifs environnementaux de rejet relatifs aux rejets industriels dans le milieu aquatique*[2]. It must consider the results of this comparison for water management in the North Basin and demonstrate how it intends to achieve the EDOs.

For new discharges, the EDO must be compared to the expected average multiplied by 2 in order to take into account the variability of the quality of the effluent. This approach only applies to EDOs established on the basis of a Quality criterion for the protection of aquatic life – Chronic effect (CVAC). It considers a coefficient of variation of 0.6, characteristic of a rejection whose quality is fairly stable, resulting from an optimized treatment system. For the Quality criterion for the prevention of contamination of aquatic organisms (CPCEO) and Quality criterion for the protection of piscivorous terrestrial fauna (CFTP) uses, the average of the values is compared directly with the OER.

The proponent must update the assessment of the project's impacts on surface water, the aquatic environment and the wildlife likely to use the receiving watercourse during the operation period, on the basis of the comparison of the expected concentrations (results of the modeling) with the 2021 EDOs and the parameters that exceed their EDOs and the magnitude of these exceedances.

A-QC4-11:

The 2021 update of the Environmental Discharge Objectives (EDOs), submitted as an appendix to the 4th series of questions and comments, will be considered as part of the monitoring of the water quality of the North Water Management Pond (NWMP) as well as of the effluent that will be discharged into the CE2. GLCI is committed to comparing the water quality results with the EDOs (2021) in accordance with the document *Lignes directrices pour l'utilisation des objectifs environnementaux de rejet relatifs aux rejets industriels dans le milieu aquatique*.

Since a water treatment plant (WTP) is now planned in the construction and operation phases of the project, the comparison of the water quality in the NWMP and in the effluent with the EDOs (2021) will allow making the necessary adjustments to the treatment to be adjusted in order to achieve compliance with the EDOs prior to the discharge of the effluent into the CE2. Comparisons will be made using the approach described in QC4-11.

The modelled parameters (Golder, 2021; presented in Appendix A-QC4-11) are compared to the EDOs (2021) in Table A-QC4-11. It should be noted that the modelling of the water quality in the NWMP does not consider the presence of the WTP and any treatment that will be applied to the water of the pond before its discharge into the CE2. The modelling is used to identify the parameters that will need to be treated at the WTP to comply with the applicable criteria and to achieve compliance with the EDOs at the final effluent.

2 Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC), 2008. *Lignes directrices pour l'utilisation des objectifs environnementaux de rejet relatifs aux rejets industriels dans le milieu aquatique*. Québec. 41 pages et annexes. Disponible en ligne: https://www.environnement.gouv.qc.ca/eau/eaux-usees/industrielles/ld-oer-rejet-indust-mileu-aqua.pdf

Table A-QC4-11 Comparison of the Water Quality in the NWMP with the 2021 EDOs for Years 3, 9 and 19 of Operation

Parameters	Maximum concentration – Dry conditions (August) [1,2] (mg/L)			EDO 2021 (mg/L)	
	Year 3	Year 9	Year 19	Criteria[3]	Concentrations allowed at the effluent
Conventional parameters					
Total suspended solids	ND	ND	ND	7	7
Total phosphorus	ND	ND	ND	0.03	0.3
Metals					
Silver	0.0003	0.0003	0.0003	0.0001	0.0001
Arsenic	0.152	0.210	0.252	0.021	0.021
Barium	0.08	0.07	0.07	0.038	0.038
Cadmium	0.00016	0.00015	0.00015	4.9E-05	4.9E-05
Chromium	0.012	0.012	0.011	0.011	0.011
Copper	4.14E-05	4.40E-05	4.24E-05	0.0013	0.0013
Iron	8.06E-05	7.42E-05	8.23E-05	1.3	1.3
Lithium	2.0	2.1	2.1	0.44	0.44
Mercury	4.54E-05	4.86E-05	4.45E-05	1.3E-06	1.3E-06
Nickel	0.008	0.008	0.009	0.0074	0.0074
Lead	2.09E-05	2.32E-05	2.24E-05	0.00017	0.00017
Uranium	0.065	0.066	0.064	0.014	0.014
Zinc	0.021	0.019	0.021	0.017	0.017
Other parameters					
Ammonical nitrogen (mg/L-N) summer	ND	ND	ND	2.1	2.1
Ammonical nitrogen (mg/L-N) winter	ND	ND	ND	4.9	4.9
Total fluorides (F)	ND	ND	ND	0.2	0.2
Nitrates (mg/L-N)	ND	ND	ND	3.0	3.0
Nitrites (mg/L-N)	ND	ND	ND	0.04	0.04
pH	7.6	7.7	7.6	Near natural values	

1 Under dry conditions, the concentrations presented are the highest. These results show the highest concentrations for one month only. Modelling results for August are presented but more results are available in Golder's modelling report (2021) for other months in both dry and wet conditions.
2 The modelling results represent what is expected in the NWMP, before treatment from the WTP and therefore are not representative of the effluent that will have been treated before its discharge into the environment.
3 Refers to the Chronic Aquatic Life Criterion with the exception of arsenic (Criterion for the prevention of contamination of aquatic organisms) and mercury (Piscivorous terrestrial fauna criterion)
ND: Parameter not modeled

As mentioned above, Table R-QC4-11 shows the anticipated exceedances of the criteria and EDOs before the water is treated at the WTP, prior to its release to the environment via the CE2. The results from the comparison of the water quality modelling with the 2021 OEOs will be used to guide the design of the UTE. Since the WTP will be equipped to tend to comply with the EDOs (which are based on the criteria of protection of chronic aquatic life or contamination of aquatic organisms, which are more stringent), the impact on water quality and contamination of aquatic organisms is considered minor (Section 7.2.4, p.7-44 of the Environmental Impact Assessment document, version 2 (WSP, 2021)).

QC4-12	**The proponent indicates in section 4.9.2 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) that it is not possible, for the moment, to identify whether it is necessary and technically possible to reach the lower limits of the EDOs. The proponent indicates having to wait for the results of the analyzes after a full year of production before developing the treatment chain for a future treatment plant.** **The comparison of the results of the modeling of the water quality of the retention basin (Appendix B) with the EDOs issued in 2019 shows, for the moment, that it will be necessary to treat these waters using a chain of treatment corresponding to the MTDER in order to tend towards the achievement of the EDOs or to reduce the loads discharged into the environment. The proponent must compare the water modeling results with the new 2021 EDOs in order to document which parameters are likely to exceed the EDOs and their respective exceedance amplitudes. The proponent must use this data to guide the design of the mine water treatment plant, without waiting for the first year of production.**

A-QC4-12:

The comparison of the modelling results of the water quality in the North Water Management Pond with the 2021 EDOs was conducted in A-QC4-11. This data was used to inform the design of the project's industrial water treatment plant (WTP).

QC4-13	**In section 4.9.3 of the Environmental Impact Statement, version 2 (WSP, 2021), it is mentioned: "The annual volume of runoff generated by the site exceeds the demand for process water, even in situations dry climates. There is therefore a surplus of water that must be managed in the North water retention basin and discharged as effluent to the CE2 watercourse. ". At the same time, Table 4-21 *Volume of final effluent water per month discharged to CE2 for years 3 to 9* indicates in particular that there will be no discharge during the month of May during this period, even in a situation humid climate and that there will be no discharge during the month of June except in humid climate situations.** **The proponent must add a table to present the average water volumes of the final effluent discharged on a monthly basis during years 10 to 19 of operation and according to dry and wet climatic conditions. The proponent must also confirm for which months, operating periods and climatic conditions, no discharge is expected into watercourse CE2.**

A-QC4-13:

Table A-QC4-13-1 presents the monthly discharges from the Northern Water Management Pond to the CE2 for different hydrological conditions. The absence of discharge during the month of May is linked to the operating rules in to simulate the storage of a possible project flood as defined by Directive 019. During the winter, water levels in the pond gradually decrease to free up space (volume) in the pond to contain such flooding. As Directive 19 recommends to "contain" the project flood, the water balance assumes that no discharge will be possible in May (when snowmelt occurs in the water balance model). This is the most critical case for the operation, and this is the case considered for the design.

Table R-QC4-13-1: Monthly Discharge of Effluent from the North Water Management Pond to CE2 Creek for Different Hydrological Conditions (m3) for the storage of a project flood

Année d'Exploitation	Conditions hydrologiques	Janv.	Févr.	Mars	Avril	Mai	Juin	Juill.	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle
1	**Moyenne**	**79 100**	**75 670**	**77 070**	**80 200**	**0**	**0**	**0**	**43 640**	**106 330**	**109 290**	**45 040**	**86 070**	**702 410**
	Sèche 1:25 ans	76 360	73 740	74 810	77 200	0	0	0	0	51 820	85 230	36 090	81 690	556 940
	Humide 1:25 ans	81 870	77 630	79 350	83 230	0	0	44 630	74 510	129 920	133 580	54 080	90 490	849 290
2	**Moyenne**	**71 160**	**67 740**	**69 130**	**72 260**	**0**	**0**	**0**	**40 750**	**105 610**	**108 570**	**37 100**	**78 130**	**650 450**
	Sèche 1:25 ans	68 490	65 870	66 940	69 330	0	0	0	0	40 070	82 880	28 220	73 820	495 620
	Humide 1:25 ans	73 920	69 680	71 410	75 280	0	0	47 580	75 490	130 900	134 560	46 130	82 550	807 500
3	**Moyenne**	**79 570**	**76 140**	**77 540**	**80 670**	**0**	**0**	**84 000**	**95 520**	**140 300**	**143 260**	**45 510**	**86 540**	**909 050**
	Sèche 1:25 ans	76 830	74 210	75 280	77 670	0	0	0	73 220	109 060	111 320	36 560	82 160	716 310
	Humide 1:25 ans	82 340	78 100	79 820	83 700	0	15 040	155 360	116 430	171 840	175 500	54 550	90 960	1 103 640
4	**Moyenne**	**0**	**0**	**9 230**	**155 720**	**0**	**0**	**13 760**	**150 390**	**240 500**	**249 250**	**70 030**	**165 710**	**1 054 590**
	Sèche 1:25 ans	0	0	0	147 730	0	0	0	0	155 400	190 880	53 810	158 050	705 870
	Humide 1:25 ans	0	0	21 260	161 080	0	0	173 080	185 850	297 340	308 180	86 400	173 440	1 406 630
5	**Moyenne**	**148 240**	**142 570**	**144 260**	**150 710**	**0**	**0**	**920**	**146 120**	**236 220**	**244 970**	**65 020**	**160 700**	**1 439 730**
	Sèche 1:25 ans	143 510	139 170	140 470	145 400	0	0	0	0	133 140	186 430	48 790	153 040	1 089 950
	Humide 1:25 ans	153 020	145 990	148 090	156 070	0	0	160 770	181 750	293 240	304 070	81 390	168 430	1 792 820
6	**Moyenne**	**149 390**	**143 720**	**145 410**	**151 860**	**0**	**0**	**48 380**	**161 930**	**252 030**	**260 790**	**66 170**	**161 850**	**1 541 530**
	Sèche 1:25 ans	144 670	140 320	141 620	146 550	0	0	0	2 880	192 100	198 800	49 950	154 190	1 171 080
	Humide 1:25 ans	154 170	147 140	149 240	157 220	0	0	218 660	201 040	312 540	323 370	82 540	169 580	1 915 500
7	**Moyenne**	**150 280**	**144 600**	**146 300**	**152 750**	**0**	**0**	**135 680**	**191 030**	**281 140**	**289 890**	**67 050**	**162 730**	**1 721 450**
	Sèche 1:25 ans	145 550	141 210	142 500	147 440	0	0	0	92 750	214 570	221 260	50 830	155 080	1 311 190
	Humide 1:25 ans	155 050	148 030	150 130	158 110	0	28 030	298 040	236 850	348 340	359 170	83 430	170 470	2 135 650
8	**Moyenne**	**160 160**	**154 480**	**156 180**	**162 630**	**0**	**0**	**234 320**	**223 910**	**314 010**	**322 770**	**76 930**	**172 610**	**1 978 000**
	Sèche 1:25 ans	155 430	151 090	152 380	157 320	0	0	29 500	173 120	242 040	248 730	60 710	164 950	1 535 270
	Humide 1:25 ans	164 930	157 910	160 000	167 990	0	104 710	336 380	275 180	386 680	397 510	93 310	180 340	2 424 940
9	**Moyenne**	**152 790**	**147 110**	**148 800**	**155 250**	**0**	**0**	**217 850**	**218 420**	**308 530**	**317 280**	**69 560**	**165 240**	**1 900 830**

Année d'Exploitation	Conditions hydrologiques	Janv.	Févr.	Mars	Avril	Mai	Juin	Juill.	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle
	Sèche 1:25 ans	148 060	143 710	145 010	149 940	0	0	11 700	167 190	236 100	242 800	53 340	157 580	1 455 430
	Humide 1:25 ans	157 560	150 540	152 630	160 610	0	94 620	331 330	270 140	381 640	392 470	85 930	172 970	2 350 440
10	**Moyenne**	**151 720**	**146 040**	**147 740**	**154 190**	**0**	**0**	**216 500**	**217 970**	**308 080**	**316 830**	**68 490**	**164 170**	**1 891 730**
	Sèche 1:25 ans	147 140	142 800	144 090	149 030	0	0	10 370	166 750	235 660	242 360	52 420	156 670	1 447 290
	Humide 1:25 ans	156 490	149 470	151 570	159 550	0	94 020	331 030	269 840	381 330	392 160	84 870	171 900	2 342 230
11	**Moyenne**	**152 210**	**146 540**	**148 230**	**154 680**	**0**	**0**	**221 480**	**219 640**	**309 740**	**318 490**	**68 990**	**164 670**	**1 904 670**
	Sèche 1:25 ans	147 480	143 140	144 440	149 370	0	0	14 080	167 980	236 900	243 590	52 760	157 010	1 456 750
	Humide 1:25 ans	156 990	149 960	152 060	160 040	0	97 890	332 970	271 780	383 270	394 100	85 360	172 400	2 356 820
12	**Moyenne**	**152 200**	**146 520**	**148 220**	**154 670**	**0**	**0**	**224 940**	**220 790**	**310 890**	**319 640**	**68 970**	**164 650**	**1 911 490**
	Sèche 1:25 ans	147 620	143 280	144 570	149 510	0	0	17 160	169 010	237 920	244 620	52 900	157 150	1 463 740
	Humide 1:25 ans	156 960	149 930	152 030	160 010	0	100 720	334 380	273 190	384 680	395 510	85 330	172 370	2 365 110
13	**Moyenne**	**151 970**	**146 290**	**147 980**	**154 430**	**0**	**0**	**162 590**	**200 000**	**290 110**	**298 860**	**68 740**	**164 420**	**1 785 390**
	Sèche 1:25 ans	147 390	143 050	144 340	149 280	0	0	0	122 380	221 980	228 670	52 670	156 910	1 366 670
	Humide 1:25 ans	156 720	149 700	151 800	159 780	0	49 390	308 720	247 530	359 020	369 850	85 100	172 130	2 209 740
14	**Moyenne**	**151 770**	**146 090**	**147 790**	**154 240**	**0**	**0**	**163 610**	**200 340**	**290 450**	**299 200**	**68 540**	**164 230**	**1 786 260**
	Sèche 1:25 ans	147 190	142 850	144 150	149 080	0	0	0	123 230	222 190	228 880	52 470	156 720	1 366 760
	Humide 1:25 ans	156 530	149 500	151 600	159 580	0	50 320	309 180	247 990	359 490	370 320	84 900	171 940	2 211 350
15	**Moyenne**	**151 190**	**145 510**	**147 210**	**153 660**	**0**	**0**	**167 900**	**201 780**	**291 880**	**300 630**	**67 960**	**163 640**	**1 791 360**
	Sèche 1:25 ans	146 460	142 120	143 410	148 350	0	0	0	126 460	223 000	229 690	51 740	155 980	1 367 210
	Humide 1:25 ans	155 960	148 940	151 030	159 020	0	54 180	311 110	249 920	361 410	372 250	84 330	171 370	2 219 520
16	**Moyenne**	**152 150**	**146 470**	**148 170**	**154 620**	**0**	**0**	**174 940**	**204 120**	**294 220**	**302 980**	**68 920**	**164 600**	**1 811 190**
	Sèche 1:25 ans	147 420	143 080	144 370	149 310	0	0	0	134 530	225 010	231 710	52 700	156 940	1 385 070
	Humide 1:25 ans	156 920	149 900	151 990	159 980	0	59 530	313 790	252 590	364 090	374 920	85 300	172 330	2 241 340
17	**Moyenne**	**147 910**	**142 230**	**143 930**	**150 380**	**0**	**0**	**167 470**	**201 630**	**291 730**	**300 490**	**64 680**	**160 360**	**1 770 810**
	Sèche 1:25 ans	143 330	138 990	140 290	145 220	0	0	0	123 540	222 270	228 960	48 610	152 860	1 344 070
	Humide 1:25 ans	152 670	145 640	147 740	155 720	0	55 350	311 700	250 500	362 000	372 830	81 040	168 080	2 203 270

Année d'Exploitation	Conditions hydrologiques	Janv.	Févr.	Mars	Avril	Mai	Juin	Juill.	Août	Sept.	Oct.	Nov.	Déc.	Moyenne annuelle
18	**Moyenne**	**149 280**	**143 610**	**145 300**	**151 750**	**0**	**0**	**102 590**	**180 010**	**270 110**	**278 860**	**66 060**	**161 740**	**1 649 310**
	Sèche 1:25 ans	144 710	140 360	141 660	146 590	0	0	0	58 670	206 050	212 740	49 990	154 230	1 255 000
	Humide 1:25 ans	154 040	147 020	149 110	157 090	0	1 170	284 610	223 420	334 910	345 740	82 410	169 450	2 048 970
19	**Moyenne**	**133 890**	**128 210**	**129 900**	**136 350**	**0**	**0**	**56 400**	**164 610**	**254 710**	**263 460**	**50 660**	**146 340**	**1 464 530**
	Sèche 1:25 ans	129 310	124 970	126 260	131 200	0	0	0	0	187 740	197 350	34 590	138 830	1 070 250
	Humide 1:25 ans	138 640	131 620	133 720	141 700	0	0	239 590	208 020	319 510	330 350	67 020	154 060	1 864 230

Table A-QC4-13-2 presents the monthly discharge of effluent from the north water management pond under more realistic operating conditions, i.e. on a monthly basis and also taking into account climate change.

Table R-QC4-13-2: Monthly Discharge of Effluent from the North Water Management Pond to CE2 on a Monthly Basis for Different Hydrological Conditions (m3)

Année d'Exploitation	Conditions hydrologiques	Janv.	Févr.	Mars	Avril	Mai	Juin	Juill.	Août	Sept.	Oct.	Nov.	Déc.	Total
1	**Moyenne**	**40 420**	**36 990**	**38 390**	**41 520**	**33 710**	**89 960**	**51 810**	**61 550**	**90 000**	**93 000**	**77 660**	**47 390**	**702 400**
	Sèche 1:25 ans	37 680	35 060	36 130	38 520	1 810	70 450	41 270	48 720	82 970	85 230	36 090	43 010	556 940
	Humide 1:25 ans	78 040	38 950	40 670	44 550	65 910	90 000	82 120	74 510	90 000	93 000	90 000	93 000	880 750
	Moyenne avec CC	44 780	39 410	40 010	43 320	42 870	90 000	59 770	65 220	90 000	93 000	90 000	64 750	763 130
2	**Moyenne**	**32 480**	**29 060**	**30 450**	**33 580**	**32 990**	**89 240**	**51 090**	**60 830**	**90 000**	**93 000**	**68 280**	**39 450**	**650 450**
	Sèche 1:25 ans	29 810	27 190	28 260	30 650	0	67 560	38 920	46 370	80 620	82 880	28 220	35 140	495 620
	Humide 1:25 ans	38 630	31 000	32 730	36 600	66 890	90 000	84 090	75 490	90 000	93 000	90 000	82 460	810 890
	Moyenne avec CC	35 550	31 460	32 070	35 370	42 740	90 000	59 520	65 100	90 000	93 000	90 000	48 610	713 420
3	**Moyenne**	**40 890**	**37 460**	**38 860**	**41 990**	**67 680**	**90 000**	**93 000**	**93 000**	**90 000**	**93 000**	**90 000**	**93 000**	**868 880**
	Sèche 1:25 ans	38 150	35 530	36 600	38 990	27 900	90 000	73 910	74 810	90 000	93 000	73 950	43 480	716 320
	Humide 1:25 ans	43 660	39 420	41 140	45 020	93 000	90 000	93 000	93 000	90 000	93 000	90 000	93 000	904 240
	Moyenne avec CC	43 970	39 880	40 480	43 790	79 630	90 000	93 000	93 000	90 000	93 000	90 000	93 000	889 750
4	**Moyenne**	**0**	**0**	**5 000**	**45 410**	**218 910**	**213 790**	**132 620**	**150 390**	**216 000**	**223 200**	**120 570**	**55 400**	**1 381 290**
	Sèche 1:25 ans	0	0	0	0	135 070	163 760	101 680	115 270	184 180	190 880	53 810	47 740	992 390
	Humide 1:25 ans	92 770	40 690	42 790	50 770	223 200	216 000	223 200	223 200	216 000	223 200	216 000	124 740	1 892 560
	Moyenne avec CC	0	32 560	42 810	49 630	223 200	216 000	175 240	162 370	216 000	223 200	179 530	63 940	1 584 480
5	**Moyenne**	**37 930**	**32 250**	**33 950**	**40 400**	**214 630**	**209 510**	**128 340**	**146 120**	**216 000**	**223 200**	**107 000**	**50 390**	**1 439 720**
	Sèche 1:25 ans	33 200	28 860	30 160	35 090	137 610	159 310	97 220	110 820	179 730	186 430	48 790	42 730	1 089 950
	Humide 1:25 ans	42 710	35 680	37 780	45 760	223 200	216 000	223 200	223 200	216 000	223 200	216 000	90 090	1 792 820
	Moyenne avec CC	44 070	37 290	37 800	44 620	223 200	216 000	162 590	158 150	216 000	223 200	166 080	58 920	1 587 920
6	**Moyenne**	**39 080**	**33 410**	**35 100**	**41 550**	**223 200**	**216 000**	**160 740**	**161 930**	**216 000**	**223 200**	**139 790**	**51 540**	**1 541 540**
	Sèche 1:25 ans	34 350	30 010	31 310	36 240	149 980	171 680	109 590	123 190	192 100	198 800	49 950	43 880	1 171 080
	Humide 1:25 ans	43 860	36 830	38 930	46 910	223 200	216 000	223 200	223 200	216 000	223 200	216 000	208 190	1 915 520
	Moyenne avec CC	45 220	38 450	38 950	45 770	223 200	216 000	213 720	175 190	216 000	223 200	201 320	60 080	1 697 100
7	**Moyenne**	**39 970**	**34 290**	**35 990**	**42 440**	**223 200**	**216 000**	**223 200**	**215 880**	**216 000**	**223 200**	**198 880**	**52 420**	**1 721 470**

Année d'Exploitation	Conditions hydrologiques	Janv.	Févr.	Mars	Avril	Mai	Juin	Juill.	Août	Sept.	Oct.	Nov.	Déc.	Total
7	Sèche 1:25 ans	35 240	30 900	32 190	37 130	172 450	194 140	132 060	145 660	214 570	221 260	50 830	44 760	1 311 190
	Humide 1:25 ans	44 740	37 720	39 810	47 800	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	1 934 070
	Moyenne avec CC	46 100	39 330	39 840	46 650	223 200	216 000	223 200	223 200	216 000	223 200	216 000	178 430	1 891 150
8	**Moyenne**	**49 850**	**44 170**	**45 860**	**52 310**	**223 200**	**216 000**	**223 200**	**223 200**	**216 000**	**223 200**	**216 000**	**223 200**	**1 956 190**
	Sèche 1:25 ans	45 120	40 770	42 070	47 000	199 920	216 000	165 140	173 120	216 000	223 200	112 280	54 640	1 535 260
	Humide 1:25 ans	223 200	80 580	49 690	57 670	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 175 140
	Moyenne avec CC	55 980	49 210	49 710	56 530	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	1 975 430
9	**Moyenne**	**64 280**	**36 800**	**38 490**	**44 940**	**223 200**	**216 000**	**223 200**	**223 200**	**216 000**	**223 200**	**216 000**	**197 320**	**1 922 630**
	Sèche 1:25 ans	37 740	33 400	34 700	39 630	193 980	215 680	153 600	167 190	216 000	223 200	93 040	47 270	1 455 430
	Humide 1:25 ans	223 200	201 600	156 340	50 300	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 395 440
	Moyenne avec CC	223 200	51 020	42 340	49 160	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 129 720
10	**Moyenne**	**41 410**	**35 730**	**37 420**	**43 870**	**223 200**	**216 000**	**223 200**	**223 200**	**216 000**	**223 200**	**216 000**	**192 490**	**1 891 720**
	Sèche 1:25 ans	36 830	32 490	33 780	38 720	193 540	215 240	153 150	166 750	216 000	223 200	91 240	46 350	1 447 290
	Humide 1:25 ans	223 200	201 600	108 150	49 230	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 346 180
	Moyenne avec CC	184 580	40 770	41 270	48 090	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 078 710
11	**Moyenne**	**41 900**	**36 220**	**37 920**	**44 370**	**223 200**	**216 000**	**223 200**	**223 200**	**216 000**	**223 200**	**216 000**	**203 450**	**1 904 660**
	Sèche 1:25 ans	37 170	32 830	34 130	39 060	194 780	216 000	154 860	167 980	216 000	223 200	94 050	46 700	1 456 760
	Humide 1:25 ans	223 200	201 600	105 670	49 730	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 344 200
	Moyenne avec CC	180 550	41 260	41 770	48 590	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 076 170
12	**Moyenne**	**41 890**	**36 210**	**37 900**	**44 350**	**223 200**	**216 000**	**223 200**	**223 200**	**216 000**	**223 200**	**216 000**	**210 320**	**1 911 470**
	Sèche 1:25 ans	37 310	32 970	34 260	39 200	195 810	216 000	156 920	169 010	216 000	223 200	96 250	46 830	1 463 760
	Humide 1:25 ans	223 200	201 600	118 200	49 700	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 356 700
	Moyenne avec CC	192 060	41 230	41 740	48 560	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 087 590
13	**Moyenne**	**41 650**	**35 980**	**37 670**	**44 120**	**223 200**	**216 000**	**223 200**	**223 200**	**216 000**	**223 200**	**216 000**	**85 170**	**1 785 390**
	Sèche 1:25 ans	37 080	32 740	34 030	38 960	179 860	201 550	139 470	153 060	216 000	223 200	64 120	46 600	1 366 670
	Humide 1:25 ans	223 200	201 600	125 910	49 470	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 364 180

Année d'Exploitation	Conditions hydrologiques	Janv.	Févr.	Mars	Avril	Mai	Juin	Juill.	Août	Sept.	Oct.	Nov.	Déc.	Total
	Moyenne avec CC	199 150	41 000	41 510	48 320	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 093 980
14	**Moyenne**	**41 460**	**35 780**	**37 480**	**43 930**	**223 200**	**216 000**	**223 200**	**223 200**	**216 000**	**223 200**	**216 000**	**86 810**	**1 786 260**
	Sèche 1:25 ans	36 880	32 540	33 840	38 770	180 070	201 770	139 680	153 280	216 000	223 200	64 350	46 410	1 366 790
	Humide 1:25 ans	223 200	131 210	41 290	49 270	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 208 970
	Moyenne avec CC	63 510	40 810	41 310	48 130	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	1 957 760
15	**Moyenne**	**40 880**	**35 200**	**36 890**	**43 340**	**223 200**	**216 000**	**223 200**	**223 200**	**216 000**	**223 200**	**216 000**	**94 240**	**1 791 350**
	Sèche 1:25 ans	36 150	31 800	33 100	38 030	180 880	202 570	140 490	154 080	216 000	223 200	65 220	45 670	1 367 190
	Humide 1:25 ans	223 200	132 470	40 720	48 700	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 209 090
	Moyenne avec CC	64 850	40 240	40 740	47 560	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	1 957 390
16	**Moyenne**	**41 840**	**36 160**	**37 850**	**44 300**	**223 200**	**216 000**	**223 200**	**223 200**	**216 000**	**223 200**	**216 000**	**110 220**	**1 811 170**
	Sèche 1:25 ans	37 110	32 760	34 060	38 990	182 890	204 590	142 510	156 100	216 000	223 200	70 220	46 630	1 385 060
	Humide 1:25 ans	223 200	144 830	41 680	49 660	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 223 370
	Moyenne avec CC	74 380	41 200	41 700	48 520	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	1 969 800
17	**Moyenne**	**37 600**	**31 920**	**33 620**	**40 070**	**223 200**	**216 000**	**223 200**	**223 200**	**216 000**	**223 200**	**216 000**	**86 820**	**1 770 830**
	Sèche 1:25 ans	33 020	28 680	29 970	34 910	180 150	201 840	139 760	153 350	216 000	223 200	60 640	42 550	1 344 070
	Humide 1:25 ans	223 200	154 270	37 430	45 410	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 224 310
	Moyenne avec CC	86 810	36 940	37 450	44 270	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	1 969 470
18	**Moyenne**	**38 970**	**33 290**	**34 990**	**41 440**	**223 200**	**216 000**	**214 950**	**180 010**	**216 000**	**223 200**	**175 820**	**51 430**	**1 649 300**
	Sèche 1:25 ans	34 390	30 050	31 350	36 280	163 930	185 620	123 540	137 140	206 050	212 740	49 990	43 920	1 255 000
	Humide 1:25 ans	223 200	135 970	38 800	46 780	223 200	216 000	223 200	223 200	216 000	223 200	216 000	223 200	2 208 750
	Moyenne avec CC	65 510	38 320	38 820	45 640	223 200	216 000	223 200	223 200	216 000	223 200	216 000	105 090	1 834 180
19	**Moyenne**	**23 570**	**17 900**	**19 590**	**26 040**	**223 200**	**216 000**	**168 760**	**164 610**	**216 000**	**223 200**	**129 630**	**36 030**	**1 464 530**
	Sèche 1:25 ans	19 000	14 660	15 950	20 880	148 530	170 230	108 140	121 740	190 650	197 350	34 590	28 520	1 070 240
	Humide 1:25 ans	147 300	21 310	23 400	31 390	223 200	216 000	223 200	223 200	216 000	223 200	216 000	218 990	1 983 190
	Moyenne avec CC	29 690	22 920	23 430	30 240	223 200	216 000	223 200	182 420	216 000	223 200	194 150	44 550	1 629 000

The impacts from the mining project on the characteristic flows of the CE2 have been updated with the new version of the water balance dating from March 2022, which considers mining discharges over 12 months. Table A-QC4-13-3 presents the average effluent discharge volumes considered in the operating phase (year 9) for average conditions (taking into account the effects of climate change) as well as dry and wet conditions. Year 9 was chosen because it has the largest total releases into the CE2.

Table A-QC4-13-3 Monthly Effluent Discharge Volumes (Year 9) for Different Climatic Conditions (Golder, 2022)

Month	Average conditions with climate change (m^3)	Dry conditions (1:25 years) (m^3)	Wet conditions (1:25 years) (m^3)
January	223,200	37,740	223,200
February	51,020	33,400	201,600
March	42,340	34,700	156,340
April	49,160	39,630	50,300
May	223,200	193,980	223,200
June	216,000	215,680	216,000
July	223,200	153,600	223,200
August	223,200	167,190	223,200
September	216,000	216,000	216,000
October	223,200	223,200	223,200
November	216,000	93,040	216,000
December	223,200	47,270	223,200

Table R-QC4-13-4 compares the impacts on the flows of the CE2 that were assessed as part of the EIA, version 2 to those calculated with the updated monthly effluent discharge volumes.

For low water flows, the change in summer low water levels is minimal, the expected increases are identical. Impacts are lower for the annual low water level compared to the previous version of the EIA; there is still an increase, but less significant.

In terms of average monthly flows, there are some changes. Whereas before we had decreases planned in May and June (due to the absence of discharge during these months), and increases in other months, we now expect increases for all months, overall less significant than before, varying from +13% to +83%.

Finally, regarding flood flows, the increase in flows for the 2-year recurrence was initially planned, with a gradual decrease for the other recurrences; we now have a decrease of -1% to -9% of flood flows. There is therefore no risk of anticipated erosion (since there is no longer an increase in flood flows), and the decrease is considered insignificant.

In general, it can therefore be concluded that the impacts on the characteristic flows of the CE2 are less significant than those previously assessed in the EIA, version 2.

The impact on water levels has not been reassessed. But given the updated results on the characteristic flows, it appears that the impact on the water levels of the CE2 will be generally less significant than those previously presented in the EIA, version 2.

Table A-QC4-13-4 Comparison of the Impact of Discharges on Flow Rates in CE2

Impact on the flow in the CE2 (%)			
Indicator		**EIA, version 2, July 2021**	**Updated**
Low water flow	$Q_{2,7}$ annual	345%	70%
	$Q_{10,7}$ annual	720%	160%
	$Q_{5,30}$ annual	526%	113%
	$Q_{2,7}$ summer	153%	153%
	$Q_{10,7}$ summer	368%	368%
	$Q_{5,30}$ summer	163%	163%
Average monthly flows	January	54%	82%
	February	80%	16%
	March	87%	13%
	April	78%	13%
	May	-16%	13%
	June	-16%	13%
	July	37%	26%
	August	27%	25%
	September	49%	25%
	October	40%	20%
	November	-1%	25%
	December	32%	45%
	Yearly	23%	24%
Flood flows	2 years	9%	-1%
	10 years	0%	-6%
	25 years	-3%	-8%
	50 years	-4%	-8%
	100 years	-5%	-9%

QC4-14	**In section 10.4.1.3 of the Environmental Impact Assessment document, version 2 (WSP, 2021), the proponent presents a preliminary EDO monitoring program. The promoter must include the following aspects in the program:** • **After 2 years of operation, and every 5 years thereafter, submit to the Provincial Administrator, for approval, an analysis report on the quality monitoring data of its treated process water effluent. This report must contain a comparison between the EDOs and the results obtained for this effluent according to the principles of the *Lignes directrices pour l'utilisation des objectifs environnementaux de rejet relatifs aux rejets industriels dans le milieu aquatique* et son addenda *Comparaison entre les concentrations mesurées à l'effluent et les objectifs environnementaux de rejet (OER) pour les entreprises existantes*[3]. The spreadsheet for comparing monitoring results with EDOs should be used for this purpose.** • **If EDO overruns are observed, present the amplitude and frequency of these overruns, the possible cause of these overruns, or their justifications and the corrective measures that the proponent intends to implement to reduce the environmental impact of its final effluent.** **The proponent must also commit to taking corrective measures, including identifying the causes of toxicity, in the event of a persistent acute or chronic toxicity problem in the treated process water effluent.** **The filing of analysis reports on effluent quality monitoring data could be used to identify contaminants that do not pose a risk to the environment, thus making it possible to reduce the list of contaminants to be monitored.**

A-QC4-14:

Monitoring of surface water quality is planned during the operation phase. It is important to note that a water treatment plant (WTP) will be in operation to treat parameters that could exceed the applicable criteria and the EDOs. Regarding the monitoring of the water quality of the effluent in relation to compliance with the EDOs, the results will be presented to the Provincial Administrator after 2 years of operation and every 5 years thereafter, until the end of the operating period. This report will contain all the required details, such as those specified in question QC4-14:

1 Nature and frequency of exceedances;
2 Cause or justification of ou justification for exceedances;
3 Applicable corrective measures.

GLCI undertakes to identify problems and put in place appropriate corrective measures when necessary. These measures will be integrated into the environmental management system of the operation phase.

3 Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC), 2017. *Lignes directrices pour l'utilisation des objectifs environnementaux de rejet relatifs aux rejets industriels dans le milieu aquatique – Comparaison entre les concentrations mesurées à l'effluent et les objectifs environnementaux de rejet pour les entreprises existantes*. Québec. 9 pages et 1 annexe. Disponible en ligne: https://www.environnement.gouv.qc.ca/eau/eaux-usees/industrielles/Addenda_OER.pdf

QC4-15	**The proponent mentions in section 4.9.1 of the *Environmental Impact Assessment, Version 2* (WSP, 2021): "The sedimentation basin of the overburden stockpiles is not linked to a sector used for storage disposal of mining waste, in accordance with D019. Therefore, no flood storage obligation is imposed. The basin can therefore be considered as a type of water treatment plant. It must therefore have the necessary size to allow its effluent to meet water quality obligations".** **The ministry considers certain infrastructures to be small-scale works. These structures are defined as being a "structure retaining an area of water or mine tailings of less than 1 ha (10,000 m²) with a structure height of less than 2 m and whose content is not radioactive, cyanide or acidogenic". In these cases, the ministry asks for equivalent requirements for the drainage networks, i.e., to evacuate a flood having a recurrence of 1:100 years. The proponent must indicate whether the sedimentation basin for the overburden piles meets the definition of a small-scale structure. If the infrastructure does not correspond to a small-scale work, the promoter must size the basin in such a way as to respect the recurrences for the basins of Directive 019.**

A-QC4-15:

The paragraph cited in the question, which is presented in section 4.9.1 of Environmental Impact Assessment, Version 2 (WSP, 2021), should have been deleted. Indeed, in the optimized version of the project, there is no sedimentation basin of overburden stockpiles. Seepage and runoff water from the overburden and peat storage facility will be collected in peripheral ditches and directed to the North Water Management Pond (NWMP), which has been sized to comply with the recurrences for the basins of Directive 019.

The East Water Management Pond (EWMP) will collect contact water from the East Waste Rock and Tailings Storage Facility, which will then be pumped to the NWMP. The EWMP is designed to operate with a low water level most of the time, in order to guarantee an active volume fully available to contain the project flood, as recommended by Directive 019. This project flood is defined as the combination of a 24-hour precipitation from a 1000-year return period and a 30-day snowmelt from a snow accumulation of a 100-year return period. The EWMP will be equipped with a pumping system of sufficient capacity to empty the project flood runoff volume within 20 days.

5 BORROW PITS

QC4-16	**In section 4.4.3 of the *Environmental Impact Assessment document, version 2* (WSP, 2021), it is indicated that one or more borrow pits will have to be opened to meet the sand and gravel needs during the construction of the mining site. A few borrow pits were investigated in 2019. It is also indicated that, depending on the required needs, the potential quantities to be extracted will be analyzed to validate which site to exploit would be the most appropriate. The proponent must present an assessment of the sand and gravel needs for the construction of the site and assess the area of the borrow pit required. In addition, the proponent must describe the work required to access the borrow pits already opened and those to be opened (clearing, road construction, etc.), the location and area to be exploited of the selected borrow pits, the work restoration to be provided if necessary, as well as the holder(s) of the lease provided for the operation of these borrow pits.**

A-QC4-16:

A technical note has been written to explain the stages of construction of the haulage roads on the site (Appendix A-QC4-16).

In addition to the construction material that will be taken into the project footprint, additional material will come from the borrow pit at km 381 and the quarry at km 394, both already in operation. These two sites were chosen because they are already in operation, have enough material to meet project construction needs and given their proximity to the project site. In the event that more material is required following construction, it could then come from other borrow pits or previously identified quarries. The necessary permit applications would then be made at the appropriate time, well before the exploitation of one of these sites.

The borrow pit at km 381 is next to the engineered landfill. It's under the name of Trimix Béton inc. It is BNE 50701, renewable every year on April 1st. GLCI will apply to get material from this borrow pit. An area of 2.5 ha will have to be opened.

The effects associated to the operation of this borrow pit are mainly related to the transport of sand by truck, which can mainly contribute to modify the air quality. In total, 10,400 t of sand from this borrow pit will be needed for the work requiring clean sand, including the installation of the culvert at CE3 during the first month. Since the pit site materials are a mixture, they cannot be used for all purposes without sieving. This tonnage represents the loading of a total of 350 trucks of 30 t. The work requiring material from the borrow pit will be spread over a period of approximately 4 months. Thus, the transport of sand by truck would be about 20 trucks per week, for a period of 4 months. However, given the short distances to be traveled since the borrow pit is located next to the project site, the limited number of truck trips and the fact that the trucks will not have to take the Billy-Diamond road and that they will move at very low speed, the effects related to transport are considered insignificant. In addition, the mitigation measures provided in the second version of the EIS (Table 7-5 of the EIS) will help reduce the anticipated effects related to transportation during the construction phase as described in Chapter 7 of the second version of the EIS. These measures mainly involve watering the roads in order to avoid resuspension and the emission of dust as well as reducing the speed of vehicle traffic. No modification to the impact assessment presented in Chapter 7 of the second version of the EIS is therefore necessary.

The quarry that will be used for concrete production is located at km 394. As mentioned earlier, this quarry is already in operation. Communications with the SDBJ mention that the SDBJ holds an exclusive operating lease to mineral surface substances (BEX no. 1767) (R-QC4-16) for the quarry at km 394. This quarry is under an active authorization from MELCC (ref.: 7610-10-01-84028-00).

The effects associated with the exploitation of this quarry are related to the transport of aggregates by truck, from the quarry to the project site, i.e. over a distance of 12 km (24 km counting the round trip). In total, 29,000 t of aggregate will be needed for the construction (concrete production), which represents the loading of a total of 967 trucks of 30 t. The work requiring the most aggregates from the quarry will extend over a period of approximately 4 months. The transport of aggregates will therefore represent 8 trucks per day, for a period of 4 months.

The mitigation measures provided in the second version of the EIS (Table 7-5 of the EIS) will help reduce the anticipated effects related to transportation and traffic on the Billy-Diamond road during the construction phase as described in Chapter 7 of the second version of the EIS. No modification to the impact assessment presented in Chapter 7 of the second version of the EIS is necessary.

6 WASTE MANAGEMENT

QC4-17	**The proponent must indicate whether the presence of the mine will have an impact on the operation of the current residual materials management site at km 381 and present mitigation measures, if applicable. The proponent must also present confirmation from the Société de développement de la Baie-James (SDBJ), holder of the authorization for this site, of the capacity of this site to receive the residual materials generated by the workers who will reside on the site. of relay 381.**

A-QC4-17:

GLCI does not intend to use the waste landfill of the 381 km truck stop; as mentioned in the Environmental Impact Assessment (WSP, 2021), the waste will be sent to other licensed landfills. The choice of sites will be made by the selected contractor for the collection, transport and disposal of residual material.

During the period when the workers of the various contractors mandated by GLCI for the construction of the infrastructures will reside at the km 381 truck stop, the additional waste generated by these workers will actually be sent to the 381 km truck stop's landfill. The SDBJ has confirmed that its landfill can accommodate waste generated by the additional workers. The email from SDBJ CEO Alain Coulombe is attached in Appendix A-QC4-17.

QC4-18	**In section 4.10.3 of the *Environmental Impact Assessment, Version 2* (WSP, 2021), the proponent indicates that residual materials that will not be composted or recycled will be sent to the Amos landfill site. The proponent must provide proof of the ability and agreement of the operator of the Amos engineered landfill to receive the residual materials from the project.** **Transporting residual materials to Amos is an approach that could limit black bears' access to an anthropogenic food source resulting from mine activities. However, the proponent does not plan to fence off the storage site for household waste and the composter. The proponent must specify how he will avoid intrusions by wildlife into the storage and composting site. The proponent should also mention if specially designed bear covers will be used.**

A-QC4-18:

What is mentioned in Section 4.10.3 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) is that GLCI will be working with a contractor specializing in waste collection and disposal. In our discussions with the contractor mentioned in the July 2021 study, he mentioned that the Amos site was the one that was currently receiving most of the residual materials he was collecting. It is the contractor who will perform the required capacity and availability evaluation to receive waste materials such as recyclable materials, hazardous waste and other waste to dispose of. The contractor may decide to direct the waste to different sites throughout the operating years.

The annual volume of residual materials to be eliminated has been estimated at 500 mt. These materials will be essentially composed of non-recyclable or compostable materials, namely wood and construction waste (20 mt) and various materials, expanded polystyrene, packaging, non-recyclable plastics, rubber, ashes and composite objects (480 mt). The Amos site confirmed the admissibility of these materials (see email from Mr. Fortin, site director, presented in Appendix A-QC4-18).

Waste will be stored on site in roll-off containers equipped with cover. The containers will be located on the industrial site where there will be continuous traffic. It would be surprising if black bears ventured onto a terrain that is constantly used by humans and their mobile vehicles. The composter will be installed in an isolated and closed container located in the same area of the industrial site.

If bears were seen, steps would be taken to scare them without harming them and ensure they do not return. GLCI already has a procedure in place for contact with wildlife that will be updated for the operating period. Following discussions and agreement with the tallyman, the scaring mode for black bears will be written in the procedure.

If the bears come back even with the measures taken, the waste container and composter sector will be fenced.

7 AIR QUALITY

Although the proponent refers several times to the dispersion study carried out in 2018, the methodology and assumptions used in the new modeling of atmospheric dispersion have been analyzed. The questions in this "Air Quality" section are all linked, unless otherwise stated, to the document *Environmental and Social Impact Assessment Modeling – Air Dispersion Modeling* (Stantec, 2021).

QC4-19	**The modeling was not carried out with the most recent version of the AERMOD model, in accordance with the provisions of Annex H of the Clean Air Regulations (RAA). The proponent must perform the modeling using the most recent version of the AERMOD model and include the adjustments requested in questions QC4-20 to QC4-32, if applicable.**

A-QC4-19:

When the 2018 EIS was completed, the most recent version of the AERMOD dispersion model was 18081. The dispersion modelling in the 2021 EIS was updated to include the Project changes due to the Value Engineering. For consistency and to allow comparison of the updated model results with the original 2018 EIS model results, the 2021 EIS used the same AERMOD version as the original 2018 EIS – 18081. This is a common practice for large projects as the EIS process can span over multiple years. The focus of the updated air quality assessment is to evaluate the effect of the Project changes on air quality resulting from the Value Engineering, without introducing an additional bias due to the change of the model version.

To understand the potential differences in model results, the dispersion modelling for NO_2, TPM, PM_{10}, $PM_{2.5}$ and Crystalline Silica for the maximum production year (year 14) during operation was conducted with the most recent version of AERMOD – 21112. The maximum predicted concentrations at the maximum point of impingement (MPOI) using AERMOD, version 21112 are compared with the 2021 EIS model results (using AERMOD version 18081) in Table A-QC4-19-1 below. The maximum predicted concentrations at sensitive receptors using AERMOD version 21112 are compared with the 2021 EIS model results (using AERMOD version 18081) in Table A-QC4-19-2 below.

Table A-QC4-19-1 shows that there is essentially no difference in the maximum predicted concentrations of NO_2, TPM, PM_{10}, $PM_{2.5}$ and Crystalline Silica at the MPOI using AERMOD version 21112 and AERMOD version 18081. Similarly, Table A-QC4-19-2 shows that there is no difference in the maximum predicted concentrations of NO_2, TPM, PM_{10}, $PM_{2.5}$ and Crystalline Silica at sensitive receptors using AERMOD version 21112 and AERMOD version 18081. Based on the comparison of model results for NO_2, TPM, PM_{10}, $PM_{2.5}$ and Crystalline Silica using the original version (18081) and the most recent version (21112) of AERMOD, no substantial changes in the predicted concentrations using the original AERMOD version (18081) are expected due to the change in the model version.

Table A-QC4-19-1 Comparison of Dispersion Modelling Results at MPOI for Project Operation using AERMOD Version 18081 and Version 21112

Substance	CAS No.	Averaging Period	Statistical	Threshold (µg/m^3)	Initial Concentration (µg/m^3)	AERMOD version 18081		AERMOD version 21112		Percent Change (Relative to AERMOD version 18081)
						Concentration Total[1] (µg/m^3)	Percentage of Limit[2] (%)	Concentration Total[1] (µg/m^3)	Percentage of Limit[2] (%)	
Total Suspended Particulate (TPM)	N/A-1	24 hours	1st Maximum	120	40	121	101%	121	101%	0.000%
Particulate Matter < 10 µm (PM_{10})	N/A-2	24 hours	99th Percentile	50	21.8	32.3	65%	32.3	65%	0.000%
		Annual	1st Maximum	20	5.5	8.18	41%	8.18	41%	0.000%
Fine particulate matter ($PM_{2.5}$)	N/A-3	24 hours	1st Maximum	30	15	20.9	70%	20.9	70%	0.000%
		24 hours	98th Percentile[3]	27	15	18.4	68%	18.4	68%	0.000%
		Annual	1st Maximum[4]	8.8	4.5	5.54	63%	5.54	63%	0.000%
Nitrogen dioxide (NO_2) (based on OLM[6])	10102-44-0	1 hour	98th Percentile[3]	113 (2020) / 79 (2025)	50	**221**	**196% (2020) / 280% (2025)**	**221**	**196% (2020) / 280% (2025)**	0.000%
		1 hour	1st Maximum	414	50	401	97%	401	97%	0.000%
		24 hours	1st Maximum	207	30	103	50%	103	50%	0.000%
		Annual	1st Maximum	103	10	19.7	19%	19.7	19%	0.000%
		Annual	1st Maximum	32 (2020) / 23 (2025)	10	19.7	61% (2020) / 85% (2025)	19.7	61% (2020) / 85% (2025)	0.000%
Crystalline Silica (SiO_2)	14808-60-7	1 hour	1st Maximum	23	6	**41.2**	**179%**	**41.2**	**179%**	0.000%
		Annual	1st Maximum	0.07	0.04	**0.305**	**436%**	**0.305**	**435%**	0.000%

Notes:

1 The modeled total concentration is the sum of the modeled maximum concentration and the initial concentration.

2 The percentage of the limit value is the total concentration divided by the limit value, as a percentage.

3 The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.

4 The 3-year average of the annual average of the daily 24-hour average concentrations.

5 Values in **Bold** text font and shaded cells represent maximum predicted concentrations greater than the ambient threshold.

6 OLM: Ozone Limiting Method

Table A-QC4-19-2 Comparison of Dispersion Modelling Results at Sensitive Receptors for Project Operation using AERMOD Version 18081 and Version 21112

Substance	CAS No.	Averaging Period	Statistical	Threshold (µg/m³)	Initial Concentration (µg/m³)	AERMOD version 18081							AERMOD version 21112							Percent Change (%)
						Maximum Predicted Concentration per Category (µg/m³)					Concentration Total[1] (µg/m³)	Percentage of Limit[2] (%)	Maximum Predicted Concentration per Category (µg/m³)					Concentration Total[1] (µg/m³)	Percentage of Limit[2] (%)	
						Road Relay km 381	Cree Camp	Valued Area	Traditional Activity	Max			Road Relay km 381	Cree Camp	Valued Area	Traditional Activity	Max			
Total Suspended Particulate (TPM)	N/A-1	24 hours	1st Maximum	120	40	31.7	2.3	12.1	45.8	45.8	85.8	72%	31.7	2.3	12.1	45.8	45.8	85.8	72%	0.000%
Particulate Matter < 10 µm (PM_{10})	N/A-2	24 hours	99th Percentile	50	21.8	7.17	0.461	2.00	7.45	7.45	29.2	58%	7.17	0.461	2.00	7.45	7.45	29.2	58%	0.000%
		Annual	1st Maximum	20	5.5	1.10	0.066	0.293	1.62	1.62	7.12	36%	1.10	0.066	0.293	1.62	1.62	7.12	36%	0.000%
Fine particulate matter ($PM_{2.5}$)	N/A-3	24 hours	1st Maximum	30	15	2.42	0.221	0.602	4.32	4.32	19.3	64%	2.42	0.221	0.602	4.32	4.32	19.3	64%	0.000%
		24 hours	98th Percentile[3]	27	15	1.26	0.094	0.355	2.21	2.21	17.2	64%	1.26	0.094	0.355	2.21	2.21	17.2	64%	0.000%
		Annual	1st Maximum[4]	8.8	4.5	0.270	0.019	0.073	0.647	0.647	5.15	59%	0.270	0.019	0.073	0.647	0.647	5.15	58%	0.000%
Nitrogen dioxide (NO_2) (based on OLM[6])	10102-44-0	1 hour	98th Percentile[3]	113 (2020)/ 79 (2025)	50	52.5	9.94	25.4	**142**	**142**	**192**	**170% (2020) / 243% (2025)**	52.5	9.94	25.4	**142**	**142**	**192**	**170% (2020) / 243% (2025)**	0.000%
		1 hour	1st Maximum	414	50	136	57.9	135	264	264	314	76%	136	57.9	135	264	264	314	76%	0.000%
		24 hours	1st Maximum	207	30	19.6	2.76	7.78	57.7	57.7	87.7	42%	19.6	2.76	7.78	57.7	57.7	87.7	42%	0.000%
		Annual	1st Maximum	103	10	1.94	0.144	0.521	6.87	6.87	16.9	16%	1.94	0.144	0.521	6.87	6.87	16.9	16%	0.000%
		Annual	1st Maximum	32 (2020)/ 23 (2025)	10	1.94	0.144	0.521	6.87	6.87	16.9	53% (2020)/ 73% (2025)	1.94	0.144	0.521	6.87	6.87	16.9	53% (2020) / 73% (2025)	0.000%
Crystalline Silica (SiO_2)	14808-60-7	1 hour	1st Maximum	23	6	14.0	2.99	5.05	13.9	14.0	20.00	87%	14	2.99	5.0	13.9	14.0	20.0	87%	0.000%
		Annual	1st Maximum	0.07	0.04	**0.109**	0.006	0.028	**0.143**	**0.143**	**0.183**	**261%**	**0.109**	0.006	0.028	**0.143**	**0.143**	**0.183**	**261%**	0.000%

Notes:

1 The modeled total concentration is the sum of the modeled maximum concentration and the initial concentration.
2 The percentage of the limit value is the total concentration divided by the limit value, as a percentage.
3 The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.
4 The 3-year average of the annual average of the daily 24-hour average concentrations.
5 Values in **Bold** text font and shaded cells represent maximum predicted concentrations greater than the ambient threshold.
6 OLM: Ozone Limiting Method

QC4-20	**The proponent indicates in sections 4.1.2 and 4.2.2 that blasting is planned three times a week (Monday, Wednesday and Friday) during the construction and operation periods. This way of proceeding does not make it possible to obtain the results for an optimal scenario, i.e. one where all the sources are in operation simultaneously. As specified in Appendix H of the RAA, the modeling scenarios must make it possible to reproduce the worst concentrations of contaminants expected according to the period of application of the limit value. The proponent must therefore resume the modeling of the scenarios and show that it has considered the maximum concentrations of contaminants emitted according to the period of application.**

A-QC4-20:

The dispersion modelling for Project construction and operation was based on the peak year of construction (year -1) and peak year of operation (year 14), which were estimated to have the construction and mining activities (e.g., fuel consumption, blasting, material movement and milling) with the highest emissions during construction and operation. The emission sources during Project construction and operation were assumed to operate simultaneously; however, all emission sources do not operate continuously (24 hours per day, 7 days per week) during the modelled year. Blasting emissions in the open pit occur only three days per week most of the time but not every week and for at maximum period of 30 minutes, but they were modelled for one hour 3 out of 7 days, every week, to ensure worst case scenario. Blasting emissions were modelled as variable emissions by day of the week and time of the day. The temporal allocation of emissions in the dispersion model represents more realistically the actual times (hours and days) where emissions are expected to occur. The temporal allocation of emissions in the model has a comparable level of conservatism as for the contaminant concentrations. The maximum predicted concentration for a particular averaging period (1-hour, 24-hours) is the maximum value from all hours (for 1-hour averaging period) or all days (for 24-hour averaging period) that are modeled in the year.

Therefore, the modeled maximum 1-hour average concentrations can occur at any hour of the model simulation, including hours when blasting emissions are modelled simultaneously with other emission sources. Similarly, the model considers maximum 24-hour average concentrations occurring during any 24-hour period (i.e., a day) of the model simulation, including days when blasting emissions are modelled simultaneously with other emission sources.

Because the model predicted maximum concentrations for each averaging period are estimated from all modelled hours in the meteorological year (8,760), the modelling scenarios for construction and operation estimated the highest contaminant concentrations for each averaging period (1-hour, 24-hour, annual).

QC4-21	**The proponent indicates in sections 4.1.2 and 4.2.2 that it applied a control efficiency of 95% of particulate emissions related to routing for the winter period (October to May). Even in winter, different materials will be deposited on road segments even if the ground is frozen. Particles will then be resuspended during the passage of mining vehicles. The mitigation assumption used by the proponent is not representative. As already mentioned (ref: QC-171), the proponent must consider emissions related to routing with an attenuation rate similar to that related to the spreading of water or dust suppressant in order to take a more conservative approach and demonstrate the impacts on the modeling results.**

A-QC4-21:

The natural mitigation control factor (or efficiency) assumed for Project haulage roads during winter conditions (95%) was derived from a study that measured the effectiveness of natural winter mitigation of road dust from two De Beers Canada Inc. diamond mining operations in northern Canada (Golder Associates 2012). The natural wintertime mitigation control factor is intended to account for the reduction in fugitive dust that occurs during winter conditions due to both immobilization of dust particles bound in the frozen road surfaces and the capping effect of the snow cover. The mechanisms that reduce fugitive emissions during winter are not limited to only snow cover. The study noted that due to snow, ice, and sub-zero temperatures the silt fraction of a road, combined with ice, becomes bound to larger pieces of aggregate in the road and is unavailable for lofting by wheel entrainment. The combination of mechanisms limits the amount of fugitive dust that can be generated during winter.

The Golder Associates (2012) study involved measuring particulate concentrations in the plume generated by mine haul trucks using a pickup-truck mounted dust sampling system deployed on a chase truck. Because of this method, overall level of traffic would not affect the results as the measurements are for a single haul truck. The study measured the effectiveness of road watering, variations in night and day emissions and differences between summer and winter emissions. One of the conclusions of the study was that the observed 95th percentile values for wintertime road dust emissions were naturally reduced by 94% at the Victor Mine and by 96% at the Snap Lake Mine, compared to uncontrolled summer conditions.

Winter sampling was conducted from January 16 to 20, 2012 at the Victor Mine and from February 2 to 6, 2012 at the Snap Lake Mine (Golder Associates 2012). Temperature, wind speed and relative humidity at the Victor Mine during the measurement program ranged from -10.5 °C to -31.8 °C, 1.8 m/s to 5.2 m/s and 72.4% to 85.9%, respectively. Temperature, wind speed and relative humidity at the Snap Lake Mine during the measurement program ranged from -3.0 °C to -18.9 °C, 6.7 m/s to 9.5 m/s and 78.3% to 95.2%, respectively. This data indicates that although weather conditions were variable at each site during the study, the results were very similar in terms of % reduction in dust during winter as compared to unmitigated summer dust generation.

The haul trucks at James Bay site transport ore and waste rock, which are larger rocks and are not expected to contribute to silt-size particles on the haulage roads that could be re-entrained by the haul trucks and result in dust emissions. Accidental spills from the haul trucks are not expected to accumulate in a sufficient depth on the surface of the road that could sustain continuous road dust emissions. Potential road dust emissions from re-entrainment of accidentally spilled material are expected to be intermittent and short in duration.

In all cases, measurements will be taken during operations, and, if dust concentrations exceed the regulatory criteria, a dust suppressant approved by the BNQ will be applied.

QC4-22	**In Section 4.1.4, the proponent used a feed rate of 555.5 t/h for each unit. In the previous study (*Atmospheric Dispersion Modeling Study* (WSP, 2018)), the feed rate used was 725 t/h for each unit. As specified previously, the modeling scenarios must make it possible to reproduce the worst concentrations of contaminants expected according to the period of application of the limit value. The proponent must justify the use of a lower rate and repeat the calculation using the value of 725 t/h and demonstrate the impacts on the modeling results.**

A-QC4-22:

The hourly feed rate (555.5 t/h) to the mobile crushers was calculated from the total mined waste rock during the worst-case year (year -1) of construction (2,386,860 t/y) and assuming that the crushing activity will be spread over 215 days and the operating time during construction will be 10 hours a day (a total of 11 hours with 1 hour break), 7 days a week. These parameters are consistent with the 2018 Atmospheric Dispersion Modelling Study. The maximum daily feed rate to the crushers is calculated to be 11,109 t/d (2,386,860 t/y ÷ 215 d/y). The maximum hourly feed rate to the crushers is calculated to be 555.5 t/h (11,109 t/d ÷ 10 h/d ÷ 2 crushers). The 2018 Atmospheric Dispersion Modelling Study applied an operational efficiency factor of 1.3 to the operating hours per day resulting in an effective workday of 7.7 hours a day (10 h/d ÷ 1.3). Therefore, the hourly feed rate in the 2018 Atmospheric Dispersion Modelling Study was calculated to be 725 t/h (11,109 t/d ÷ 7.7 h/d ÷ 2 crushers). The operational efficiency factor of 1.3 corresponds to approximately 2.3 hours of unutilized time out of 10 work hours per day, which accounts for intermittent stops and restarts and occasional malfunctions of the equipment; however, the assumed unutilized time due to operational inefficiency could be reasonably assumed to be distributed over the operating hours (10 h/d) rather than eliminating 2.3 consecutive hours from the workday. Therefore, the hourly feed rate of 555.5 t/h to each of the two mobile crushers is a representative estimate for the mobile crushers operation and the associated emissions.

QC4-23	**In sections 4.1.5 and 4.2.4, the proponent uses a silt rate of 2%, that of the ore, to calculate the emissions related to butting. In comparison, in the previous study (*Atmospheric Dispersion Modeling Study* (WSP, 2018)), the rate of silt used was 9.5%. The proponent must explain why it used a silt rate of 2%, i.e. that of the ore, to calculate the emissions related to the butting activities both in the construction phase and in the operating phase.**

A-QC4-23:

In the absence of project-specific data, the 2018 Atmospheric Dispersion Modelling Study assumed a silt content of 9.5% to calculate dust emissions from the bull dozing at the waste rock piles and open pit, corresponding to “lump ore” in the “iron and steel production” source group from the US EPA AP-42 Section 13.2.4 (Aggregate Handling and Storage Piles), Table 13.2.4-1. The 2021 Atmospheric Dispersion Modelling Study used the project-specific silt content of 2% for ore, which was provided by Galaxy. The assumed silt content of 9.5% in the 2018 EIS is too conservative because in AP-42 Section 13.2.4 this corresponds to lump ore (crushed iron ore) sized between 6 mm and 30 mm mesh screen, while the James Bay waste rock that is manipulated using the bull dozers contains much bigger rocks. A more representative substitute for waste rock is “crushed limestone” from US EPA AP-42 Section 13.2.4, Table 13.2.4-1 with a silt content of 1.6%. This value is similar in magnitude to the 2% silt content for ore provided by Galaxy.

QC4-24	**The proponent must explain the choice of year 14 (Y14) for the operating scenario that maximizes atmospheric emissions. According to the table presented in appendix G, for the item “Total Tonnage by phase”, years Y10 to Y14 have the same total tonnage. In the previous version of the modeling report (*Atmospheric Dispersion Modeling Study* (WSP, 2018)), mining infrastructure expansion activities occurred concurrently with production activities. The proponent must specify whether these activities are still planned and consider them when choosing the operating scenario retained, if applicable.**

A-QC4-24:

The dispersion modelling for Project operation was based on a worst-case scenario, which for the Project represents year 14. Year 14 was identified as the peak operational year, and therefore the worst-case operational scenario, as it is the year estimated to have the highest rates for mining activities (i.e., fuel consumption and blasting), material movement and milling. Other operational years (i.e., 10, 11, 12 and 13) are estimated to have similar material movement rates, however year 14 is estimated to have the highest amount of fuel consumption (Table A-CCE3-4-1), in additional to high material movement and milling rates.

In the previous version of the modelling report (Atmospheric Dispersion Modelling Study (WSP, 2018)), mining infrastructure expansion activities were taking place at the same time as production activities. However, these expansion activities are no longer planned for the project.

Table A-QC4-24 Estimated Fuel Consumption per Year

Fuel Consumption	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19
Mine	-	1,801	5,529	5,775	5,916	6,014	5,783	5,617	5,682	7,029	6,806	7,201	6,920	7,130	7,502	7,734	7,117	7,368	6,452	6,738	2,147
Surface Ops	139	139	226	226	226	226	226	226	226	226	226	226	226	226	226	226	226	-	226	226	226
General & Administration	137	137	205	205	205	205	205	205	205	205	205	205	205	205	205	205	205	-	205	205	205
Mill	-	193	416	416	416	416	416	416	416	416	416	416	416	416	416	416	416	-	416	416	416
Total	276	2,271	6,376	6,622	6,763	6,861	6,630	6,464	6,529	7,875	7,653	8,048	7,767	7,977	8,348	8,581	7,964	7,368	7,299	7,584	2,994

QC4-25	**In section 4.2.9 the proponent indicates that it used Annex B.2 of the United States Environmental Protection Agency (US EPA) AP-42 to assess emissions of particles with a diameter of less than 4 µm (PM4) . It must specify what percentage has been applied for each type of emission source.**

A-QC4-25:

Emissions of PM_4 were calculated as 25% of total particulate (TPM) emissions based on the US EPA AP-42 Appendix B.2 (Generalized Particle Size Distributions), using the particle size distribution for "mechanically generated dust emissions" for "aggregate and unprocessed ores" (Category 3). The 25% was applied for the following emission source categories in the 2021 air quality assessment:

- Drilling
- Blasting
- Wind erosion of storage piles
- Material handling
- Bulldozing
- Mobile crushing/screening (during construction)

Fugitive dust PM_4 emissions from unpaved haulage roads were calculated by interpolating the "k" factor (kg/VKT) from the particle size distribution curve derived from the "k" factor values for $PM_{2.5}$, PM_{10} and TPM (US EPA AP-42 Chapter 13.2.2 Unpaved Roads), as described in the response to QC4-26.

QC4-26	**In Appendix C, the proponent must specify how the "k" factor (kg/VKT) was established for PM4 in the "Haul Truck Fugitives" item.**

A-QC4-26:

Fugitive dust PM_4 emissions from unpaved haulage roads were calculated by interpolating the "k" factor (kg/VKT) from the "k" factor distribution curve derived from the "k" factor values for $PM_{2.5}$, PM_{10} and PM_{30} (US EPA AP-42 Chapter 13.2.2 Unpaved Roads). The "k" factors for $PM_{2.5}$, PM_{10} and PM_{30} from the US EPA AP-42 Chapter 13.2.2 are provided in Table A-QC4-26-1 below. The derived "k" factor distribution curve based on the "k" values in Table A-QC4-26-1 is shown in Figure A-QC4-26-1 below. The "k" factor for PM_4 was interpolated from the "k" factor distribution curve resulting in a value of 0.1219 kg/VKT.

Table A-QC4-26-1 "k" Factors for $PM_{2.5}$, PM_{10} and PM_{30}

PM (µm)	k (lb/VMT)	k (kg/VKT)
$PM_{2.5}$	0.15	0.0423
PM_{10}	1.5	0.4228
PM_{30}	4.9	1.3813

Source: US EPA. 2006. AP-42 Chapter 13.2.2 Unpaved Roads, November 2006.
1 lb/VMT = 281.9 g/VKT (US EPA 2006)

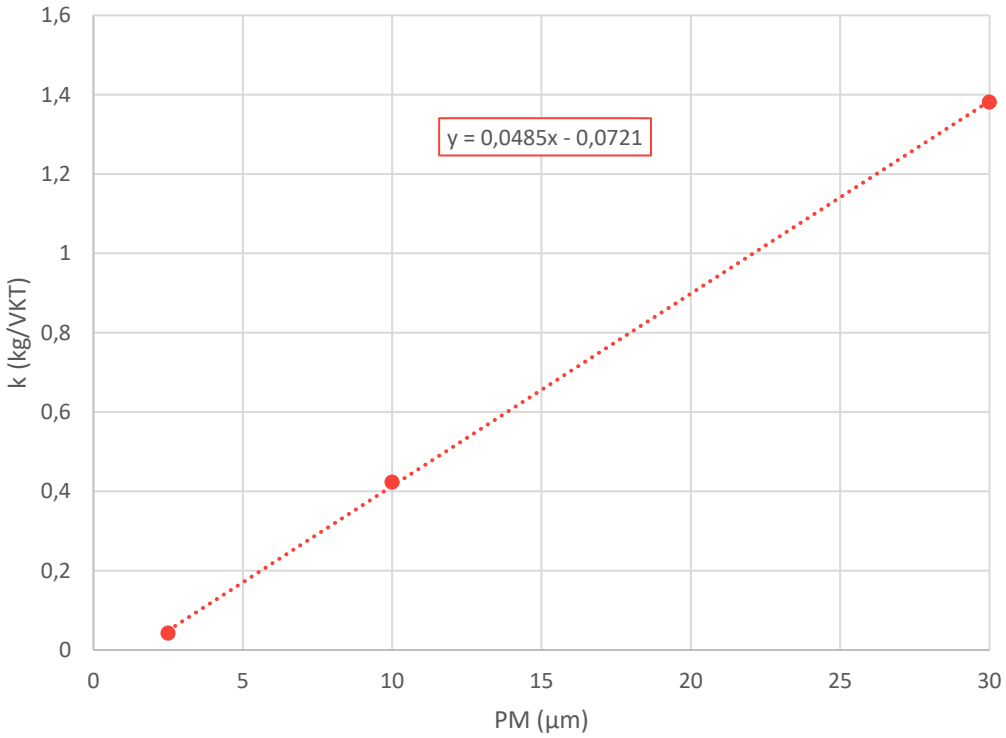


Figure A-QC4-26-1 "k" Factor Distribution Curve with Particle Size

QC4-27	**The proponent does not present in detail the physical characteristics of the sources that made it possible to determine the emission heights, the initial lateral dimensions (σy) and the initial vertical dimensions (σz) of the volume sources, in order to validate whether they were properly incorporated into the model. The proponent must specify this information for the following points: routing, bulldozing, blasting as well as material loading and unloading operations.**

A-QC4-27:

The plume width and plume height of the volume sources used in the air quality dispersion modelling were determined based on the physical dimensions of the mining equipment which generates the dust emissions (e.g., haul trucks, loaders, bulldozers). The initial lateral dimension (σy) and initial vertical dimension (σz) were calculated from the plume width and plume height, respectively, using the formulas from the AERMOD User's Guide (US EPA, 2021), Table 3-2 (Summary of Suggested Procedures for Estimating Initial Lateral Dimensions and Initial Vertical Dimensions for Volume and Line Sources). Dust emissions from unpaved haulage roads were modelled as line sources consisting of adjacent volume sources. The plume width, plume height, release height, σy and σz for the haulage roads were calculated from the height of the haul truck and the road width, following the US EPA Guidance for modelling of haulage roads (US EPA, 2012).

The plume width, plume height, release height, σy and σz of the volume sources used in the air quality dispersion modelling for Project construction and operation phases are presented in Table A-QC4-27-1 and Table A-QC4 27-2, respectively. The footnotes for the tables indicate the equipment model and dimensions used to determine the plume width and plume height, from which the release height and σy and σz were calculated.

Table A-QC4-27-1 Volume Source Parameters used in the Air Quality Model for Construction

Source	Description	UTM X	UTM Y	Plume Width	Plume Height	Release Height [p]	σ_y [r]	σ_z [r]
		(m)	(m)	(m)	(m)	(m)	(m)	(m)
Haulage Roads	Various haulage routes on site	Line sources consisting of adjacent volume sources		52.0 [a]	8.50 [h]	4.25	24.2	3.95
UNLDROCK	Unloading of rock at ore location	358553	5790082	6 [b]	10 [i]	5	1.40	4.65
UNLDEWR	Unloading of waste rock at east dump	358823	5789557	6 [b]	10 [i]	5	1.40	4.65
UNLDSAND	Unloading of sand at ore location	358553	5790082	6 [b]	10 [i]	5	1.40	4.65
LDRKCP1B	Loading of rock at the central pit 1 bench	357810	5789558	6 [b]	3 [j]	5 [q]	1.40	1.40
LDSDCP1B	Loading of sand at the central pit 1 bench	357810	5789558	6 [b]	3 [j]	5 [q]	1.40	1.40
LDWRCP1B	Loading of waste rock at the central pit 1 bench	357810	5789558	6 [b]	3 [j]	5 [q]	1.40	1.40
LDCP	Loading at concrete plant	358562	5790139	6 [b]	3 [j]	5 [q]	1.40	1.40
CRUSH1	Crushing Unit 1	358481	5789962	3.7 [c]	4.8 [c]	2.4	1.72	2.23
CRUSH2	Crushing Unit 2	358488	5789953	3.7 [c]	4.8 [c]	2.4	1.72	2.23
SCREEN1	Screening Unit 1	358499	5789971	3.9 [c]	4.8 [c]	2.4	1.83	2.23
SCREEN2	Screening Unit 2	358506	5789962	3.9 [c]	4.8 [c]	2.4	1.83	2.23
TRDOZ1	Track Dozer 1	358367	5789958	3.5 [d]	4 [k]	2	0.81	1.86
TRDOZ2	Track Dozer 2	358400	5789926	3.5 [d]	4 [k]	2	0.81	1.86
WHDOZ1	Wheel Dozer 1	358587	5790013	5 [e]	4 [l]	2	1.16	1.86
BLASTANFO	ANFO Explosive (winter)	357756	5789595	67.9 [f]	10 [m]	5	15.81	4.65
BLASTANEM	AN Emulsion Explosive (summer)	357756	5789595	67.9 [f]	10 [m]	5	15.81	4.65
PRODDRIL1	Production Drill 1	357752	5789607	5 [g]	5 [n]	2.5	1.16	2.33
PREDRILL	Predrill 1	357737	5789593	5 [g]	5 [n]	2.5	1.16	2.33

Notes:

a Based on the road width, two lanes (46 m) + 6 m (US EPA 2012)

b Based on the width of haul truck CAT 777 (6 m)

c The dimensions of the mobile crushers and screeners are assumed the same as in the 2018 EIS

d Based on the width of dozer CAT D9T (3.5 m)

e Based on the width of dozer CAT 834K (5 m)

f Based on the average blast area per blast (4,616 m²)

g Based on an assumed width of the drill (5 m)

h Based on the height of a CAT 777 haul truck (5 m) x 1.7 (US EPA 2012)

i Based on the unloading height of haul truck CAT 777 (raised body, 10 m))

j Based on the drop height of the loader bucket (3 m)

k Based on the height of dozer CAT D9T (4 m)

l Based on the height of dozer CAT 834K (4 m)

m Based on an assumed height of the blast plume (10 m)

n Based on an assumed width of the drill (5 m)

p Release height calculated as 1/2 x Plume Height, except as noted for individual sources

q Release height set at the top of haul truck CAT 777 (5 m)

r σy and σz calculated from plume width and plume height using the formulas from the AERMOD User's Guide (US EPA 2021), Table 3-2.

Table A-QC4-27-2 Volume Source Parameters in the Air Quality Model for Operation

Source	Description	UTM X	UTM Y	Plume Width	Plume Height	Release Height [n]	σ_y [q]	σ_z [q]
		(m)	(m)	(m)	(m)	(m)	(m)	(m)
Haulage Roads	Various haulage routes on site	Line sources consisting of adjacent volume sources		52.0 [a]	8.50 [g]	4.25	24.2	3.95
UNLDROCK	Unloading of rock at ore location	358553	5790082	6 [b]	10 [h]	5	1.40	4.65
UNLDWR	Unloading of waste rock at east dump	359150	5789403	6 [b]	10 [h]	5	1.40	4.65
LDRKCP4B	Loading of rock at the central pit 4 bench	357762	5789660	6 [b]	3 [i]	5 [p]	1.40	1.40
LDRES	Loadout of residue (tailings)	358767	5790310	6 [b]	3 [i]	5 [p]	1.40	1.40
LDCONC	Loading of concentrate product	358809	5790329	6 [b]	3 [i]	5 [p]	1.40	1.40
UNLDTAIL	Unloading of tailings residue at east dump	359149	5789405	6 [b]	10 [h]	5	1.40	4.65
TRDOZ1	Track dozer 1	359162	5789359	3.5 [c]	4 [j]	2	0.81	1.86
TRDOZ2	Track dozer 2	359146	5789439	3.5 [c]	4 [j]	2	0.81	1.86
WHDOZ1	Wheel dozer 1	357738	5789632	5 [d]	4 [k]	2	1.16	1.86
BLSTANFO	ANFO explosive (winter)	357756	5789595	50.4 [e]	10 [l]	5	11.72	4.65
BLASTANEM	AN emulsion explosive (summer)	357756	5789595	50.4 [e]	10 [l]	5	11.72	4.65
PRODRIL1	Production drill 1	357640	5789657	5 [f]	5 [m]	2.5	1.16	2.33
PRDRIL2	Production drill 2	357653	5789644	5 [f]	5 [m]	2.5	1.16	2.33
PREDRILL	Predrill 1	357626	5789642	5 [f]	5 [m]	2.5	1.16	2.33

Notes:

[a] Based on the road width, two lanes (46 m) + 6 m (US EPA 2012)

[b] Based on the width of haul truck CAT 777 (6 m)

[c] Based on the width of dozer CAT D9T (3.5 m)

[d] Based on the width of dozer CAT 834K (5 m)

[e] Based on the average blast area per blast (2,539 m²)

[f] Based on an assumed width of the drill (5 m)

[g] Based on the height for the CAT777 haul truck (5 m) x 1.7 (US EPA 2012)

[h] Based on the unloading height of haul truck CAT 777 (raised body, 10 m)

[i] Based on the drop height of the loader bucket (3 m)

[j] Based on the height of dozer CAT D9T (4 m)

[k] Based on the height of dozer CAT 834K (4 m)

[l] Based on an assumed height of the blast plume (10 m)

[m] Based on an assumed width of the drill (5 m)

[n] Release height calculated as 1/2 x Plume Height, except as noted for individual sources

[p] Release height set at the top of the CAT 777 haul truck (5 m)

[q] σ_y and σ_z calculated from plume width and plume height using the formulas from the AERMOD User's Guide (US EPA 2021), Table 3-2.

QC4-28	**The emission heights of the surface sources do not correspond to half the average height of the waste rock, ore, unconsolidated deposit and organic matter piles, whereas this should be the case. The proponent must adjust these parameters in the modelling.**

A-QC4-28:

The waste rock and ore stockpiles modelled in the 2021 air quality assessment occupy large areas ranging from 1,536 m² (ROM pad) to 568,662 m² (north-east waste rock pile) and are relatively flat, with a height ranging from 2 m (ROM pad) to 80 m (north-east waste rock pile). Therefore, a representative release height for wind erosion emissions would be at the height of the stockpiles and not at half of the height of the stockpiles. A release height set to half of the height of the stockpile is representative for industrial conical stockpiles. The US EPA AP-42 Chapter 13.2.5 (Industrial Wind Erosion) distinguishes between large relatively flat piles and tall piles that can significantly penetrate the surface wind layer by the height-to-base ratio. Relatively flat stockpiles are characterized with a height-to-base ratio less than 0.2. The waste rock and ore stockpiles that were modelled in the air quality assessment have a height-to-base ratio less than 0.2.

QC4-29	**In Table 1, concerning the criterion for selenium of 2 µg/m³, the proponent must compare the modeled hourly concentrations with the criterion, since the latter applies to an hourly period and not an annual one.**

A-QC4-29:

The ambient air quality criterion for selenium (2 µg/m³) was incorrectly presented in Table 1 in the Air Dispersion Modelling Report; the criterion corresponds to a 1-hour averaging period. The selenium modeling results in Table 21 and Table 22 were updated to represent the predicted maximum concentrations for a 1-hour averaging period. The maximum 1-hour average selenium concentrations in the model domain from Table 21 are listed in Table A-QC4-29-1 below, and the maximum 1-hour average selenium concentrations at sensitive receptors from Table 22 are listed in Table A-QC4-29-2 below.

Table A-QC4-29-1 Selenium Model Results during Operation (Updated Table 21 from the Air Dispersion Modelling Report)

Substance	CAS No.	Averaging Period	Statistical	Threshold (µg/m³)	Type of Threshold	Authorization	Initial Conc. (µg/m³)	Modeled Concentration (µg/m³)						Concentration Total[1] (µg/m³)	Contribution of Project[2] (%)	Percentage of Limit[3] (%)
								Maximum per Meteorological Year								
								Y1	Y2	Y3	Y4	Y5	Max.			
Selenium (Se)	7782-49-2	1-hour	1st Maximum	2	Criterion	MELCC	0.15	0.000529	0.000576	0.000601	0.000595	0.000601	0.000601	0.150601	0.40%	8%

Notes:
1 The modeled total concentration is the sum of the modeled maximum concentration and the initial concentration.
2 The project contribution is the maximum modeled concentration divided by the total concentration, as a percentage.
3 The percentage of the limit value is the total concentration divided by the limit value, as a percentage.

Table A-QC4-29-2 Selenium Model Results at Sensitive Receptors during Operation (Updated Table 22 from the Air Dispersion Modelling Report)

Substance	CAS No.	Averaging Period	Statistical	Threshold (µg/m³)	Type of threshold	Authorization	Initial Concentration (µg/m³)	Modeled Concentration (µg/m³)					Concentration Total[1] (µg/m³)	Contribution of Project[2] (%)	Percentage of Limit[3] (%)
								Maximum per Category							
								Road Relay km 381	Cree Camp	Valued Area	Traditional Activity	Max.			
Selenium (Se)	7782-49-2	1-hour	1st Maximum	2	Criterion	MELCC	0.15	0.000266	0.0000607	0.000108	0.000369	0.000369	0.150369	0.25%	8%

Notes:
1 The modeled total concentration is the sum of the modeled maximum concentration and the initial concentration.
2 The project contribution is the maximum modeled concentration divided by the total concentration, as a percentage.
3 The percentage of the limit value is the total concentration divided by the limit value, as a percentage.

QC4-30	**Although the dry deposition of the particles was considered in the modelling, the method used and the deposition hypotheses adopted (diameter, density and mass fraction for each size range) are not specified in the report. The proponent must present this information so that the ministry can ensure that the methodology is adequate.**

A-QC4-30:

Dry deposition of particulate matter (PM) emissions was modelled using the AERMOD atmospheric dispersion model (US EPA 2021). AERMOD uses a resistance model to calculate the dry deposition rate of particulate emissions as a function of geophysical parameters, meteorological conditions and gravitational settling. The AERMOD model includes two methods for handling dry deposition of particulate emissions. Method 1 is used when a significant fraction (greater than 10%) of the total particulate mass has a diameter of 10 µm or larger. Method 2 may be used when a small fraction (less than 10% of the mass) is in particles with a diameter of 10 µm or larger. The deposition velocity for Method 2 is calculated as the weighted average of the deposition velocity for particles in the fine mode (i.e., less than 2.5 µm in diameter) and the deposition velocity for the coarse mode (i.e., greater than 2.5 µm but less than 10 µm in diameter) (US EPA 2021).

Fugitive dust sources associated with mining typically have more than 10% particulate with aerodynamic diameters greater than 10 microns

Deposition of particulate emissions from the Project's fugitive dust sources (e.g., haulage roads, bulldozing, material handling, wind erosion of storage piles) were modelled using Method 1. Particulate matter from fugitive dust sources was divided into three particle size categories to account for the different deposition mechanism for particles of different size (i.e. larger particles being deposited close to the emission source and smaller particles travelling further downwind prior to being deposited). The three particle size categories were defined in the model as follows:

- Particles with aerodynamic particle diameter from 0 µm to 2.5 µm;
- Particles with aerodynamic particle diameter from 2.5 µm to 10 µm;
- Particles with aerodynamic particle diameter from 10 µm to 30 µm.

Method 1 requires specifying the mass-mean aerodynamic particle diameter (µm) for each of the particle size categories, the mass fractions (between 0 and 1) and the particle density (g/cm^3) for each of the categories. The mass fractions are source-specific and were calculated for each emission source based on the TPM, PM10 and PM2.5 emission factors used to calculate the PM emission rates for different particle sizes. The density of all particle size categories was assumed to be 2.7 g/cm^3 consistent with the rock density provided by GLCI. The deposition parameters used to model dry deposition of particulate emissions from fugitive dust sources are provided in Table A-QC4-30-1.

Table A-QC4-30-1 Deposition Parameters for PM Emissions from Fugitive Dust Sources

Particle Size Category	Representative Aerodynamic Particle Diameter (µm)	Particle Density (g/cm^3)
0 µm to 2.5 µm	1.25	2.7
2.5 µm to 10 µm	5	2.7
10 µm to 30 µm	20	2.7

Deposition of particulate emissions from fuel combustion sources (e.g., diesel PM from mining equipment tailpipe exhaust and propane combustion sources for heating and ventilation) were modelled using Method 2. Method 2 requires specifying the fraction (between 0 and 1) of particle mass emitted in the fine mode - less than 2.5 µm, and the representative mass-mean aerodynamic particle diameter (µm). The deposition parameters used to model dry deposition of particulate emissions from combustion sources are provided in Table A-QC4-30-2.

Table A-QC4-30-2 Deposition Parameters for PM Emissions from Combustion Sources

Source Type	Fraction of PM2.5 Emissions (-)	Representative Aerodynamic Particle Diameter (µm)
Mining Equipment Tailpipe Exhaust	0.97 [a]	1.25
Propane Heating and Ventilation	1.0	1.25

Note:
a It is assumed that 97% of Diesel PM is fine particulate matter (PM2.5), based on the US EPA NONROAD model documentation (US EPA 2010. Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-Compression-Ignition. NR-009d).

QC4-31 **For the operating scenario, the maximum concentrations modeled exceed, more than 300 m from the project facilities, the standards and quality criteria of the atmosphere for total particulate matter (PST) and crystalline silica. In accordance with the provisions of section 4.3 of the Instruction Guide on mining projects, since the project is located on public land, only exceedances occurring at sensitive receptors located beyond 300 m from the facilities are considered in the analysis.**

However, by analyzing the location of the sensitive receptors in relation to the modified project, on the map shown in Figure B1-2, the sensitive receptor TRC1_38 is located less than 300 m from the facilities. According to the information in Table 15 of the modeling report, this is a site visited by the population for hunting and fishing. Given its proximity to the project, the proponent must provide additional information concerning the use of this place by the population (e.g.: frequency of use, number of people who use this place and any other information that will make it possible to properly draw up the portrait of this sensitive receptor), because the concentrations modeled for TSPs and crystalline silica, at this point, are likely to exceed the standard and the criteria for the quality of the atmosphere. The proponent must also provide mitigation measures related to the additional information previously provided.

A-QC4-31:

The TRC1_38 sensitive receptor is a trapping area for beaver and other furbearing animals. Bear hunting is also done in this area. The users of the territory only find themselves periodically in this sector and where there is no camp. The modeling results presented in response A-QC4-32 show that only the annual concentrations exceed the applicable criteria. The maximum concentrations over a period of one hour are below the applicable criteria.

QC4-32	**The annual maximum concentration of crystalline silica modeled at the truck stop at kilometer 381 (km 381) on the Billy-Diamond road is 0.149 µg/m³, which corresponds to 213% of the annual criterion. Mining activities contribute 73% (0.109 µg/m³) of the total concentration obtained at the roadhouse at km 381, which already exceeds the annual criterion of 0.07 µg/m³, without even adding the initial concentration of 0.04 µg/m³. To reduce the modeled annual concentrations for crystalline silica at the km 381 truck stop, the proponent must assess additional mitigation measures and their impacts on the concentrations must be determined using modeling.**

A-QC4-32:

The principal naturally occurring crystalline silica exists as quartz in the soil/mineral rock. Crystalline silica is mainly emitted in the atmosphere due to circulation on transport routes. The dust from the vehicle tires is a fugitive dust and the crystalline silica is typically a small part of the dust, i.e., the particulate matter, that becomes airborne.

Crystalline silica emissions presented in the 2021 atmospheric dispersion modeling study were estimated as a percentage of PM_{10} emissions (required for the 1-hour period criterion) and PM_4 emissions (required for the annual period criterion) from fugitive dust sources from the Project, based on the quartz content by weight (wt) in ore (pegmatite) and waste rock (gneiss, basalt and diabase), and assuming that the PM_{10} and PM_4 emitted have the same quartz/crystalline silica content as the in situ content of the lithologies. X-ray diffraction analysis of thirteen samples from the project site (see Appendix F of the 2021 Atmospheric Dispersion Modeling Study) indicates that the measured quartz content in the ore and waste rock is about 26% and 30% (wt), respectively.

The on-site transportation routes are the major contributors to the maximum predicted crystalline silica concentrations in the model domain and at the road relay of kilometer 381 (km 381). The atmospheric dispersion modeling study considers that the Project transport routes are constructed entirely from waste rock from the open pits and that the crystalline silica emissions from these routes have been calculated based on the quartz content (30%) waste rock. In addition, the conservative assumption that emitted PM_{10} and PM_4 have the same quartz/crystalline silica content as the in-situ content of lithologies was re-evaluated in the context of a United States Environmental Protection Agency (US EPA) health assessment study for crystalline silica (US EPA 1996), which investigates the ratio of ambient levels of crystalline silica relative to PM_{10}.

The crystalline silica health assessment study (US EPA, 1996) examines the relationship between PM_{10} and its crystalline silica composition to establish mathematical estimates of airborne crystalline silica concentrations from measured ambient PM_{10} levels. The study shows that the airborne crystalline silica fraction in emitted PM_{10} is smaller than the crystalline silica fraction in the parent soil/mineral source. Based on direct ambient air quality measurements of PM10 and crystalline silica at two quarry sites in central coastal California (Goldsmith 1991) and at 22 metropolitan areas in the US (Davis et al., 1984), the US EPA study concludes that 10% is considered a reasonable upper-bound estimate of the crystalline silica fraction in PM_{10} emissions.

The updated model incorporates the more representative assumption that the crystalline silica fraction accounts for a maximum of 10% of the PM_{10} and PM_4 emissions from fugitive dust sources. The predicted maximum 1-hour average concentrations as well as the predicted annual average concentrations of crystalline silica in the domain model during Project operation have been updated and are presented in Table A-QC4-32-1. The predicted maximum 1-hour average concentrations and predicted annual average concentrations of crystalline silica at sensitive receptors during Project operation are presented in Table A-QC4-32-2.

Table A-QC4-32-1 shows that the predicted maximum 1-hour average crystalline silica concentration in the model domain (17.7 µg/m³) is below the 1-hour criterion and that the predicted maximum annual average concentration (0.133 µg/m³), including the background concentration (0.04 µg/m³), is above the annual criterion. This predicted maximum annual average concentration is estimated at the eastern project site boundary, i.e. at the Billy-Diamond road. Table A-QC4-32-2 shows that the 1-hour criterion was not exceeded at sensitive receptors. It also shows that the modeled maximum annual concentration at sensitive receptors is higher than the annual criterion at a single traditional activity location (0.05 vs. 0.030 µg/m³) located within the project application limits as well as at the road relay at km 381 where the annual criterion is slightly exceeded (0.037 vs. 0.03 µg/m³). The truck stop does not accommodate any permanent residents, it receives travelers and all employees who perform three-week rotations (three weeks on followed by three weeks off); they are therefore only present there 50% of the time. The place of traditional activity where the maximum predicted annual concentration of crystalline silica is greater than the annual criterion (receptor ID TRC1 in Table 15 of the 2021 atmospheric dispersion modeling study) is a hunting area where there is no permanent occupation (dwelling). Therefore, the addendum to the human health toxicological risk assessment (Sanexen, 2021; Appendix R-QC4-32) does not indicate any long-term adverse health effects for this site.

In addition, as described in the Dust Emissions Management Plan (see Appendix E of the 2021 Atmospheric Dispersion Modeling Study, a detailed description of the methods is presented there), the proposed ambient air quality monitoring program for the Project will include ambient air quality monitoring for total particulate matter, PM_{10}, $PM_{2.5}$, crystalline silica and selected metals. A monitoring station will be set up near the road relay at km 381. Crystalline silica will be sampled from filtered PM_4 samples using a PQ100 sampler. The PM_4 fraction will be collected using a sampling flow and a selective head fitted with an appropriate cyclone. The silica analysis will be carried out in a laboratory approved by the MELCC.

Although the monitoring station will be installed in May 2022 to obtain a pre-project reference level, the crystalline silica measurements cannot be used as the initial concentration in the modeling since the detection limit according to the method approved by the MELCC (measurements over 5 days) is at best 0.069 µg/m^3, which just makes it possible to check compliance with the limit value (0.07 µg/m^3). An initial concentration of around 0.04 µg/m^3 could therefore not be measured by this method.

On the other hand, the concentrations of crystalline silica measured in the ambient air during operation will be compared with the concentrations predicted by the model as well as with the applicable ambient air quality criteria. The fraction of crystalline silica in PM_4 will be measured and will validate the hypothesis presented above (fraction of crystalline silica representing a maximum of 10% of PM_{10} and PM_4 emissions). Air quality dispersion modeling for crystalline silica will then be updated. If the modeled annual concentrations for crystalline silica at sensitive receptors still exceed the applicable limit value, additional mitigation measures will be evaluated and their impacts on the concentrations will have to be determined using modelling.

GLCI also commits to present to the MELCC, for approval, a detailed sampling estimate before the start of construction. This estimate will include the exact location of the station, the sampling schedule, as well as the equipment and analytical methods that will be used. Nevertheless, most of the information provided in the sampling estimate is already presented in a preliminary manner in the dust emission management plan (see Appendix E of the 2021 atmospheric dispersion modeling study).

Table A-QC4-32-1 Dispersion model results for crystalline silica during operation, assuming it represents 10% of PM_{10} emissions

Substance	CAS No.	Period	Statistical	Threshold (µg/m³)	Type of Threshold	Authorization	Initial Concentration (µg/m³)	Modeled Concentration (µg/m³)						AERMOD version 21112		
								Maximum per Meteorological Year						Concentration Total[1] (µg/m³)	Contribution of Project[2] (%)	Percentage of Limit[2] (%)
								Y1	Y2	Y3	Y4	Y5	Max.			
Crystalline Silica (SiO_2)	14808-60-7	1 hour	1st Maximum	23	Criterion	MELCC	6	8.66	7.32	7.29	11.7	6.92	11.7	17.7	66%	77%
		Annual	1st Maximum	0.07	Criterion	MELCC	0.04	**0.085**	**0.083**	**0.082**	**0.081**	**0.093**	**0.093**	**0.133**	70%	**191%**

Notes:

[1] The modeled total concentration is the sum of the modeled maximum concentration and the initial concentration.

[2] The percentage of the limit value is the total concentration divided by the limit value, as a percentage.

Values in **Bold** text font and shaded cells represent maximum predicted concentrations greater than the ambient threshold.

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Table A-QC4-32-2 Dispersion model results for crystalline silica at sensitives receptors during operation, assuming it represents 10% of PM_{10} emissions

Substance	CAS No.	Period	Statistical	Threshold (µg/m³)	Type of Threshold	Authorization	Initial Concentration (µg/m³)	Modeled Concentration (µg/m³)					AERMOD version 21112		
								Maximum per Category					Concentration Total[1] (µg/m³)	Contribution of Project[2] (%)	Percentage of Limit[2] (%)
								Road Relay km 381	Cree Camp	Valued Area	Traditional Activity	Max			
Crystalline Silica (SiO_2)	14808-60-7	1 hour	1st Maximum	23	Criterion	MELCC	6	5.74	0.986	1.68	5.59	5.7	11,7	49%	51%
		Annual	1st Maximum	0.07	Criterion	MELCC	0.04	0.037	0.002	0.010	**0.050**	**0.050**	**0,090**	55%	**128%**

Notes:

[1] The modeled total concentration is the sum of the modeled maximum concentration and the initial concentration.

[2] The percentage of the limit value is the total concentration divided by the limit value, as a percentage.

Values in **Bold** text font and shaded cells represent maximum predicted concentrations greater than the ambient threshold.

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8 GHG AND CLIMATE CHANGES

QC4-33	**The total emissions of the project, in the construction phase, are approximately 19,000 t eq. CO_2 over one year, half being attributable to the heating of the camp and approximately 40% coming from mobile equipment. Compared to the quantification presented in 2018, the estimated emissions for the construction phase are lower than initially expected. It should be noted that the report presented in 2021 is for a duration of work of 12 months instead of 18 months, as presented in 2018. According to the ISO 14064 standard, a conservative approach is required when quantifying emissions greenhouse gases (GHGs). According to this approach, the proponent must present the balance of total emissions, i.e. 27.9 kt eq. CO_2, over the total duration of the 18-month construction phase rather than the revised 12-month balance.**

A-QC4-33:GLCI has adjusted the calculations for construction emissions to account for the total amount of fuel used in construction. When considering 18 months of construction, total GHG emissions are approximately 27,317 t CO_2e (refer to Table A-QC4-33-1).

Table A-QC4-33-1 Summary of Estimated Construction GHG Emissions

Activity	Units	CO_2	CH_4	N_2O	Total (expressed as CO_{2e})
Blasting[A]	t/y	152.5	-	-	153
Stationary Combustion[B]	t/y	15,759	0.35	1.29	16,153
On-Road Transportation[C]	t/y	960	0.13	1.10E-05	963
Off-Road Mobile Equipment [c]	t/y	3,749	0.10	0.17	3,803
Shipping of Delivered Supplies (indirect) [c]	t/y	2,916.8	0.12	0.16	2,969
Employee Travel (indirect)	t/y	3,276.8	0.002	0.002	3,278
Total Direct Emissions	*t/y*	20,621	0.59	1.46	21,071
Total Indirect Emissions	*t/y*	6,193.6	0.12	0.17	6,246
Total (direct + indirect)	*t/y*	26,814	0.71	1.63	27,317

Notes:
[A] Based on MAC emission factors (MAC 2014)
[B] Based on ECCC's 2019 Canada's Greenhouse Gas Quantification Requirements (ECCC 2019c)
[c] Based on ECCC emission factors provided in Table A6-14 of the NIR (ECCC 2021b)

QC4-34	**The average annual balance of total GHG emissions during the operating phase decreased by 25,515 t. eq. CO_2 compared to the 2018 impact study. This decrease is mainly attributable to the drop in diesel consumption for mobile sources. More specifically, the following modifications to the project were suggested by the proponent:** • **The size of trucks that will be used on site has been increased, thereby reducing the total number of trucks on site;** • **Waste rock piles were repositioned during project optimization to reduce transportation distances;** • **The acquisition of electric auxiliary vehicles (forklift, bus and van) will also contribute to reducing GHG emissions.**

However, some detailed information is missing to validate these reductions. In fact, table D-3 of the Air dispersion model document (Stantec, 2021) only presents the quantities of fuels (in kilolitres), but not the applicable assumptions. Thus, the proponent must provide the details of the calculations (e.g. the number of truck trips, the mileage, etc.) so that the significant reduction in fossil fuels can be confirmed.

A-QC4-34:

The major difference between the 2018 project and the 2021 project is the diesel consumption for mobile equipment, which has been halved. The average annual diesel consumption calculated for mobile equipment in 2018 was 14,836,850 L, while that of the 2021 project is 7,471,000 L.

This decrease is mainly due to waste rock and tailings storage facilities (WRSTFs) being repositioned and the disposal of waste rock in pit 3, which has reduced distances travelled by the haul trucks. The number of trucks was also reduced, and even though they are larger in size, haul truck consumption has been cut in half.

The project's value engineering process led to a total haulage distance reduction of approximately 25%. However, it is not possible to retrieve detailed 2018 data; the 2018 data file we have shows the estimated fuel volume and cost but does not show the number of trips, nor the distance.

Now, comparing the 2018 development plan to the 2021 development plan, the 25% reduction in total haulage distance is plausible. It is estimated that for the 2021 project, the West WRTSF, the farthest away, require transport over distances between 400 m and 1,500 m while the Northeast, East and Southwest WRTSFs require transport over distances between 200 m and 800 m. In the 2018 project, transport to the Northwest WRTSF would have been made over distances ranging from 600 m to 4,600 m.

The mining plan has also been modified from the 2018 plan. The mining rate was reduced from 14 Mt/y to 10 Mt/y, and two years of mining were added to the mine plan.

Another change resulting in reduced diesel consumption is the trucks that will transport the concentrate to Matagami. However, this change results in a smaller reduction than that of the haulage distances. In 2018, there were an estimated 22 trips per day using 45 t semi-trailers, while in 2021, 10 to 12 trips are expected per day. The trucks planned for the 2021 project are 85 t double-rail semi-trailers, except during the thaw when the limit is 57.5 t. There is a fuel increase per trip of approximately 35% to Matagami and 10% on the return trip when the dumpers are empty, but the number of trips is reduced by 50%.

The length of haulage roads decreasing by 25%, the material extracted annually decreasing by 30% and the reduction in the consumption of concentrate trucks accounts for the 50% reduction in diesel consumption for mobile equipment.

Diesel consumption for stationary equipment remained about the same, as did propane consumption. The consumption of explosives is reduced, but the contribution of explosives to GHG emissions is approximately 1%.

Direct emissions, as calculated, were reduced by a factor equivalent to the diesel reduction factor for mobile equipment, or by approximately half. They went from some 61,232 t CO2 eq. per year to some 35,497 t CO2 eq. per year of operation.

QC4-35	**The estimate of product transport emissions, between Matagami and the processing plant and/or international ports, does not seem to have been taken into account in the emission calculations. All transportation emissions generated by Galaxy Lithium's activities must be considered. The proponent must therefore produce an estimate of the product transport emissions between Matagami and the processing plant and/or international ports.**

A-QC4-35:

The emissions from train shipment of concentrate from Matagami to Trois-Rivières was omitted. However, it has been quantified by WSP (2019). WSP's (2019) estimate of the rail emissions were 2,629 t CO2e. This is still a valid estimate of the emissions based on the Project Description. It should be noted that the reference consulted for GHG emissions from rail transportation (Railway Association of Canada, Locomotive Emissions Tracking Program, 2019) gives only an overall factor in CO2eq, CH4 and N2O emissions from rail transportation cannot be determined.

QC4-36	**The proponent must produce a quantification of GHG emissions related to deforestation and the disturbance of wetlands. The methodology used for the quantification of deforestation is provided in the appendix to this document.** **The proponent must produce a quantification of carbon fluxes for the period during and after mining activities due to land use change (CAT). It must also present a plan to mitigate the net GHG emissions associated with the CAT (plan and quantify mitigation measures). For information, the aerial and underground parts of the entire affected territory are included in the carbon quantification calculations.**

A-QC4-36:

The quantification of GHG emissions related to deforestation and wetland disturbance, which is calculated just once and attributed to the construction phase, is presented in Appendix A-QC4-36.

QC4-37	**Good practice requires taking into account the potential impacts of climate change on the stability and behavior of infrastructures. It is necessary to specify the various elements that have been taken into account in order to reduce these impacts. It is mentioned in section 4.9.1 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) that an increase in freeboard of 0.5 m would be sufficient to take into account the impacts of climate change on the mine infrastructure, but that "no other additional calculations have been made to determine the height of the freeboard. » The promoter must present any calculations made to determine the height of the freeboard.** **In addition, still in section 4.9.1, the proponent does not take into account the other components that could be at risk, in particular the infrastructure for managing surface water. However, the document *Tailing, Waste Rock, Overburden and Water Management Facility Preliminary Engineering Design* (Golder, 2021) mentions the other components that could be at risk, particularly in terms of increased precipitation depending on the season. Since the content of section 4.9.1 of the impact study and that of the report by Golder (2021) do not match, the proponent must specify the measures it intends to take to ensure that all of the infrastructure can cope with anticipated climate change.**

Among the adaptation and mitigation measures proposed in Table 9 of the *Preliminary Assessment of the Project's Climate Resilience – Version 2* (WSP, 2021), some include a safety factor based on the millennial flood. Since this flood is calculated on historical data, it does not take into account the future climate. It will therefore be expected to increase in the future with the expected increase in precipitation.

The report entitled *Analyse de risques et de vulnérabilités liés aux changements climatiques pour le secteur minier québécois*[4] is an essential reference for identifying the issue of climate change specifically for mining sites, this being focused on Quebec with details relating to northern regions including James Bay. This report presents more precise regional climate data developed by the Ouranos Consortium for the Matagami-Chibougamau sector.

The proponent must therefore ensure that its flood calculations take into account recent climate data, which are already marked by climate change, or even amplify its safety factor by increasing the value of the maximum flood. The sponsor must then update Table 9 with these new data.

A-QC4-37:

The design of the basins considers a minimum freeboard of 1 m between the level reached during a project flood and the crest of the dikes, as recommended by Directive 019. As shown in Appendix B, Table 6 of the *Tailings, Waste Rock, Overburden and Water Management Facility Front End Engineering Design* report prepared by Golder (2021) and set out in Appendix R-QC4-8-1, the project flood, equivalent to a 24-hour precipitation from a 1000-year return period (121.2 mm[5]) and 30-day snowmelt from a snow accumulation of a 100-year return period (350.0 mm), is less than 1 m. The emergency spillways will also be designed (during a future phase) to ensure a 0.5 m freeboard between the level at the maximum probable flood (MPF) and the crest of the dike.

The design events shown in the climate study and set out in Appendix C of the *Tailings, Waste Rock, Overburden and Water Management Facility Front End Engineering Design* report, prepared by Golder (2021), include an 18% increase for extreme precipitation events, as recommended by the design code for a stormwater management system eligible for a declaration of conformity (Government of Quebec). It should be noted, however, that the water equivalent of the 100-year snow cover is not increased because Ouranos studies anticipate a reduction in snow cover due to shorter winters. These increases were also considered in the development of the 100-year and 1000-year flood values (Table 6 in Appendix B and Table 7 in Appendix C of the Golder report, 2021).

As mentioned in section 1.4 and set out in sections 2.2 and 2.3 of the *Évaluation préliminaire de la résilience climatique du projet* [*Preliminary Assessment of Project Climate Resilience report] – Version 2* (WSP, 2021), Ouranos' climate portrait for the Matagami – Chibougamau region was considered and enhanced by other data even more specific to the study site.

Finally, this same report takes into account the *Analyse de risques et de vulnérabilités liés aux changements climatiques pour le secteur minier québécois [Climate Change Risk and Vulnerability Analysis for the Quebec Mining Sector]* report to develop the list of potential impacts mentioned. Therefore, there is no need to update Table 9 since the 18% increase was integrated into the project during the climate risk assessment. Consequently, the adaptation and mitigation measures set out in Table 9 are still adequate.

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4 Unité de recherche et de service en technologie minérale de l'Université du Québec en Abitibi-Témiscamingue (URSTM-UQAT). 2017. Analyse de risques et de vulnérabilités liés aux changements climatiques pour le secteur minier québécois PU-2014-06-913 – Rapport final. 106 pages + 5 annexes https://mern.gouv.qc.ca/wp-content/uploads/analyse-changements-climatiques-secteur-minier.pdf

5 En considérant une majoration de 18% pour considérer les projections des changements climatiques.

6 Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC), 2021. *Fiche d'information: Accumulation de résidus miniers dans une fosse à ciel ouvert — Protection des eaux souterraines*. Québec. 3 pages. Disponible en ligne: https://www.environnement.gouv.qc.ca/eau/souterraines/fiche-info-accumulation-residus-miniers.pdf

QC4-38	**The proponent indicates in the *Environmental Impact Assessment, Version 2* (WSP, 2021) that the connection to the 315 kV line would add two years to the project schedule, and has therefore retained its connection plan to the 69 kV line. For the shortfall of 0.401 MW, the promoter emphasizes having considered renewable energies, in addition to propane. In appendix R-12 of the document *Answers to questions and comments received from the MELCC as part of the analysis of the Environmental Impact Assessment* (WSP, 2019), the firm Tugliq states that the very low irradiation solar in the region does not encourage the installation of solar infrastructures. However, the average wind speed on the site (7 to 7.5 m/s) would be within the operating range of the wind turbines. Tugliq called wind power economically viable, but added that it could not be a stable source of energy. In contrast, Schedule R-12 simply compares wind or solar power to a hydro hook-up that meets 100% of the mine's electricity demand.** **As requested in QC-12 and QC2-4, the proponent must present a technical and economic assessment of the wind power potential as a back-up source, for a capacity similar to that filled by propane.**

A-QC4-38:

GLCI asked Econoler, a group of consultants specializing in energy efficiency, to evaluate the potential for replacing propane with wind power. The report is included in Appendix A-QC4-38. The report mentions that replacing 100% of the propane with a wind farm would require oversizing the wind farm and its batteries to meet the maximum winter consumption. The additional energy generated in the summer would be unnecessarily more expensive than the cost of available hydroelectricity. A scenario that replaces 100% of summer needs with a 1 MW wind farm would reduce GHG emissions from propane by 23.8%, or 851 tonnes per year. It would cost between $285 and $385 to avoid the emission of 1 tonne of GHGs.

For reference, carbon pricing in Canada is $50/t eq. CO2 in 2022 and is expected to reach $170 per tonne by 2030. In Quebec, the cap-and-trade system (CATS) was awarded a selling cost of $37.14/t eq. CO2 in 2022.

QC4-39	**In the document *Environmental Impact Assessment, Version 2* (WSP, 2021), the proponent indicates that it will purchase electrical equipment, i.e. the acquisition of a forklift, two buses and nine electric vans. In addition, the promoter will set up a technological watch for the other diesel equipment, in anticipation of their replacement in 10 years. The promoter must undertake to present the results of the technology watch, for information, to the Administrator.** **Renewable energies might not be technically profitable, at first sight. However, many initiatives have been set up to encourage the establishment of renewable energy infrastructure in the mining sector. The Government of Quebec has set up the *Programme d'appui à la recherche et à l'innovation du domaine minier*, the objective of which is to financially support mining companies in innovation and improving their competitiveness, according to one or more dimensions of sustainable development. In addition, the Electrification and Climate Change Fund finances several programs aimed at reducing GHG emissions that could apply to the energy component of the project (e.g. EcoPerformance). At the federal level, *Natural Resources Canada's Clean Growth Program, Energy Innovation Program, Green Infrastructure Program* and *Smart Renewables and Electrification Pathways Program* provide funding, grants and incentives to encourage research, demonstration and development of a clean economy.**

The promoter must produce a new technical and economic analysis (including all the calculation details) which takes into account these different programs and aid on renewable energy options. This analysis must take into account the use of renewable energy as a back-up source and the evolution of the cost of electrical equipment by the 2030s. If necessary, the promoter must provide an exhaustive justification of his energy choice.

The proponent must also update Table 3-8 of the impact study, in order to reflect a fairer comparison of electrical equipment versus diesel-powered equipment.

A-QC4-39:

GLCI asked InnovExplo, a group of engineers specializing in mining projects, to create an inventory of available and future zero-emission mining equipment and heavy machinery capable of replacing the fleet currently planned for the project. This report is included in Appendix A-QC4-39.

The report provides an overview of electric, hybrid and hydrogen technologies. It lists the equipment currently available and the prototypes under study. It summarizes the main constraints including, with regard to hydrogen, the supply of fuel; with regard to electricity, the energy requirements to charge the batteries and the substantial reduction in battery life during cold weather, as well as the short life of the batteries. Additionally, since each equipment manufacturer develops prototypes for different equipment, mining companies would end up with stocks of parts from different manufacturers, which would be very difficult to manage.

The report concludes that manufacturers are not ready to supply the electrical version of equipment for the mining industry and that when they will be ready, increased electricity consumption by the mining sites is to be expected for charging the batteries of the equipment.

In our case, Hydro-Québec cannot supply all of the requirements, and the current fleet includes electric versions of light trucks and buses.

9 HYDROLOGY AND HYDROGEOLOGY

QC4-40	**In Section 7.2.3 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) it is stated: "The watersheds of the CE1 and CE6 watercourses are not impacted by the project. Considering natural runoff, the catchment area of the CE2 stream is reduced by 16%. However, since it will receive mining effluent, its total area will increase by 340%. » Table 7-6 shows an increase in the watershed area of the CE stream by 34%.** **The proponent must indicate whether the difference in area of the watershed of watercourse CE2 attributable to mine runoff is 34% or 340%.**

A-QC4-40:

The difference in area of the CE2 watershed attributable to mine runoff is 34% as indicated in Table 7-6 of the Environmental Impact Assessment, Version 2 (WSP, 2021).

QC4-41	**As part of the analysis of the project's impacts on the hydrology and hydraulics of the watercourses in the study area, climate change was not included in the calculation of the flows presented (except in effluent discharge rates, for which climate change is included). The proponent indicates that this choice was made in order to highlight the impacts of the project, by isolating them from the impacts due to climate change, which would occur even in the absence of the project.** **However, based on the information presented in the GHG and climate change section of the document, it can be expected that extreme precipitation events will be more frequent and of greater intensity, which would therefore result in a tendency to the increase in peak flows of watercourses in the sector due to extreme rainfall events. These qualitative considerations on the effect of climate change were taken into account in the evaluation of the impact of the project. On the other hand, for the CE2 watercourse, we can expect the forecast increase in flows to be a little greater than that presented.** **The proponent must indicate the expected qualitative effect of climate change on the low flow rates of watercourse CE2.**

A-QC4-41:

Given the current state of knowledge, there is no clear trend in winter, but one could still expect a slightly less sustained winter low-water period given the expected increase in precipitation and winter temperatures.

With respect to the summer low-water period, in general, we can expect to see their intensity and frequency increase, although on average, the mean precipitation should be somewhat higher.

Finally, considering the impacts of the project on the CE2 watercourse during low water periods, the projected increase in flows should partially offset the effects of climate change on this stream.

QC4-42	**In table 7-15 of section 7.3.4 of the document *Environmental Impact Assessment, Version 2* (WSP, 2021), it is indicated as impacts for the watercourse CE2 that there will be in winter a decrease in mean monthly and low water flows. At the same time, Table 7-8 in Section 7.2.3 of the same document shows an increase in annual low flows and average monthly flows for the winter season.** **Given this contradictory information, the proponent must confirm the impacts of the project on the average monthly and low-water flows in the winter period. It must, where applicable, present the corrected information in Table 7-8.**

A-QC4-42:

Table 7-15 in Section 7.3.4 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) has been modified to reflect the conclusions of Table 7-8 from Section 7.2.3 of the same document.

Thus, we can now see from the revised Table 7-15 an increase in annual low-water flows and average monthly flows for the winter season in the CE2.

Table 9-1 (revised) Project impact on streams and water bodies in the study area

STREAMS / WATER BODIES	IMPACT SOURCE	DESCRIPTION OF ANTICIPATED IMPACTS ON THE AQUATIC ENVIRONMENT	IMPACT ON FISH AND FISH HABITAT
Kapisikama Lake	Decrease in watershed size and groundwater drawdown due to pit dewatering activities	Gradual drying up of the lake, **from the fourth year of work**	Loss of 12 220 m^2 of fish habitat
CE1	No Impact	Not Applicable	Not Applicable
Asini Kasachipet Lake	**No Impact**	**Not Applicable**	**Not Applicable**
CE2	Presence of mine effluent and decrease in natural flow over a portion of the watershed	Summer Increase of flows Increase in average levels of water and of low-water levels. Flooding Increase of flows Increase in levels Increase in flow speeds Winter **Increase** in average levels of water and of low-water levels Imperceptible effect on levels	No changes in habitat functions are expected. Increased flow rates should not cause erosion or morphological changes in the stream.
CE3	Decrease in natural flow over a portion of the watershed	Decrease in average low-water and flood flows. Small level reduction between the Asini Kasachipet lake and the **S1 and S1 segments** which fades **downstream**.	No changes in habitat functions are expected. Despite an expected decrease in flows (average and low-water) over **two segments**, these changes will only bring a slight decrease in levels.
CE4	Decrease in watershed size and groundwater drawdown due to pit dewatering activities	Decrease in all flows, **mainly** for low-water periods Downstream of the Billy-Diamond Road, decrease in low-water levels for the first 350 m. This decrease gradually fades after 1,500 m.	The decrease in water level could result in a loss of fish habitat during low-water periods. However, due to the shape of the channel (U-shaped), this decrease is expected to result in a limited surface reduction.
CE5	Decrease in watershed size	Small decrease in flows resulting in imperceptible changes in level	No changes in habitat functions are expected.
CE6	Decrease in watershed size	Decrease of the various flows	Despite an expected decrease in flows, these changes will only bring about a slight local decrease in levels. No changes in habitat functions are expected.

Note: Only the downstream portion of the Billy-Diamond Road culvert is considered fish habitat for the CE4 watercourse.

QC4-43	**The flows presented in table 6-12a of section 6.2.7.3 of the document *Environmental Impact Assessment, Version 2* (WSP, 2021) seem to have been measured downstream of the watercourses. It is essential that these flows are measured/estimated at the effluent discharge point (process water and domestic water). A measurement taken at the limit of the watersheds of each of the watercourses is not acceptable, because it is not representative of the actual flow at the discharge points.** **The proponent must present the average monthly flows and the low water flows upstream of the discharge points for each of the effluents.**

A-QC4-43:

Mean monthly flood and low-water flows in the CE2 at the right of the expected mine effluent (4.1 km² watershed) are presented in Table A-QC-4-43-1 while the mean monthly flood and low-water flows in the CE3, at the right of the expected sanitary effluent (3.6 km² watershed) are presented in Table A-QC4-43-2.

Table A-QC4-43-1 Mean monthly flood and low-water flows in CE2 art the right of the mine effluent

Mean Monthly Flows (L/s)	
January	38
February	29
March	25
April	30
May	130
June	132
July	90
August	94
September	92
October	105
November	93
December	62
Flood Flows (m³/s)	
2 years	0.30
10 years	0.52
25 years	0.62
50 years	0.70
100 years	0.77
Low-water Flows (L/s)	
Q2,7annual	7
Q10,7annual	3
Q5,30annual	5
Q2,7summer	17
Q10,7summer	7
Q5,30summer	16

Table A-QC4-43-2 Mean monthly flood and low-water flows in the CE3 At the right of the sanitary effluent

Mean Monthly Flows (L/s)	
January	34
February	26
March	22
April	26
May	114
June	115
July	78
August	82
September	80
October	91
November	81
December	54
Flood Flows (m^3/s)	
2 years	0.35
10 years	0.58
25 years	0.69
50 years	0.77
100 years	0.85
Low-water Flows (L/s)	
Q2,7annual	6
Q10,7annual	3
Q5,30annual	4
Q2,7summer	15
Q10,7summer	7
Q5,30summer	14

QC4-44	**In section 7.2.1 of the *Hydrology Specialist Study Update* (WSP, 2021), an arbitrary concentration of 100 mg/l was used in predictive studies of groundwater and surface water quality. It would have been preferable to use the results of the kinetic tests. The promoter must justify this choice. If the justification is not sufficient, he will have to repeat the calculations with the results of the kinetic tests.**

A-QC4-44:

This concentration was used for the sole purpose of easily reporting concentrations as a percentage; the concentration of 100 mg/l (100%) representing the maximum value of the kinetic test. This method could be used since modelling was performed without any delay or adsorption parameters associated with a chemical parameter, as required by the MELCC.

The simulation performed is more conservative than if kinetic test results had been used. With regard to modelling, the maximum concentration (equivalent to 100%) was actually applied for one year after the last tailings deposit.

For example, for arsenic, the results of the kinetic tests show that the concentration after 50 weeks is 0.05 mg/l. However, in the modelling, a concentration of 0.4 mg/l (100%) was left for 52 weeks. Thus, after 52 weeks, using the concentrations from the kinetic tests, we would have obtained concentrations less than 0.05 mg/l across all the WRSTFs (shown in blue on Map 15 of the document *Mise à jour de l'étude spécialisée sur l'hydrologie [Update of the specialized study on hydrology*] (WSP, 2021)). In the modelling performed, concentrations above 0.1 mg/l are observed at the WRSTFs, even after 50 years. It is therefore not necessary to rerun a model as the one carried out is more conservative.

10 GROUNDWATER

QC4-45	**The proponent presents in section 6.2.8.2 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) the choice of parameters retained for the groundwater analysis. The choice of parameters was based on the risks associated with the use of the site and on the requirements of Directive 019. It is essential to document the phosphorus concentrations during the initial characterization of the groundwater of a new mine. This makes it possible to decide whether, according to the monitoring results, an environmental discharge objective (EDO) is necessary for this parameter. Accordingly, the sponsor should add phosphorus to the list of analytical program parameters.** **In the absence of this information (concentration of phosphorus in groundwater) for this project, monitoring of phosphorus will be required at the final effluent. The results of this monitoring should be compared with a threshold value of 0.3 mg/l.**

A-QC4-45:

GLCI is committed to carrying out groundwater sampling in the summer of 2022 in order to document the phosphorus concentrations of groundwater before construction of the mine site begins. In addition, GLCI undertakes to monitor phosphorus in the final effluent that will be discharged into the CE2 as well as into groundwater.

QC4-46	**The proponent must provide the information indicated in the MELCC information sheet *Accumulation de résidus miniers dans une fosse à ciel ouvert — Protection des eaux souterraines*[6], as part of the application for authorization under Article 22 of the Act. on the quality of the environment concerning the management of mine tailings, including the establishment and operation of a mine tailings accumulation area.**

A-QC4-46:

GLCI commits to provide the information indicated in the MELCC information sheet *Accumulation de résidus miniers dans une fosse à ciel ouvert — Protection des eaux souterraines*, as part of the authorization request under Article 22 of the law on the quality of the environment concerning the management of mine tailings, including the establishment and operation of a mine tailings accumulation area.

During the first years of operation, the mine tailings will be accumulated in the dumps provided for this purpose. The authorization request under Article 22 will be made accordingly. The beginning of the accumulation of tailings in the pit is scheduled for year 8. During this authorization request, all the information indicated in the MELCC sheet *Accumulation de résidus miniers dans une fosse à ciel ouvert — Protection des eaux souterraines* will then be supplied.

6 Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC), 2021. *Fiche d'information: Accumulation de résidus miniers dans une fosse à ciel ouvert — Protection des eaux souterraines*. Québec. 3 pages. Disponible en ligne: https://www.environnement.gouv.qc.ca/eau/souterraines/fiche-info-accumulation-residus-miniers.pdf

11 SOILS

QC4-47	**The document *Mise à jour de l'étude spécialisée sur la teneur de fond naturelle dans les sols* (WSP, 2021) defines two (2) types of soil layers: fine sand and gravelly sand. The fine sand is "fine sand to silty sand, with some gravel in places". Gravelly sand is "gravelly sand to sand and gravel, with pebbles and sometimes boulders". According to the samples retained for the calculation of the values of the background content, some samples do not resemble their type of soil layer. For example, the case of the sample identified TR-24-PM3 is described as a "Sand and gravel" should not be associated with the fine sand layer. The sample identified as TR 05-PM1 and described as "Fine to coarse sand, traces of gravel" should not be associated with the gravelly sand layer. The proponent must review the distribution of samples and redo the calculation of values.**

A-QC4-47:

The document *Mise à jour de l'étude spécialisée sur la teneur de fond naturelle dans les sols* (WSP, 2021)) has been revised and the calculations of the values have been redone according to the requested sample distribution. The document is presented in Appendix A-QC4-47.

The samples TR-04-PM1, TR-05-PM1, TR24-PM2, TR26-PM2 et TR36-PM2 that were considered in the gravel sand unit are now associated to the fine sand unit. Sample TR24-PM3 that was considered in the fine sand unit is now associated to the gravel sand unit. Moreover, all samples that were taken in the trenches, which were analyzed as part of the SEA Phase II, were all considered in the fine sand unit. The calculations of the natural background content in the soils were redone taking into account the adjustments made in the allocation of the samples to the 2 units. The results of the updated natural background content are presented in Tables 6 and 7 of the report (also presented below). These results have also been updated in the baseline chapter of the EIA, Version 2 (see answer to question QC4-49 below). These modifications do not lead to any changes in the impact assessment.

TABLEAU 6

Calcul des teneurs de fond - Unité de sable graveleux

Mise à jour de l'évaluation de la teneur de fond naturelle en métaux

Mine de lithium Baie-James

N/Réf : 201-12362-00

	Aluminium (mg/kg)	Baryum (mg/kg)	Calcium (mg/kg)	Fer (mg/kg)	Lithium (mg/kg)	Magnésium (mg/kg)	Manganèse (mg/kg)	Potassium (mg/kg)	Silicium (mg/kg)	Sodium (mg/kg)	Strontium (mg/kg)	Titane (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
Calcul de la teneur de fond														
- Moyenne des données lognormales	8,33	3,45	7,24	8,93	1,39	7,59	4,27	6,55	6,41	4,18	1,90	6,16	2,80	2,12
- Écart-type des données lognormales	0,54	0,35	0,36	0,42	0,57	0,44	0,41	0,48	0,53	0,63	0,32	0,30	0,40	0,37
- τ (P;n;α)	2,005	2,005	2,022	2,005	2,005	2,005	2,005	2,005	2,081	2,042	2,081	2,0055	2,002	2,005
Teneur de fond - Distribution log-normale	12194,0	63,5	2881,0	17749,6	12,7	4813,7	163,9	1821,5	1822,1	235,4	13,1	864,9	36,7	17,4
Calcul de la teneur de fond														
- Moyenne des données normales	4796,00	29,97	1482,00	8211,00	4,79	2178,00	78,10	778,90	710,90	113,20	7,09	496,50	19,20	10,99
- Écart-type des données normales	2806,00	13,46	499,80	3158,00	2,85	996,60	36,26	389,60	478,50	38,20	2,68	165,30	6,24	1,98
- τ (P;n;α)	2,005	2,005	2,022	2,005	2,005	2,005	2,005	2,005	2,081	2,042	2,081	2,0055	2,002	2,005
Teneur de fond - Distribution normale	10422,0	57,0	2492,6	14542,8	10,5	4176,2	150,8	1560,0	1706,7	191,2	12,7	828,0	31,7	15,0
Teneur de fond - Vibrisse supérieure	11307,5	50,0	2410,0	15682,5	10,5	4752,5	149,5	1602,5	1356,3	127,5	12,5	847,8	28,8	15,0

: Valeur retenue (vibrisse supérieure)
: Méthode applicable
: Méthode non applicable

TABLEAU 7

Calcul des teneurs de fond - Unité de sable fin

Mise à jour de l'évaluation de la teneur de fond naturelle en métaux

Mine de lithium Baie-James

N/Réf : 201-12362-00

	Aluminium (mg/kg)	Baryum (mg/kg)	Calcium (mg/kg)	Fer (mg/kg)	Lithium (mg/kg)	Magnésium (mg/kg)	Manganèse (mg/kg)	Potassium (mg/kg)	Titane (mg/kg)	Vanadium (mg/kg)
Calcul de la teneur de fond										
- Moyenne des données lognormales	8,05	2,63	7,00	8,47	3,49	7,13	3,78	6,00	5,95	2,52
- Écart-type des données lognormales	0,58	0,60	0,53	0,50	1,11	0,47	0,49	0,69	0,33	0,40
- τ (P;n;α)	2,032	2,032	2,167	2,032	2,032	2,032	2,032	2,032	2,032	2,032
Teneur de fond - Distribution log-normale	10203,9	46,8	3487,7	13241,3	313,1	3255,7	118,5	1621,3	746,6	28,2
Calcul de la teneur de fond										
- Moyenne des données normales	3764,00	22,75	1252,00	5423,00	3,56	1384,00	49,18	501,30	403,50	16,60
- Écart-type des données normales	2572,00	6,77	631,40	2963,00	1,70	653,50	25,37	347,30	131,10	3,38
- τ (P;n;α)	2,032	2,032	2,167	2,032	2,032	2,032	2,032	2,032	2,032	2,032
Teneur de fond - Distribution normale	8990,3	36,5	2620,2	11443,8	7,0	2711,9	100,7	1207,0	669,9	23,5
Teneur de fond - Vibrisse supérieure	7 555,0	27,5	3 175,0	12 160,0	8,9	2 788,0	115,0	1 204,0	684,0	20,0

: Valeur retenue (vibrisse supérieure)

: Méthode applicable

: Méthode non applicable

QC4-48	**The 2021 survey logs appear to be missing from the *Mise à jour de l'étude spécialisée sur la teneur de fond naturelle dans les sols* (WSP, 2021). The proponent must provide the survey logs to demonstrate the adequacy of the samples from this campaign to the types of soil layers.**

A-QC4-48:

The reports from the surveys conducted in 2021 have been added to the appendix of the revised *Mise à jour de l'étude spécialisée sur la teneur de fond naturelle dans les sols*, presented in Appendix A-QC4-47.

QC4-49	**In the document *Mise à jour de l'étude spécialisée sur la teneur de fond naturelle dans les sols* (WSP, 2021), each concentration must correspond to the calculated value and not to its criterion A. When the value of the concentration of a sample is under the detection limit, it is then the value of this limit which must be used for the calculation. The calculations and table in Section 6.2.9.1 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) should be revised accordingly.**

A-QC4-49:

For the background content calculations, the detection limit value was taken into account for samples with a concentration below it. Criterion A was not used in any calculations.

When the number of values below the detection limit was too high, no background content was calculated and criterion A defined for the geological province will be considered during rehabilitation. In addition, in the majority of cases, the laboratory detection limit corresponds to the value of criterion A.

However, in response to question QC4-47, the document *Mise à jour de l'étude spécialisée sur la teneur de fond naturelle dans les sols [Update of the Specialized Study on Natural Background Content in Soils]* (WSP, 2021) has been revised and the calculations of the values have been redone according to the distribution of samples requested. The amendments were also applied to section 6.2.9.1 of Environmental Impact Assessment , Version 2 (WSP, 2021). The only changes made are the number of samples considered and the concentration of some metals; they are underlined in the text and in Table 6-18 below.

6.2.9.1 SOIL

NATURAL BACKGROUND LEVELS

Evaluation of soil quality in the study area was based mainly on *Lignes directrices sur l'évaluation des teneurs de fond naturelles dans les sols* (Ouellette, 2012) and on *Guide de caractérisation physicochimique de l'état initial des sols avant l'implantation d'un projet industriel* (MDDELCC, 2015). Natural background levels (NBLs) were determined based on soil samples taken at **114** soil sampling sites (66 exploration trenches and 10 drilling sites) spread out over the study area (Map 6-4).

The surveys were conducted in areas unaffected by anthropogenic activities, based on available information. In addition, samples were taken from natural, undisturbed stratigraphic units. The updated Soil Background Concentration Technical Study *(L'Étude spécialisée sur la teneur de fond naturelle dans les sols)* (WSP, 2021a**)** details the methodology used, the work carried out and the results obtained.

Four stratigraphic units are frequently found in the natural soils of the study area. First, a horizon of topsoil or peat is present at the surface. Beneath this unit, the natural soils are made up of an alternation of three main stratigraphic units. The first is composed of coarse sand to sand and gravel, containing pebbles and sometimes blocks. The second unit is composed of fine sand to silty sand, containing a little gravel in places. Last, a third unit of silt to clayey silt is sometimes found, mainly at depths. Thus, the calculations leading to the determination of NBLs were conducted using analysis results obtained on stratigraphic units described as being coarse sand (67 samples) and fine sand (57 samples), these being more widespread and thus most representative of the soils in the study area.

A separate statistical analysis was performed on the two stratigraphic units considered—the coarse sand unit and the fine sand unit—to establish the background levels. This analysis was carried out based on the analysis results of total metal contained in the soil samples. The NBLs were assessed based on the statistical analysis. The calculated values provided an initial level representative of the natural environment. Because of the substantial proportion of samples below the laboratory limit of detection (LOD), the following parameters were excluded from the analysis: antimony, silver, arsenic, cadmium, chromium, cobalt, copper, tin, mercury, molybdenum, nickel, lead and selenium.

The statistical analysis was thus performed for aluminum, barium, calcium, iron, lithium, magnesium, manganese, potassium, titanium and vanadium. Silicon, sodium, strontium and zinc were also analyzed, but only for the coarse sand unit.

Normal background levels were calculated for these parameters using the upper whisker method. The NBL was also assessed for each parameter analyzed by setting the upper confidence limit at 95% of the 95th percentile of the distribution of levels. For the parameters for which an adjusted NBL was not calculated, the generic criterion "A" of the *Guide d'intervention* was set as the natural background level. The results obtained are presented in Table 6-18.

The results of the chemical analyses obtained on the coarse sand unit samples showed levels higher than the background levels established for the Superior Geological Province (generic "A" criteria) for two parameters: arsenic (two samples) and hexavalent chromium (six samples). For hexavalent chromium (Cr VI), two samples showed levels that fell between two criteria—"B" and "C"—and four samples showed levels above the "C" criterion. For the fine sand unit, the chemical analysis results also showed concentrations above generic "A" criteria for arsenic (two samples) and above the "B" criterion for Cr VI (one sample). For all the other parameters analyzed, no generic criterion is defined in the MDDELCC Guide.

CONCENTRATION IN HEXAVALENT CHROMIUM

During the 2018 characterization, three analyzed samples showed Cr VI levels that fell between the "B" and "C" criteria and four showed Cr VI levels above the "C" criterion. After these were detected, the MELCC requested a special analysis for Cr VI in order to define the extent of its presence in the soil (WSP, 2021b).

In 2020, concentric samples were taken around three trenches that showed levels of hexavalent chromium that exceeded the Guide d'intervention's generic "B" criterion in 2018. All samples collected from a 50 m radius around the three trenches showed hexavalent chromium levels below the Guide d'intervention's generic "A" criterion, when analyzed using ion-exchange chromatography. It is possible that levels detected in samples during characterization in 2018 can be attributed, in full or in part, to interference from the method of analysis used (colorimetry).

It therefore seems reasonable to conclude that the higher Cr VI concentrations obtained in 2018 can be attributed to false positives from the method, or at least, that the results of this additional characterization demonstrate that this higher hexavalent chromium level, if it existed, was an isolated event limited to three sectors investigated. Consequently, there is no reason to believe that there is a hexavalent chromium problem on the site.

REMOTE LANDFILL

A Phase II Environmental Site Assessment (ESA) was done in summer 2017 at the remote landfill close to the project site (Map 6-4) (WSP, 2018d). According to the results of the assessment, the estimated volume of buried residual materials (paper, plastic, metal, wood, fabric) is 756 m^3.

Soils with levels of C_{10}-C_{50} petroleum hydrocarbons and total sulphur exceeding the generic "A" criteria of the MDDELCC *Guide d'intervention* and with levels of metals exceeding the limits set out in Schedule I of the *Regulation respecting the landfilling and incineration of residual materials* (RLIRM) were updated during the work. These soils, the preliminary volume estimate of which is approximately 3,000 m^3, are in contact with the residual materials of the remote landfill and are considered non-compliant for an industrial site because of their level of lead.

Also, soils whose surface level of chromium VI lay in the "B-C" range of the generic criteria were also updated in the survey performed at the base of a heap of treated-wood poles. The volume associated with this type of contamination was assessed at 5 m^3.

Table 11-18 Calculation of background levels of metals in soils

Parameter/Lithological unit	Natural background level (mg/kg)	
	Coarse sand unit	Fine sand unit
Aluminum	11,307.5	7,555.0
Antimony	-	-
Silver	0.5	0.5
Arsenic	5	5
Barium	50	27.5
Cadmium	0.9	0.9
Calcium	2,410.0	3,175.00
Chromium	100	100
Cobalt	30	30
Copper	65	65
Tin	5	5
Iron	15,682.5	12,160.0
Lithium	10.5	8.9
Magnesium	4,752.5	2,788.0
Manganese	149.5	115.0
Mercury	0.3	0.3
Molybdenum	8	8
Nickel	50	50
Lead	40	40
Potassium	1,602.5	1,204.1
Silicon	1,356.3	-
Selenium	3	3
Sodium	127.5	-
Strontium	12.5	-
Titanium	847.8	684
Vanadium	28.8	20.0
Zinc	15.0	150

LEGEND:

100 : NBL value = *Guide d'intervention* criterion "A"

100 : NBL value updated from the version presented in the EIA, Version 2 (WSP, July 2021)

100 : NBL value calculated using the upper whisker method

QC4-50	**The proponent indicates in the technical note *Caractérisation complémentaire des sols pour les teneurs en Cr VI – Résultat de caractérisation de l'été 2020* (WSP, 2021) that it appears reasonable to conclude that the higher Cr VI concentrations are attributable to false positives of the method, or at least, the results of the additional characterization show that this higher concentration of hexavalent chromium, if it exists, would be isolated at the level of the three sectors investigated.** **Although there were additional samples taken and analyzed near the three points indicating the presence of Cr VI, there were no additional samples taken directly at these points. It would have been preferable to take samples directly from these points to determine if the contamination is still present there. As this was not carried out, an opinion from a chemist is necessary to affirm that the values detected in Cr VI are due to the method of analysis. The sponsor must provide an opinion from a chemist so that the hypothesis that the concentration detected is attributable to a false positive of the method. Otherwise, the interpretation of the results must conclude that there is hexavalent chromium contamination.** **That said, the proponent must address the presence of hexavalent chromium in the project assessment (section 7.2.1 of the *Environmental Impact Assessment, Version 2* (WSP, 2021)). The proponent must indicate the measures planned for the eventual management of these contaminated soils.**

A-QC4-50:

The initial hypothesis explaining the concentrations of hexavalent chromium (CrVI) and which was presented in response to the first series of questions from the MELCC (WSP, July 2019) was that of natural concentrations in the soil. Following this response, a second request from the MELCC demanded that this theoretical argument be validated in the field. In response to this second request, an additional characterization was therefore carried out. At that time, it was deemed unnecessary to take samples from the same location since the concentrations were considered natural. Samples were therefore taken in the area to determine the presence of CrVI.

The absence of CrVI in all the samples taken in July 2020 during the additional characterization led us to believe that the concentrations detected in the 2018 samples are attributable to interferences in the analytical method (false positives). This hypothesis is supported in the scientific literature. Indeed, as mentioned in the technical note *Caractérisation complémentaire des sols pour les teneurs en CrVI – Résultat de caractérisation de l'été 2020* (WSP, 2021), it is recognized that the analysis of CrVI by colorimetry is subject to interference leading to CrVI concentrations that can be up to three times higher than the values measured by ion chromatography[7,8]. Interferences are caused by several factors, including the presence of molybdenum, vanadium, mercury, permanganate and/or organic matter in the sample. Since the samples were collected in a marshy environment, it cannot be ruled out that organic matter could have found its way into the samples and created interference.

This hypothesis is validated by the analytical laboratory chemist (pers. comm. Sébastien Brault, Bureau Véritas, March 29, 2022) who confirms that: "All colorimetric methods have their share of interference. In the case of hexavalent chromium, the significant presence of hexavalent molybdenum or mercury salts can cause positive interference. Vanadium can also interfere when its concentration is ten times higher than that of chromium. The analytical method of CrVI by a non-colorimetric method is to be recommended. However, despite the fact that false positives are possible with the method initially used in 2018, it appears that nothing in the measured levels of the other parameters and in these same samples can confirm this beyond any doubt.

7 Brooks Applied. 2017. Advances in Detection of Hexavalent Chromium. Présentation du 18 avril 2017 dans le cadre du DoD EMDQ Workshop 2017, Phoenix, Az.

8 Lace, Annija et al. 2019. Chromium Monitoring in Water by Colorimetry Using Optimised 1,5-Dephenylcarbazide Method. International Journal of Environmental Research and Public Health. 21 mai 2019. 15 pages.

That being said, if Cr VI is really present at the 2018 sampling points, thus rejecting the "false positive" hypothesis due to interferences in the analytical method, this presence would be punctual at the sampling points since CrVI was not detected within 50 m. At the end of the operation, the developer will excavate the soil in places not covered by piles and having indicated high CrVI concentrations during the 2018 samplings. He will take samples from the walls and bottom of the excavation in order to validate the quality of the soils left in place in accordance with the vocation of the property and will dispose of the soils in a site authorized by the MELCC to receive them. The volume to be managed at the impact points could be of the order of a few cubic meters. The volume will be delineated during future excavation work at the end of the useful life of the mine. This specific activity will be added to the restoration plan.

The stations concerned are located on the edge of the pit, they are as follows:

— TR-11 (X: 357 466 mE; Y: 5 789 424 mN);

— TR-12 (X: 358 186 mE; Y: 5 789 221 mN).

The third station with a positive CrVI result will be underneath the North-East waste pile.

QC4-51	**In QC3-16 of the document presenting the 3rd series of questions, it was indicated that criteria had to be established in order to allow possible management of soil contaminated with lithium, vanadium or titanium. As the proponent has not suggested criteria B and C (grid of criteria from the *Guide d'intervention – Politique de protection des sols et réhabilitation des terrains contaminés*), it must then commit to respecting the rehabilitation criteria presented here- low. The recommendation of rehabilitation criteria for parameters absent from the *Règlement sur la protection et la réhabilitation des terrains* (RPRT), or from the intervention guide named above is based on a search for criteria or standards published outside the Quebec. In this case, documents from the US EPA, Ontario, British Columbia and the Canadian Council of Ministers of the Environment (CCME) were consulted. The criteria proposed below were chosen from these documents.** **The lithium criteria are:** • **16 mg/kg for the soils of land used for residential purposes;** • **230 mg/kg for soils of commercial/industrial land.** **The vanadium criteria are:** • **39 mg/kg for the soils of land used for residential purposes;** • **86 mg/kg for soils of commercial/industrial land.** **Finally, with regard to titanium, no source consulted presents a criterion. Thus, for soils containing titanium and other contaminants covered by the RPRT or the intervention guide, lithium or vanadium, it is recommended to manage them according to the criteria or standards applicable to these other contaminants. In the case of soils containing only titanium, they can be managed according to the background levels specific to the site after validation with the ministry.**

A-QC4-51:

GLCI commits to respecting these criteria.

12 SEDIMENTS

In the document *Complément à l'étude spécialisée sur l'habitat aquatique – Caractérisation des sédiments à deux stations supplémentaires* (WSP, 2021) the proponent presents the initial characterization of the sediments which was carried out at two additional stations of the CE-2 watercourse (document PN-4.26). These are the two stations CE-2C and CE-2D, both located downstream of the mine discharge in the CE-2 watercourse. Questions QC4-53 to QC4-59 relate to the aforementioned document.

QC4-52	**The proponent must consolidate all the results obtained at the exposed stations and at the control stations which now constitute the initial characterization of the sediments and which have been presented in various reports. The proponent must submit an initial characterization report according to the *Guide de caractérisation physico-chimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel – version 2*[9]. The initial characterization report may also present, as reference values, the levels measured in the other watercourses in the sector.**

A-QC4-52:

All the results obtained at the exposed stations and control stations were grouped together. The technical note presented in Appendix A-QC4-52 may be considered as an initial characterization report according to the *Guide de caractérisation physico-chimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel – version 2* (MDDELCC, 2017).

QC4-53	**The characteristics sought to establish the choice of exposed and reference stations are defined in the *Guide de caractérisation physico-chimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel – version 2* (MDDELCC, 2017). As a reminder, the stations must be established in accumulation zones (presence of fine sediments) and that the control stations must be established in a sector not influenced by mining activities and have characteristics (granulometry, TOC) similar to those of the control stations. The proponent must justify the choice of exposed stations and control stations.**

A-QC4-53:

In 2017, the eight stations selected (CE-1A, CE-2A, CE-2B, CE-3A, CE-3B, CE-4A, CE-5A and CE-5B) to perform the initial characterization of sediments were set in all streams (5) of the Project's influence zone. At that time, the location of mining and sanitary effluents was not known. In 2020, once the mine effluent was established in the CE2, two additional sampling stations (CE-2C and CE-2D) were added to the CE-2B sampling station, to complete the three exposed stations required. Station CE-2A is considered as a control station since it is located upstream of the mine effluent discharge point.

As for the sanitary effluent, it is located on the CE3 stream between the CE-3A and CE-3B sampling stations. Station CE-3A is considered as the control sampling station whereas station CE-3B is considered to be the exposed sampling station. Five sediment samples were collected at each of these stations.

[9] Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC), 2017. *Guide de caractérisation physicochimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel*. Québec, 12 pages et 3 annexes. Disponible en ligne: https://www.environnement.gouv.qc.ca/Eau/oer/Guide_physico-chimique.pdf

The remaining stations are considered to be control stations and are located along other streams within the project's area of influence. These stations will not be exposed to the mine effluent nor to the sanitary effluent. Thus, the initial characterization of sediments complies with the recommendations of the MDDELC *Guide de caractérisation physico-chimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel* (2017). It includes, for the mining and sanitary effluents, at least three exposed sampling stations (CE-2B, CE-2C, CE-2D and CE-3B) as well as a control station in the stream receiving the mine effluent (CE-2A) and one in the stream receiving the sanitary effluent (CE-3A). In addition, four control stations are located on streams located within the Project's area of influence that will not receive any effluent (CE-1A, CE-4A, CE-5A and CE-5B).

Map RQC4-53 shows the location of all sampling stations. It shows that most stations are located along watercoures and not in lakes or steep meanders. It is important to note that the stations were located in areas where there is sufficient sediment accumulation to allow for the collection of five samples (substations). However, the location of some stations was based on the accessibility (often difficult) of watercourses. The accessibility to the stations, for the construction and operation follow-up campaigns, should be improved once the mine site is built. Also, some watercourses had very few areas of sediment accumulation in addition to being mainly composed of an organic substrate. Table A-QC4-53 provides a brief description of the control and exposed sampling stations.

Table A-QC4-53 Summary of control and exposed sediment sampling stations

STATIONS		EFFLUENT	SAMPLING NUMBER	DESCRIPTION/PARTICULARITY
Control Station	CE-1A	None	1	Low quantity of sediments accumulation
	CE-2A	Mine	5	Upstream from the mine effluent
	CE-3A	Sanitary	5	Upstream from the mine effluent
	CE-4A	None	1	Low quantity of sediments accumulation
	CE-5A	None	5	-
	CE-5B	None	5	-
Exposed Station	CE-2B	Mine	5	Downstream station closest to the mine effluent
	CE-2C	Mine	4+duplicates	Influenced by CE-6
	CE-2D	Mine	5	Downstream station, somewhat away from the mine effluent but upstream from the branching with CE-6
	CE-3B	Sanitary	5	Downstream from the mine effluent

Zone d'étude locale / *Local study area*

Effluent minier / *Mining effluent*

Effluent sanitaire / *Sanitary effluent*

Stations d'échantillonnage / *Sampling Sites*

Station exposée / *Exposed station*

Effluent minier / *Mining effluent*

Effluent sanitaire / *Sanitary effluent*

Station témoin / *Control station*

Sation témoin / *Control station*

Hydrographie / *Hydrography*

CE3 Numéro de cours d'eau / *Stream number*

Cours d'eau permanent / *Permanent stream*

Cours d'eau à écoulement diffus ou intermittent / *Intermittent or diffused flow stream*

Sens d'écoulement de l'eau / *Direction of water flow*

Littoral des cours d'eau / *Watercourses shoreline*

Infrastructures / *Infrastructure*

Route principale / *Main road*

Route d'accès / *Access road*

Ligne de transport d'énergie / *Transmission line*

Relais routier / *Truck stop*

GALAXY

Mine de lithium Baie-James

Carte RQC4-53
Échantillonnage des sédiments : stations témoins et stations exposées

Sources :
Orthoimage : Galaxy, août / august 2017
Données du projet / Project data : Galaxy, 2018
Fosse, carrière et entreposage des explosifs /
Pit, quarry and explosives magasine : Mining Plus, 2018
Secteur administratif et industriel et aire de mineral /
Administrative and industrial sector and ROM pad : Primero, 2018
Banc d'emprunt / Borrow pit, Stantec, 2019

0 240 480 m

UTM, fuseau 18, NAD83

Dessin : A. Masson
Approbation : I. Cartier
201-12362-00_MELCC_QC4-53_WspT376_220216.mxd

wsp

QC4-54	**In question QC2-27, the proponent was asked to complete the characterization of the sediments in the control zone (not influenced by the mining effluent) in order to obtain at least five samples, since only one sample had been taken and analyzed at the station that had been identified as the control station (1A). However, the new characterization relates exclusively to the part of the watercourse located downstream of the mine effluent, and station 2A (upstream of the mine discharge) now appears on Map 1. The proponent must indicate whether station 2A is now one of the control stations.**

A-QC4-54:

It is important to mention that during the initial field campaign in 2017 (WSP 2018), the location of the effluent was not yet known. When the latter was identified, additional effort was made to better characterize the sediment quality in the CE" receiving the effluent. This deficiency was identified in the previous analysis completed by the Ministry (QC2-26) and responded to in WSP (2020). As a reminder, the request was worded as follows:

> "*Selon les informations présentées, seule la station 2B est exposée à l'effluent minier le plus préoccupant (eaux de la halde à stériles et résidus miniers). Le promoteur devra établir deux autres stations exposées en aval de cet effluent, soit dans le cours d'eau CE2 ou dans un plan d'eau récepteur du CE2, aux endroits les plus propices à l'accumulation de sédiments fins. Le promoteur devra compléter la caractérisation des sédiments à ces deux nouvelles stations avant le début des travaux."*

As a result, two additional stations were sampled: one near the planned discharge point and the other influenced by intermittent inflow from another stream (CE6). The location was presented to the Ministry on Map QC2-25-26.

The receiving environment of the Project consists of several wetlands and the substrate shows few areas where sediments accumulate sufficiently to allow 5 substations located 1 m apart. In addition, because access is very difficult due to the presence of these wetlands, it is not easy or safe to access certain areas of the study area. The site reconnaissance visit in 2020 identified the best stations to use during follow-up activities and where sediments accumulate reasonably to allow sampling.

Table A-QC4-53 identifies the sampling stations that are currently considered as control and exposed stations according to the *Guide de caractérisation physico-chimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel – version 2* (MDDELCC 2017).

QC4-55	**Since station CE-2C was established downstream of the mouth of stream CE-6, the quality of the sediments at this station is likely to be influenced by the inputs from stream CE-6, in addition of the mining effluent that will be discharged into the CE-2 watercourse. This must be taken into account when interpreting the results of sediment quality monitoring that may take place later. The promoter must justify the location of the CE-2C station.**

A-QC4-55:

Based on the proposed approach (Table A-QC4-53), 6 control stations and 4 exposed stations were selected and sampled for sediment quality characterization. The CE-2D station is located directly downstream from the effluent's location, while the CE-2C station receives the influence of the CE6 stream (intermittent stream). These two additional stations (composed of 5 substations) positioned on the CE2 provide a more complete picture than if both stations had been positioned upstream of the branch line with the CE6 watercourse. Station CE-2C will reflect sediments further downstream which have the CE6 as the source.

QC4-56	**For the particle size profile of the samples presented in Figures 1 and 2, we notice that the particle diameter is limited to the range below 200 microns (0.2 mm). However, the analyzes must relate to the fraction less than 2 mm. The promoter must specify whether this is an interpretation error and validate the resulting results, which are presented in Table 2. The promoter must also present the laboratory certificate for the particle size analysis.**

A-QC4-56:

Figures 1 and 2 in the report show the proportion of the full sample that falls into each of the size classes. On the vertical axis, the proportion is shown as a function of the particle diameter in µm, which is shown on the lower horizontal axis. The maximum diameter of the particles is 1,000 µm, i.e. 1 mm. There are no particles with a larger diameter. Table 2 shows the composition of the samples at both stations. All the particles analyzed are observed to be smaller than 2 mm in diameter (maximum diameter in the "sand" class).

The horizontal axis at the top of the graphs (Figures 1 and 2) shows the particle size in phi values. The phi indicator, used in statistics, consists of a logarithmic transformation of the size, presented in micrometres and represented on the lower horizontal axis.

The particle size analyses were performed by the Geomorphology/Sedimentology Laboratory at Laval University using highly accurate laser diffraction. WSP had also performed particle size analyses (Appendix C; WSP, 2018) during the initial characterization campaign. The equipment used in the last characterization is used for research and is state-of-the-art. The accuracy is therefore adequate, if not superior, in establishing the granulometry in order to characterize sediments in streams as part of the baseline.

We have checked with the Geomorphology/Sedimentology Laboratory of Laval University and they do not issue a certificate for grain size analyses.

QC4-57	**The proponent must justify that a single sediment sample, at each of the two new exposed stations (CE-2C and CE-2D), has been subjected to a particle size analysis, whereas this should normally be carried out on all sediment samples.**

A-QC4-57:

The substrate being very organic, it was difficult to obtain enough sediments for chemical analyzes for the five substations. As the particle size analyzes require approximately 1 liter of material each, it was not possible to collect enough sediment to make one sediment sample per substation. The sediments from the CE-2C and CE-2D stations are composite samples, made up from the sediments remaining from the substations (the chemical analyzes having been prioritized). The granulometric nature of the sediments being quite homogeneous at the same place (at the 5 substations located on approximately 4 to 5 linear meters in the watercourse), we therefore remain very confident that the results obtained adequately reflect reality for the needs of the study.

QC4-58	**It is indicated in the quality control section that a duplicate of sediments was collected (CE2 C D). However, the comparison of the results of these two samples is not clear. The sponsor must clearly indicate the results of the analyzes of the sample and its duplicate.**

A-QC4-58:

Table A-QC4-58 presents the results of the chemical analyses for the CE2-C-D sample and its duplicate, as well as the mean of the measured values, their standard deviations and coefficients of variation. The results of the analyses are also available in the laboratory certificates that were presented in the report *Complément à l'étude spécialisée sur l'habitat aquatique – Caractérisation des sédiments à deux stations supplémentaires* (WSP, 2021).

Table A-QC4-58 Results of the chemical analyses of sample CE-2C-D and its duplicate

Substance	Detection Limit	CE-2C-D	Duplicate	Mean	Standard Deviation	Coefficient of Variation
Metals and Metalloids						
Aluminum (mg/kg)	200/2,000*	35,400	5,820	20,610	14,790	71.76
Antimony (mg/kg)	7	<7	<7	3.5	0	0
Silver (mg/kg)	0.5	<0.5	<0.5	0.25	0	0
Arsenic (mg/kg)	0.7	5.2	13.1	9.15	3.95	43.17
Barium (mg/kg)	20	121	47	84	37	44.05
Beryllium (mg/kg)	1	<1	<1	0.5	0	0
Bismuth (mg/kg)	15	<15	<15	7.5	0	0
Bore (mg/kg)	10	<10	<10	5	0	0
Cadmium (mg/kg)	0.3	0.81	<0.3	0.48	0.33	68.75
Calcium (mg/kg)	300	3,900	8,200	6,050	2,150	35.54
Total Chromium (mg/kg)	1	89	24	56.5	32.5	57.52
Cobalt (mg/kg)	2	12	2	7	5	71.43
Copper (mg/kg)	1	23	5	14	9	64.29
Tin (mg/kg)	5	<5	<5	2.5	0	0
Iron (mg/kg)	400/4,000*	64,200	17,900	41,050	23,150	56.39
Magnesium (mg/kg)	10/100*	21,500	2,220	11,860	9,640	81.28
Manganese (mg/kg)	3/30*	620	146	383	237	61.88
Mercure (mg/kg)	0.02	<0.02	0.11	0.06	0.05	83.33
Molybdène (mg/kg)	2	<2	<2	1	0	0
Nickel (mg/kg)	2	37	8	22.5	14.5	64.44
Lead (mg/kg)	5	8	11	9.5	1.5	15.79
Potassium (mg/kg)	40/400*	12,400	911	6,655.5	5,744.5	86.31
Selenium (mg/kg)	0.5	<0.5	<0.5	0.25	0	0
Silicon (mg/kg)	150	468	456	462	6	1.30
Sodium (mg/kg)	300	1,820	448	1,134	686	60.49
Zinc (mg/kg)	5	82	40	61	21	34.43
Integrating Parameters						
Total Oil and Grease (mg/kg)	300	<300	944	547	397	72.58
Petroleum Hydrocarbons (C10 to C50) (mg/kg)	100	<100	<100	50	0	0
Inorganic Parameters						
Total Organic Carbon (%)	0.05%	0.82	23.8	12.31	11.49	93.34
Humidity (%)	0.2%	38.2	86.2	62.2	24	38.59
Total Sulfur (mg/kg)	100	860	1,410	1,135	275	24.23
Trace Elements and Heavy Elements						
Lithium (mg/kg)	20	31	<20	20.5	10.5	51.22
Thallium (mg/kg)	1	<1	<1	0.5	0	0
Strontium (mg/kg)	1	38	57	47.5	9.5	20.00
Titanium (mg/kg)	10/100*	4,060	499	2,279.5	1,780.5	78.11
Uranium (mg/kg)	20	<20	<20	10	0	0
Vanadium (mg/kg)	10	56	15	35.5	20.5	57.75
Mean	-	-	-	-	1,596.13	38.86

* A higher detection limit indicates that dilution has been performed to reduce analyte concentration or matrix interference.

13 SURFACE WATER

QC4-59	**It is difficult to assess the extent of the impact of the discharge of mining effluent into the CE2 watercourse. The proponent must prepare a series of maps that locate the CE2 watercourse in its watershed and indicate the direction of flow from the mine effluent to the Eastmain River. In addition, the proponent must assess the extent of the impact of the effluent on the quality of surface water, on aquatic life and on hydrology and indicate it on the maps previously requested.**

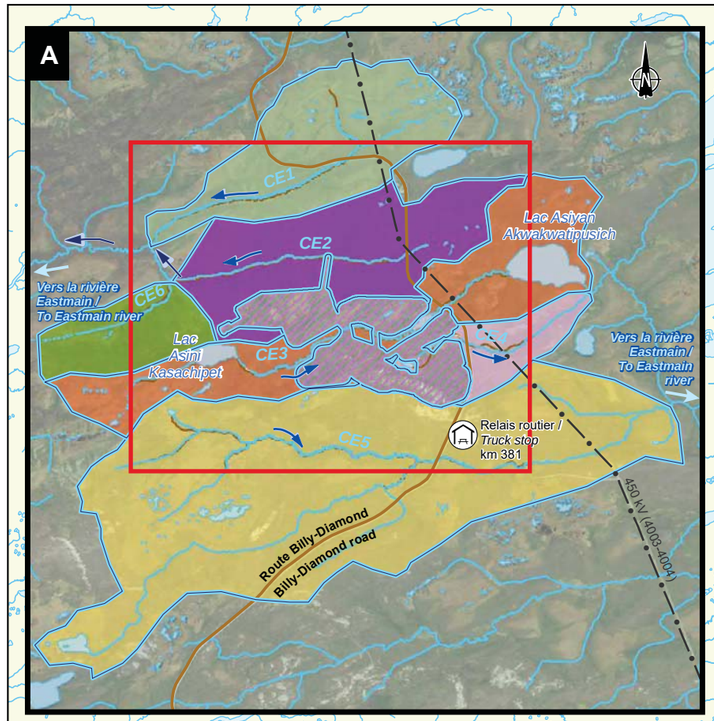
A-QC4-59:

Map R-QC4-59 highlights the watersheds when the mine is in operation (projected conditions). At the scale shown, it is possible to see the entire downstream portion of CE2, up to where it meets the Eastmain River. The distance from the effluent point to the Eastmain River junction is approximately 53 km. The coordinates of the CE2 and Eastmain River spur are:

X = -77,739385

Y = 52,194856

As indicated in previous responses, the WTP will treat the accumulated water in the water management pond prior to its discharge into the CE2, in order to meet the applicable water quality criteria. No significant change to the water quality of the watercourse—and therefore to the aquatic life that depends on it—is anticipated. The impact study (Version 2) also evaluates the expected flows and water levels and shows an increase in water levels, which will have a greater dilution effect than currently observed.



Zone d'étude locale / *Local study area*

Hydrographie / *Hydrography*

- Limite de bassin versant / *Watershed limit*
- Bassin versant 1 / *Watershed 1*
- Bassin versant 2 / *Watershed 2*
- Ruissellement sur le site vers l'effluent CE2 / *Site runoff to CE2 effluent*
- Bassin versant 3 / *Watershed 3*
- Bassin versant 4 / *Watershed 4*
- Bassin versant 5 / *Watershed 5*
- Bassin versant 6 / *Watershed 6*
- Cours d'eau permanent / *Permanent stream*
- Cours d'eau à écoulement diffus ou intermittent / *Intermittent or diffused flow stream*
- CE3 Numéro du cours d'eau / *Stream number*
- Sens d'écoulement de l'eau / *Direction of water flow*
- Effluent minier / *Mine effluent*

Infrastructures / *Infrastructure*

- Route principale / *Main road*
- Route d'accès / *Access road*
- Ligne de transport d'énergie / *Transmission line*
- Relais routier / *Truck stop*

GALAXY

Mine de lithium Baie-James / James Bay Lithium Mine

Carte / Map RQC4-59
Bassins versants aux conditions projetées /
Future Watershed Limits

Sources :
Canvec, 1 : 50 000, RNCan, 2015
BDGA, 1 : 1 000 000, RNCan, 2011
Donnée du projet / Project data : Galaxy, 2021

0 2 4 km
UTM, fuseau 18, NAD83

Février / *February* 2022

Dessin : A. Masson
Approbation : C. Martineau
201-12362-00_RQC4-59_WspT379_BV_220225.mxd

wsp

QC4-60	**In the document *Update to facility surface water quality modeling* (WSP, 2021), it is stated "The NWMP modeling results for wet and dry conditions are presented in Tables 6 through 8 for select months in LOM years, 3, 9, and 19 and are compared with applicable effluent limits defined by Directive 019 (D019) and MMER. The months were selected to represent summer/fall conditions as the water balance model is not as robust for winter months."** **Although the water balance model is less robust for the winter season according to the report, the proponent must indicate, to the best of his knowledge, whether the concentrations expected in the winter in the retention basin will be similar, lower or higher than those shown in Tables 6 to 8 for the summer and fall months.**

A-QC4-60:

Modelling results indicate small variations, less than +-10%, during the year for most metals. Arsenic showed greater variations, of the order of 30%.

In winter, the water quality modelling in the North Water Retention Pond predicts lower arsenic concentrations than in summer but still slightly higher than in spring; the lowest concentrations are expected in April (Figure A-QC4-60). Annual variations in arsenic concentrations are mainly related to the higher inflow of contact water from the waste rock and tailings mass in May (largest flows) to October (medium-high flows), which increase the As loadings to the basin. The seasonal variations of arsenic appear higher than for other metals because the arsenic contents, according to the tests of leaching in column, are higher, compared to the concentrations in the environment, than for the other metals. They are also higher in rock analyses. Arsenic is the only metal that exceeds the C and D criteria in all types of rock (see Table 5, WSP, July 2018).

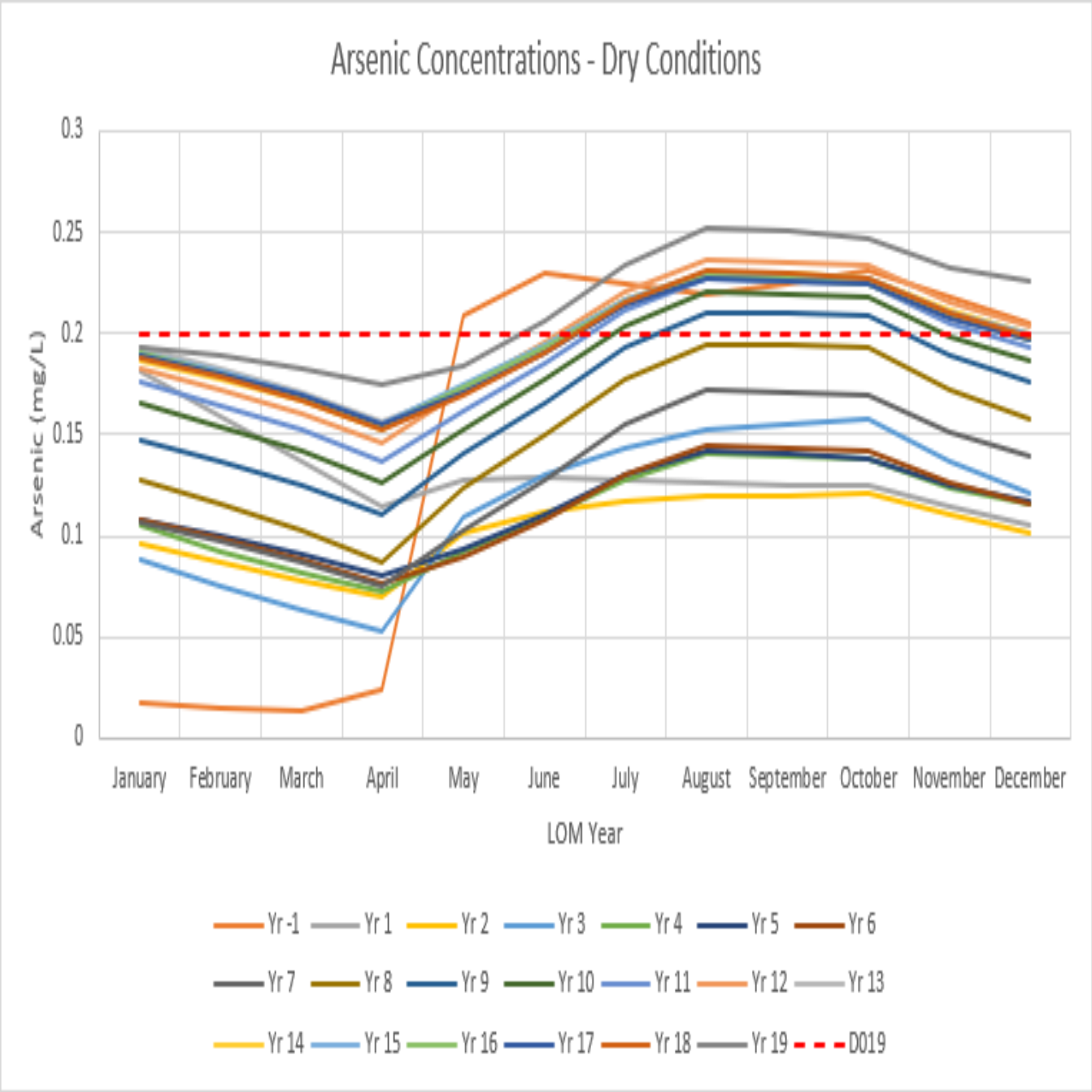


Figure A-QC4-60 **Monthly arsenic concentrations in the North Water Management Pond**

14 FAUNA

QC4-61	**In section 7.3.4 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) it is stated that "The mining effluent will at least meet the criteria established by D019, the REMMD and the EDOs. It is also stated "During the operation phase, impacts on ichthyofauna are associated with changes in water quality (…) and water returned to the natural environment from mining effluents. The intensity is considered to be low since the impacts are not significant after the application of the mitigation measures and fade quickly in the environment." In the absence of a comparison of the concentrations expected in the final effluent with the EDOs, it seems risky to indicate that the mining effluent will at least respect the EDOs as an action aimed at reducing the impact of the effluent on the ichthyofauna.** **The proponent must update the assessment of the impacts on ichthyofauna, during the operating period, based on the comparison of the expected concentrations with the 2021 EDOs. The proponent must demonstrate its assertion indicating that the effects of the discharge of the final effluent will fade quickly in the receiving environment.**

A-QC4-61:

Table A-QC4-11 shows the anticipated criteria exceedances and EDOs established before the water is treated at the WTP, prior to its release into the environment via CE2. However, a WTP is planned and will be equipped to meet the applicable criteria and move towards compliance with EDOs. As such, contact water from the site will be directed to the main water management basin and will undergo treatment prior to discharging to CE2. In addition, as noted in Response A-QC4-11, GLCI undertakes to conduct a comparison of water quality results with the EDOs (2021) in accordance with the *Lignes directrices pour l'utilisation des objectifs environnementaux de rejet relatifs aux rejets industriels dans le milieu aquatique [Guidelines for the Use of Environmental Discharge Objectives for Industrial Discharges to the Aquatic Environment]* for mine effluent water quality monitoring. This comparison will enable the treatment required to be adjusted prior to discharging to CE2. Thus, the "intensity" impact assessment parameter remains low. The residual impact on ichthyofauna remains unchanged.

QC4-62	**In section 7.3.4 of the *Environmental Impact Study, Version 2* (WSP, 2021), the proponent indicates that the compensation plan will include a study of the initial state of the lake (diagnosis) and of the population of yellow perch. The diagnosis of the lake and the yellow perch population does not constitute an avenue of compensation. However, the diagnosis must be carried out in order to have a reference state of the environment that will be impacted and to adequately describe the impact of the project on the fish habitat as well as on the fish population that this lake shelters. The proponent must therefore carry out the diagnosis of Lake Kapisikama according to the *Guide de normalisation des méthodes d'inventaire ichtyologique en eaux intérieures Tome I – Acquisition de données*[10].. It is important to decide on the allopatry of the yellow perch population and, if so, to establish a genetic and phenotypic profile (comparison with local populations or further south).** **The proponent must submit the diagnostic report of the lake and the yellow perch population to the Provincial Administrator prior to the decision for this project.**

10 Service de la faune aquatique, 2011. Guide de normalisation des méthodes d'inventaire ichtyologique en eaux intérieures, Tome I, Acquisition de données, ministère des Ressources naturelles et de la Faune, Québec, 137 p. Microsoft Word - Normalisation_17Fev2011_FINAL.doc (gouv.qc.ca)

A-QC4-62:

The diagnosis of Lake Kapisikama and the further study of the yellow perch population were not proposed as a compensation plan but to mitigate the impact of the loss of the lake by relocating the current yellow perch population. The latter has already been studied in the specialized study on aquatic habitat (WSP, 2018). The purpose of the two additional studies was to establish more precisely the reference state of the lake and its population in order to assess the possibilities of relocation (QC3-23). This solution is also set aside since it is considered a risky and undesirable intervention for the environment and the receiving communities due to the strong competitiveness of the species for resources (QC3-24, QC4-63).

In order to validate the allopatry of yellow perch in Lake Kapisikama, an environmental DNA test will be carried out before the end of winter. The results will be transmitted as soon as they are available.

According to the results of the hydrogeological modeling, the dewatering of Lake Kapisikama will begin 4 years after the start of mining operations. Well before this dewatering, GLCI will have to obtain the authorizations required for the destruction of the fish habitat from the federal government. As discussed in the answers to questions QC4-63 and QC4-64, the loss of fish habitat areas will be compensated. The avenues considered as compensation are detailed in answers A-QC4-63 and A-QC4-64.

QC4-63	**In section 7.3.4 of the *Environmental Impact Assessment, version 2* (WSP, 2021), the proponent indicates that the compensation plan will include the relocation of individuals from the lake to favorable habitat and that the details of this plan remain to be assessed. The relocation of fish does not constitute a compensation measure but rather a mitigation or conservation measure, i.e. the avoidance of the mortality of a fish population during the destruction of a water environment/fish habitat. In addition, as indicated in question QC3-24, the relocation of yellow perch is a risky and undesirable intervention for the environment and the receiving communities due to the strong competitiveness of the species for resources.** **The proponent must indicate how it intends to ensure the conservation of the yellow perch population without compromising the receiving environment and the sustainability of other fish populations. The proponent must further describe the methodology it plans to use for the relocation of the population, as well as the research carried out to identify sites suitable for relocation and specify the selection criteria used (e.g. head lake, isolated and unproductive, in which no presence of green newt, other populations of amphibians with a precarious status or fragile fish community would have been listed).** **Since release downstream or simple relocation are considered to be risky, the proponent must indicate whether alternatives, such as the conversion of an unproductive anthropized site into an artificial lake with facilities that meet the needs of the species, have been considered. The yellow perch population conservation measures undertaken do not exclude the obligation to design and implement sufficient compensation measures to generate benefits equivalent to the negative effects of the project on this population and on the water environment.**

A-QC4-63:

We agree that the relocation of the yellow perch population is a risky and undesirable intervention for the environment and the receiving communities due to the strong competitiveness of the specie for resources. The efforts that should be invested are colossal and do not guarantee the success of the approach. This solution is therefore put aside and therefore the methods to carry out the relocation will not be developed.

The loss of this fish habitat will therefore be the subject of a federal compensation plan that will implement sufficient measures to generate benefits equivalent to the negative effects of the project on this population.

QC4-64	**In section 7.3.4 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) the proponent indicates that a habitat compensation plan will be developed. The proponent must provide an update on the progress of its offset project research and documentation in relation to a potential project. The proponent must specify the stakeholders consulted (e.g. communities, tallymen, GNC, Hydro-Québec, MELCC, MFFP, DFO, etc.). The projects envisaged by the proponent must be discussed with the various stakeholders concerned in order to validate their feasibility and acceptability.**

A-QC4-64:

For the compensation of the fish habitat caused by the gradual dewatering of Lake Kapisikama starting in year 4 of operation, an exemption request was initiated with Transport Canada but the compensation project has not yet been identified. A dialogue is opened with the tallyman of the affected sector (RE2). He is thinking about project ideas. Meetings were also held in Eastmain on March 26 and 27 with family members of the tallyman in the affected sector, as well as with members of the community, some of whom are members of the Cree Trappers' Association. People were invited to brainstorm compensation project ideas and share them with GLCI. A next meeting is scheduled for June 2022 to discuss this further. In the meantime, discussions will take place by email and through the GLCI Community Liaison Officer.

When the project(s) for water compensation have been identified more precisely, GLCI commits to submit the compensation plan to the Administrator of the environmental assessment process for approval at the same time as the project is submitted to the federal authorities (DFO) for the request for authorization of work that could lead to the deterioration of fish habitat (S.R., ch. F-14, art. 35).

Discussions have also been undertaken with the community for the compensation of wetlands. During the meetings that took place in Eastmain on March 26 and 27, 2022, wetland compensation projects were also discussed. The presentation is attached as Appendix A-QC4-64.

The projects already identified relating to the development of hunting areas are located in the territory of trapline RE2, the one most impacted by the project. These are two old borrow pit sites located east of Billy Diamond Road, at km 394 and 371. Site 1 is accessible by a 2 km unmaintained road located just in front of the access from the SDBJ quarry. The site covers an area of 3.5 ha. Site 2 is also accessible by a 2 km unmaintained road and covers some 11 ha. Other potential sites were identified along the Eastmain River by the community of Eastmain and members of the tallyman's family during meetings on March 26 and 27.

The idea of creating landing zones for geese was also put forward. An area east of the road relay seems suitable for this purpose. It is a strip devoid of trees, almost a km long by a hundred meters wide (nearly 10 ha), with a body of water located at its northern end. Geese are hunted when they arrive from the south.

The implementation of these projects will be staggered over time. This will make it possible to see the elements of the current compensation projects that have worked well and the corrections to be made. At the suggestion of the tallyman's family members, projects could also be carried out at different times of the year.

In addition, GLCI is also considering a data acquisition project on the behavior of wetlands. A dialogue has begun with the Chaire industrielle CRSNG-UQAT sur la biodiversité en contexte minier.

To assess the viability of these projects, identify others and develop them, GLCI commissioned a team from Englobe's department of ecological engineering and compensatory facilities. Discussions with the community of Eastmain as well as the development of plans, budgets, identification of required permits and timelines are provided for in this mandate. The report is expected in September 2022.

GLCI commits to carry out water and wetland compensation projects to the satisfaction of provincial and federal authorities.

15 SOCIAL ACCEPTABILITY

QC4-65	**The proponent must take into account the presence of the truck stop at km 381 and limit the possible harmful impacts on it. The proponent must therefore indicate the mitigation measures that will be put forward specifically for the truck stop at km 381.**

A-QC4-65:

Several mitigation measures are planned to minimize disturbances at the km 381 truck stop. These measures, which are set out in Table 7-5 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) are repeated here.

The following mitigation measures will reduce emissions that may affect air quality at the km 381 truck stop:

- SUR 01: Mark out the boundaries of the planned earthworks, restrict the areas of deforestation and soil stripping as well as cutting areas to the footprint of the required infrastructure (road, pits, stockpiles, basin, etc.).
- SUR 02: Mark out access, paths and work areas before undertaking work, and prohibit parking and movement of machinery and vehicles outside of those areas.
- NOR 01: Restore work areas and stockpiles by levelling surfaces, covering them with natural soils, scarifying or seeding them to support revegetation. Stabilize reworked areas, embankment slopes, overburden stockpiles, etc., as work progresses.
- AIR 01: Regularly water roads, work areas, and stockpiles by moistening them to prevent resuspension and dust emission and ensure that recordings of the application of water and dust suppressants is kept during construction and operation of the site. The frequency and intensity of watering the roads will thus be adapted to weather conditions and results from monitoring of air quality.
- AIR 02: Avoid unnecessary engine idling to reduce noise and disturbances from exhaust gas, smoke, dust, or any other contaminants likely to come from the machinery.
- AIR 03: Limit the vehicle speed on the various sites as well as for mine operations.
- AIR 04: Instead of burning, proceed as much as possible with chipping tree removal residue and clear brush at the work site and then spread.
- AIR 05: Optimize stripping according to the real needs of the operation so as not to overexpose unused stripped surfaces in relation to wind erosion and/or to restrict, as needed, access to these surfaces if they are not used during long periods of time.
- AIR 06: Monitor total particulate matter (TPM), respirable particles (PM10), fine particles (PM2.5) and crystalline silica, especially near the truck road, from the start of operations.
- AIR 07: Ensure regular maintenance of dust collectors in order to maintain a purification efficiency at all times.
- NOR 11: Ensure that vehicle and machinery exhaust systems are in good condition and function optimally to minimize contaminant emissions into the air, and ensure that the same is true for dust control systems for equipment and machines that are equipped.

Mitigation Measure QUA 14 includes monitoring the water quantity and quality of the truck stop drinking water supply well at km 381 and providing drinking water to the truck stop or drilling a new drinking water well in the event that the drawdown renders the truck stop drinking water well unusable.

The following measures will reduce disturbances related to noise, vibration and air pressure that could occur at the truck stop:

- SON 01: Ensure that motorized equipment (trucks, loaders, bulldozers, backhoes, etc.) are equipped with efficient silencers and are in good condition.
- SON 02: Inspect the machinery regularly to ensure that the exhaust systems are in good condition to limit noise emissions.
- SON 03: Develop a mound with waste rock at the southern perimeter of the east WRTSF so as to have a screen effect between the mobile equipment circulating at the top of the stockpile and the truck stop at km 381. This mound will evolve according to the elevation of the stockpile.
- VIB 01: Notify all employees and the public about the blasting schedule.
- VIB 02: For blasting activities, maintain a maximum of four holes exploding in 8 ms to ensure compliance with the vibration criteria of D019.
- VIB 03: To limit overpressure, perform blasting activities in the absence of thermal inversion and carrier wind, when activities will be carried out within 800 m of the km 381 truck stop.
- VIB 04: Use blasting mats and a collar height of at least 5 m when the blasting will be carried out within 500 m of the km 381 truck stop and the James Bay Road, to limit rock projections.
- VIB 05: Set up a vibration and noise self-monitoring system during blasting operations.

The following measures are planned to avoid attracting wildlife to the project site and thus to the vicinity of the truck stop:

- FAU 05: Ensure workers are aware that it is important not to feed animals and not to leave food lying around so as not to attract wildlife near work areas.
- FAU 08: Limit wildlife access to food waste by installing a composter and lids on garbage cans.

The following measures concern traffic management which could represent a nuisance to the truck stop:

- CIR 01: Establish a traffic management plan, including appropriate signage in specific areas, indicating speed limits and snowmobile and ATV crossings.
- CIR 03: Maintain at all times public routes free of any obstruction of debris, waste, dirt, sediment, etc.

The following measures address quality of life and may help mitigate adverse impacts to the truck stop:

- VIE 01: Establish an ongoing dialogue with the public through an internal community relations group and communication program.
- VIE 02: Establish and implement a Galaxy Lithium Code of Ethics and ensure that all workers are well informed of its contents.
- VIE 07: In collaboration with the Cree liaison officer and the CBHSSJB, implementation by the Galaxy's human resources department of a social issue awareness program for workers, including sexual harassment, prostitution, alcohol and drug use, gambling, money management, violence and any other issue that may arise during mine construction and operation phases.
- VIE 15: Set up and implement a system for receiving and processing complaints before construction begins and until closure. A report on the nature of complaints received by Galaxy, and the manner in which they were dealt with, will be presented to the members of the monitoring committee at each meeting.
- VIE 19: According to the rules of the Km 381 truck stop, Galaxy policies, and applicable laws, zero tolerance of prostitution, and request police intervention if a case is reported.

Finally, the measure PAY 01, which plans to round the top of waste rock stockpiles, will allow better integrating them into the landscape for the users of the truck stop.

QC4-66	**The emergency management plan must provide for coordination procedures with the health system in the event of incidents with a high number of victims which could require the evacuation of patients by ambulance or by air. The proponent (ref. QC-142 and QC2-42) was previously asked to hold discussions with the Cree Board of Health and Social Services of James Bay, as well as the Eastmain and Nemaska clinics regarding the coordination of health services in the event of an emergency with numerous victims. The proponent must report on the progress of these discussions.** **It is also described in the document *Environmental Impact Assessment, Version 2* (WSP, 2021) that an agreement with the Société de Développement de la Baie James (SDBJ) at km 381 would provide emergency services. The proponent must present the main elements of this agreement. To this end, the proponent is also invited to continue its discussions with the Cree Board of Health and Social Services of James Bay, which may assist them in the coordination of services.**

A-QC4-66:

Discussions with the Cree Board of Health and Social Services of James Bay (CBHSSJB) and with the Eastmain and Nemaska clinics regarding the coordination of health services in the event of an emergency with numerous victims have not taken up but we have informed them of the project progress and that we want to resume discussions to organize the coordination of collaborative emergency measures. The current Emergency Response Plan (ERP) was developed to meet the needs of the project's pre-construction phase. The ERP for the construction phase is currently under development. Discussions with the CBHSSJB, as well as the Eastmain and Nemaska clinics, are planned in the short term, during the preparation of construction works and before initiating any construction works. The ERP will plan for the necessary coordination with the organizations of regions 18 (CBHSSJB) and 10 (Centre régional de la Santé et des Services sociaux de la Baie James (CRSSSBJ), in the event of mass casualty incidents that may require patient evacuation by ambulance or air.

With respect to the agreement between GLCI and SDBJ regarding emergency services, SDBJ is prepared to share the emergency vehicle, helipad and first responder services as needed until GLCI is well established on the project site. In fact, the emergency vehicle belongs to the CRSSSBJ and is available through the 911 service. As soon as construction begins, GLCI will have all its medical services ready and available. GLCI will then be able to share these services with SDBJ when needed. GLCI is in contact with the PRE-Hospital Emergency Services – Civil Security of the CRSSSBJ, which will inform the medical services of this opportunity.

QC4-67	**In section 5.4.1 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) the proponent states that: "On April 14, 2021, project updates were also presented as part of consultations communities by videoconference. About twenty members of the Cree communities, stakeholders or workers from community organizations were present. It was suggested by participants to repeat this form of activity later." The proponent must indicate whether other community consultations have already been held since April 2021, or whether they are planned.** **The proponent must also specify the questions, comments and concerns about the project update expressed by the tallyman and his family.**

A-QC4-67:

Since April 2021, a few meetings have been held in November and December 2021 with the RE2 tallyman and his family as well as with the Cree Nation of Eastmain to set out (for a second time) the differences between the 2018 project and the 2021 project as well as the training, employment and business opportunities. The anticipated content of the Impact Benefit Agreement (IBA) to be signed was also set out during these meetings.

The meeting was held in Montreal on November 8 (report included in Appendix A-QC4-67) with 3 members of the Weapenicappo family and the Chief of the Eastmain Nation. On December 1, a meeting was held in Eastmain with the young people from the Weapenicappo family, whose trapline is affected by the mining project, as suggested in November. A meeting was held on December 2 with the local Cree Women's Association and on December 3 with the local Cree Trappers Association. Following these meetings, it was decided to present the project again to the entire Eastmain community. This meeting was held in Eastmain on December 13 (minutes included in Appendix A-QC4 67). GLCI also held a presentation and discussion with more members of the Weapenicappo family on December 14.

GLCI contacted the Cree First Nation of Waswanipi's Director of Mining Projects in December to arrange a meeting, and a virtual meeting was held on February 2.

All of these groups share a common concern as to when the training programs will begin and what the business opportunities will be for the members of the various communities. Members of the Weapenicappo family also wanted to ensure that access to the Eastmain River would not be blocked by the quarry use at km 394; this was confirmed.

The youth and women's groups wondered if there would be positions requiring little education or with on-the-job training. The Weapenicappo family has expressed their desire to be prioritized over other Cree companies in the awarding of contracts since their territory is the most affected. In Waswanipi, the only request expressed was for business opportunities.

With regard to training, GLCI cannot commit to a start date until the general, provincial and federal, permits are issued. GLCI does not want to create expectations that it cannot meet.

A generic list of potential positions was presented that included several apprentice/assistant positions.

The Weapenicappo family was referred to WEDC to assist them in their entrepreneurial projects and was informed that additional points would be allocated to the local content (Cree) in the assessment of the business proposals.

Waswanipi's Director of Mining Projects has been put in contact with GLCI's Director of Commercial Operations and Contractual Matters.

The last consultations took place on March 26 and 27, 2022 in the Cree Nation community of Eastmain to inform people of the latest updates on the project and to give them the opportunity, once again, to ask questions and express their concerns and expectations regarding the project. On Saturday, March 26, the family members of tallyman RE2 were met. About ten people were there. Discussions focused primarily on potential compensation projects for wetlands and water environments. Participants also asked questions about the anticipated impacts of the Galaxy Lithium project on the territory. A presentation was also made to the whole community. This presentation can be found in Appendix A-QC4-67. Twenty people were present. The concerns raised are the same as those discussed at previous meetings. When the report is completed, it will be validated by the representatives of the community, through the GLCI community liaison officer who is on site.

On Sunday, March 27th, an open house session was offered to members of the Cree Nation of Eastmain for the entire afternoon. In total, 6 people showed up, several of whom were present at the meetings the day before. Discussions mainly focused on job opportunities, business opportunities and the work planned by GLCI in the short and medium term.

Dialogue remains open with tallyman RE2 and his family, as well as with members of the Cree community.

QC4-68	**In Table 7-5 of Section 7.1.3 of the *Environmental Impact Assessment, Version 2* (WSP, 2021), measure ELR 01 indicates that it is planned to "establish a purchasing policy that prioritize local and regional businesses in tenders, when skill and price are competitive. The promoter also specified that a pre-development agreement was signed in March 2019. The promoter must present a report on the progress of the discussions related to the prioritization of Cree companies in calls for tenders. and how this will be achieved.**

A-QC4-68:

Local content is one of Allkem's core values and as such we develop our project delivery strategy with a strong focus on local content, community involvement and ensuring good collaboration between all stakeholders. In an effort to achieve this, GLCI, a wholly owned subsidiary of Allkem, has implemented the following strategies:

- Periodic meetings in the Eastmain community (when COVID restrictions permit). For example, on-site meetings were held in December 2021 with the local economic development corporation (WEDC), members of the Eastmain community, the family of the affected tallyman and the Cree Nation Government's (CNG) Economic Development Officer.
- A meeting is held every two weeks with WEDC to discuss upcoming phases of construction and service procurement needs, local contractor capabilities and local new business developments.
- Applications for the various phases of construction and service procurement needs include specific criteria inviting bidders to contact WEDC (see excerpt below) to understand capacity, availability and how the local community can support bidders. This criterion is then incorporated into the bidder evaluation table and significant emphasis is placed on the level of local content in the award recommendation. Using this strategy, a local construction company (Stajune) has received 2 civil works mandates in the last two years.
- GLCI decided not to hire a general contractor for the project in order to have more control over hiring when overseeing the different work phases. Work phases were divided by size and complexity to ensure that local contractors could bid on the project.
- GLCI hired a Community Liaison Officer in 2020 with the primary role of hearing the community's various concerns and relaying them to GLCI to ensure they are considered in our future strategy. The Liaison Officer is also responsible for organizing and facilitating communications and meetings with the community.
- GLCI will work with local and regional organizations to develop a training and employment program to enable Cree community members to access potential employment during the construction and operation phases of the James Bay Lithium Mine Project. Where skills are equal, GLCI will favour local workers.

Excerpt from the paragraph included in each submission document:

INDIGENOUS BUSINESS OPPORTUNITIES

Vendors are encouraged to maximize employment and subcontracting/partnership opportunities to the Indigenous nation located on the territory where the Galaxy Lithium project is situated, meaning the Cree Nation of Eastmain. Vendors should contact the General Manager of the wholly-owned development corporation of the Cree Nation of Eastmain, Wabannutao Eeyou Development Corporation (WEDC), to discuss the involvement of Cree businesses as well as employment and partnership/subcontracting opportunities. The contact information for the General Manager of the WEDC is as follows:

- *Greg Williams, General Manager, WEDC: greg@wedc.email or 1-819-977-5596.*

As part of their proposals, Vendors are required to explain the nature of the Indigenous involvement that they are planning as part of the contract. They are also required to demonstrate evidence of meaningful engagement with the Cree Nation of Eastmain and its businesses, preferably through letters of intent (LOIs) signed with the WEDC. Information regarding engagement with Cree Nation of Eastmain to be detailed in proposals should include but is not limited to:

a) Whether the Vendor and/or its proposed subcontractors/partners qualify as a Eastmain Cree Enterprise or Cree Enterprise;

b) The number of Cree persons the Vendor is committing to hire and /or that the Vendor expects that its proposed subcontractors/partners will hire;

c) The total man-hours the Vendor expects to, or expects that its proposed subcontractors/partners will, commit to Cree workers as a percentage of total man-hours;

d) The materials, supplies and construction equipment (units and hours) the Vendor expects to, or expects that its proposed subcontractors/partners will, commit to acquire from Crees, Eastmain Cree Enterprises or Cree Enterprises as a percentage of total materials, supplies and construction equipment (units and hours);

e) The programs that the Vendor and its proposed subcontractors/partners will have in place in order to address training or mentoring initiatives for Cree persons;

f) The internal policies and commitments of the Vendor and any proposed subcontractors/partners relating to a positive workplace for Cree workers; and

g) Commitments to implement cultural sensitivity programs to sensitize their non-Indigenous employees to Indigenous and Cree realities.

QC4-69	**In section 5.7.1 of the *Environmental Impact Assessment, Version 2* (WSP, 2021), the proponent indicates that "Discussions have been initiated with the Cree stakeholders and the Eastmain community in order to establish an impact and benefit agreement. These exchanges are still ongoing and no agreement has been finalized. However, a pre-development agreement was signed with the Eastmain Band Council on March 15, 2019." The developer must report on the exchanges that have taken place since the signing of the pre-development agreement with the Eastmain Band Council. Eastmain band as well as the tallymen of traplines RE1, RE2, RE3, VC33, VC35 and R08.**

A-QC4-69:

Discussions on the Impact Benefit Agreement (IBA) are currently underway, although nothing has been finalized at this stage of the project. As mentioned in response A-QC4-67, during November and December 2021, meetings were held with the tallyman of trapline RE2 and his family, as well as with the Cree Nation of Eastmain; the anticipated content of the Impact Benefit Agreement (IBA) to be signed was discussed. Other than the financial terms, the IBA is expected to be quite similar to the one signed with Critical Elements Corporation.

At this time, GLCI undertakes to have committees similar to those included in the Critical Elements Corporation's IBA. There are two committees in this IBA, the Pihkuutaau Agreement, available at https://www.cecorp.ca/wp-content/uploads/2019-07-08-Pihkuutaau-Agreement-version-pour-SEDAR.pdf. Thus, the two IBA committees will likely be an Environment Committee and an Implementation Committee. The Environment Committee will be the same Environment Committee that will monitor the operations. Included in its functions will be the monitoring of the IBA's environmental clauses.

16 LANDUSE

QC4-70	**The proponent must specify whether one or more users of the territory have indicated that they wish their camp to be moved because of the project.**

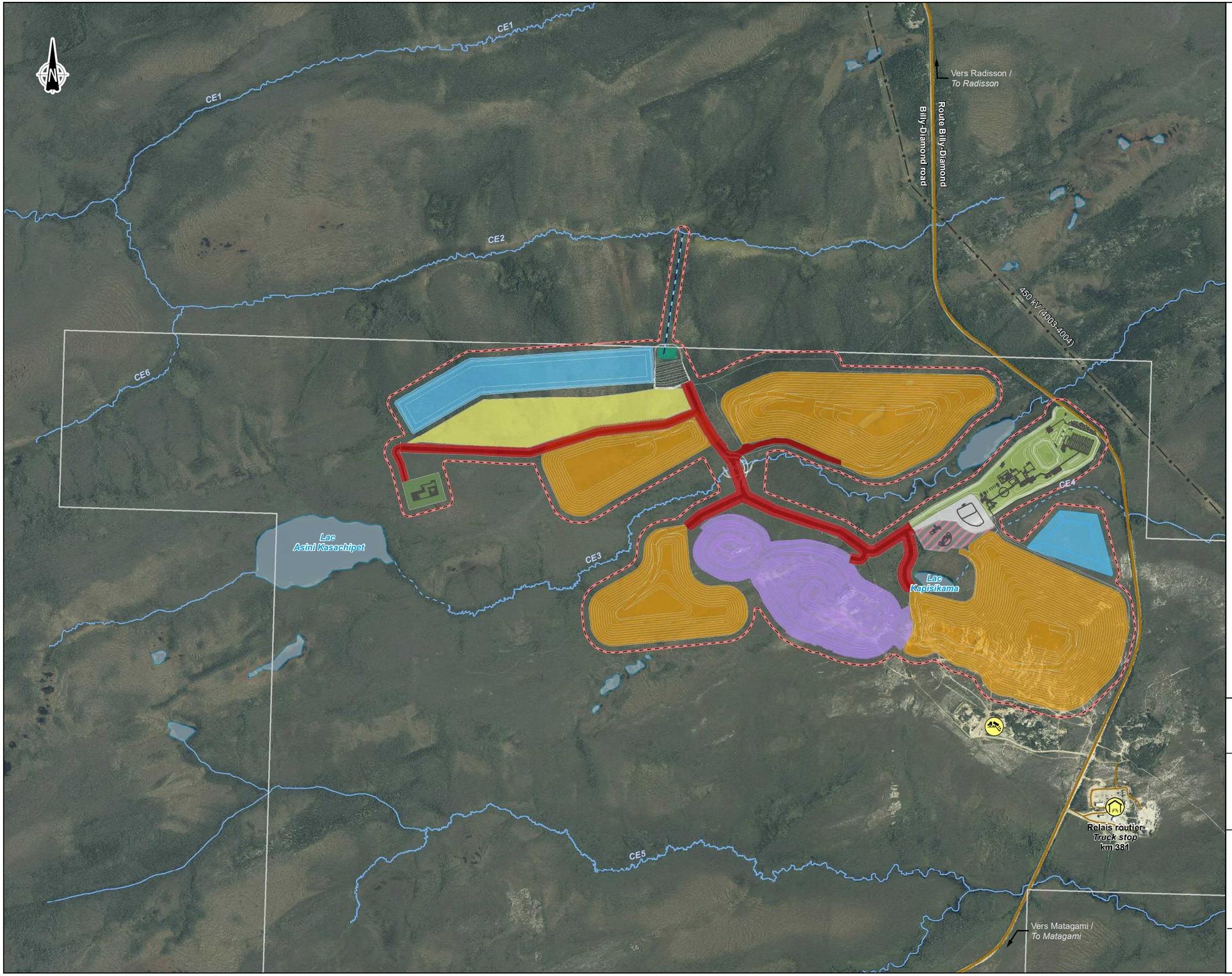
A-QC4-70:

As part of the many consultations and exchanges with users of the territory, none mentioned that they wanted their camp to be moved because of the project.

QC4-71	**The proponent must provide a map indicating the exclusion zone for the practice of traditional activities, including the 50 m buffer strip around the infrastructures. The proponent must draw up this map in collaboration with the tallyman, at least for the delimitation of the exclusion zone. The proponent must inform other land users practicing in the project area of the perimeter of the exclusion zone, as well as document and consider their comments with respect to the exclusion zone.**

A-QC4-71:

Map R-QC4-71 shows the mine general arrangement and the exclusion zone for traditional activities within a 35 m buffer strip around the project infrastructure. This map was shared by email on July 5, 2021 with the RE2 tallyman and the Chief of the Cree Nation of Eastmain. If any comments are made with respect to this exclusion zone, GLCI undertakes to take them into account.



Limite de propriété / *Property limit*

Périmètre d'exclusion (35 m) /
Perimeter of exclusion (35 m)

Composantes du projet / *Project Component*

Route / *Road*

Effluent minier / *Mine effluent*

Usine de traitement de l'eau / *Water treatment plant*

Secteur administratif et industriel /
Administrative and industrial sector

Fosse / *Pit*

Halde à minerai / *ROM pad*

Halde à stériles / *Waste rock stockpile*

Halde à matières organiques et dépôts meubles /
Overburden and peat storage facility

Entrepôt à explosifs / *Explosives magazine*

Aire d'entreposage / *Dry storage area*

Usine à béton (temporaire) /
Concrete batch plant (temporary)

Bassin de rétention d'eau / *Water retention basin*

Infrastructures / *Infrastructure*

Route principale / *Main road*

Route d'accès / *Access road*

Ligne de transport d'énergie / *Transmission line*

Relais routier / *Truck stop*

Lieu d'enfouissement technique isolé /
Isolated technical landfill

Hydrographie / *Hydrography*

CE3 Numéro de cours d'eau / *Stream number*

Cours d'eau permanent / *Permanent stream*

Cours d'eau à écoulement diffus ou intermittent /
Intermittent or diffused flow stream

Plan d'eau / *Waterbody*

GALAXY

Mine de lithium Baie-James / James Bay Lithium Mine

Carte / *Map* RQC4-71
Aménagement du site minier avec périmètre d'exclusion /
Mine Site General Arrangement with Perimeter of Exclusion

Sources :
Othoimage : Microsoft Bing (ESRI, 2017)
Gestim : MRNF Québec, 210315
Données du projet / Project data : Galaxy 2020

0 200 400 m
UTM, fuseau 18, NAD83

Février / *February* 2022

Dessin : A. Masson
Approbation : C. Martineau
201-12362-00_RQC4-71_WspT377_220215.mxd

wsp

QC4-72	**Section 6.4.6.1 of the *Environmental Impact Statement, Version 2* (WSP, 2021) refers to a mushroom picking program in the Billy Diamond Road area. This collection is done by the community as part of a project for commercial purposes. The proponent must provide more information about this project, including:** • **Delimitation of the area;** • **Stakeholders;** • **Consultations with participants in this project and concerns raised;** • **The potential impacts of the James Bay Mine Project on the mushroom picking project;** • **Impact of the mining project on participants' ability to generate revenue from the harvesting program.**

A-QC4-72:

During the last consultation with the Eastmain community in December 2021, we inquired about the mushroom picking project. The mushroom prized by the Japanese and which has an interesting commercial potential is the matsutake. This mushroom grows in pine forests which regenerate forest fire sites. They are however very difficult to find (see the article from 2019, https://ici.radio-canada.ca/nouvelle/1361344/matsutake-champignons-nord-quebec-ruee-or-blanc).

In Eastmain, the project is abandoned, as we have been told. The project was located on the territory between the Billy-Diamond Road and the village of Eastmain, in the area of the 2006 fires. Thus, the proposed mining project will have no impact on the mushroom harvesting project.

17 ARCHEOLOGY

QC4-73	**In section 6.4.6.1 of the *Environmental Impact Study, Version 2* (WSP, 2021), it is stated: "Prior to the completion of the archaeological inventory planned for the summer of 2021, a validation of the areas of archaeological potential selected will also be made with the experts in archeology of the Cree Nation Government (CNG) and the tallyman of trapline RE2." For information, since the GNC no longer has an expert in archeology, the proponent may consult the archeology experts of the Aanischaaukamikw Cree Cultural Institute. The proponent must indicate whether these experts were consulted or when they will be, and whether any changes have been made to the mitigation and follow-up measures following this meeting. The proponent must provide the results of the archaeological inventory that was carried out in 2021.**

A-QC4-73:

It was originally planned to meet with the RE2 tallyman. However, due to COVID-related restrictions imposed by Public Health during field work carried out from July 24 to 29, 2021, it was not possible to hold this meeting.

However, it is important to note that the areas of archaeological potential visited were previously delineated in a potential study conducted by Arkéos in 2011 and revised in 2017 (Arkéos, 2019). These areas were chosen because they were known to be areas of ancient occupation, topography, hydrography and sedimentology. An important step in identifying these targeted areas was by consulting and interviewing the Cree people, who have occupied the territory for generations.

Finally, since no archaeological evidence was revealed during the visual inspection and archaeological inventory, it was not deemed useful to consult other archaeological experts. The Arkéos team of archaeologists involved in the project has many years of experience and a good knowledge of the project area, having previously worked on Hydro-Québec projects in the sector.

As requested, the report setting out the results of the archaeological inventory that was drawn up in 2021 by Arkéos can be found in Appendix A-QC4-73.

18 TRANSPORTATION

QC4-74	**The project will impact road transport on the Billy-Diamond road. In section 7.4.4 of the *Environmental Impact Assessment, Version 2* (WSP, 2021) it is indicated that there is currently a transportation management plan for the pre-construction period and that it will be modified to the period of construction and then of operation. The proponent must submit this transportation management plan as part of this analysis.**

A-QC4-74:

The transportation plan for the pre-construction period as well as the preliminary version of the transport plan for the construction period are attached as Appendixes A-QC4-74-1 and A-QC4-74-2. Sections added to the pre-construction version include:

- Rules to be followed in the parking areas for contractors in the truck stop area;
- Rules to be followed in the parking areas at the truck stop camp for employees and contractors;
- The prohibition of crossing the Billy-Diamond road by quad or snowmobile;
- Signage to be installed on the Billy-Diamond road;
- Signage on the site;
- Rules to be followed in the parking areas on the site;
- Direction of traffic and maximum speed on the site;
- Rules for light and heavy trucks on the Billy-Diamond road, including restrictions during the thaw period;

As soon as the work related to the site entrance from the Billy-Diamond road is completed, the rules for entering and exiting the site will be added to the procedure. It should be noted that SDBJ plans to integrate this work into the repair of section 381-620, which is scheduled for the summer of 2023.

The update of the emergency plan is also in preparation for the construction period.

For the operational period, further changes will be made to the transportation plan. These will be related to:

- Traffic and parking rules on the site;
- Driver training.

QC4-75 **In order to determine more precisely the impacts of road transport and to estimate the number and type of vehicles associated with the project that will travel on the Billy Diamond road and between the mine site and the Cree Nation of Eastmain, the proponent must complete the tables following:**

TRANSPORTATION BETWEEN THE MINE SITE AND MATAGAMI

Steps	Types of Vehicles	Vehicle Dimensions (or Visual with Dimensions)	Vehicle Tonnage	Number of transports by Vehicle (day)	Number of transports by Vehicle (night)	Number of Round Trips and/or Returns	Departure Interval
Construction							
Operation							
Moose Hunting Period							
Goose Hunting Period							
Restoration							

TRANSPORTATION BETWEEN EASTMAIN CREE NATION AND THE MINE SITE

Steps	Types of Vehicles	Vehicle Dimensions (or Visual with Dimensions)	Vehicle Tonnage	Number of transports by Vehicle (day)	Number of transports by Vehicle (night)	Number of Round Trips and/or Returns	Departure Interval
Construction							
Operation							
Moose Hunting Period							
Goose Hunting Period							
Restoration							

A-QC4-75:

The planned transportation between the mine site and Matagami is presented in Table A-QC4-75-1 while the planned transportation between the Eastmain Cree Nation and the mine site is presented in Table A-QC4-75-2.

Table A-QC4-75-1 Transport planned between the mine site and Matagami

Project Phase	Vehicle Types	Dimensions of the vehicles (length x width)	Capacity of vehicles (tons)	Number of transports outward/day (daytime)	Number of transports return/day (daytime)	Number of transports (nightshift) [1]	Departure interval
Construction	Pick-up	5.89 m x 2.03 m	--	8 to 22	8 to 22	0	15 minutes
	Flatbed semitrailer	15.80 m x 2.54 m	MTQ's standard	5	5	0	1 h
	Semitrailer 52'	15.85 m x 2.59 m	MTQ's standard	20	20	0	20 minutes
Operation	Pick-up	5.89 m x 2.03 m	--	4 to 9	4 to 9	0	15 minutes
	Flatbed semitrailer	15.80 m x 2.54 m	MTQ's standard	1	1	0	non applicable
	Semitrailer 52'	15.85 m x 2.59 m	MTQ's standard	3	3	0	20 minutes
	Concentrate Twin-trailer truck	33.04 m x 2.59 m	85	12	12	0	20 minutes
Moose hunting season	Pick-up	5.89 m x 2.03 m		2 to 7	2 to 7	0	15 minutes
	Flatbed semitrailer	15.80 m x 2.54 m	MTQ's standard	1	1	0	non applicable
	Semitrailer 52'	15.85 m x 2.59 m	MTQ's standard	2	2	0	20 minutes
	Concentrate Twin-trailer truck	33.04 m x 2.59 m	85	12 / 0 [2]	12 / 0 [2]	0	20 minutes
Goose hunting season	Pick-up	5.89 m x 2.03 m	--	2 to 7	2 to 7	0	15 minutes
	Flatbed semitrailer	15.80 m x 2.54 m	MTQ's standard	1	1	0	non applicable
	Semitrailer 52'	15.85 m x 2.59 m	MTQ's standard	2	2	0	20 minutes
	Concentrate Twin-trailer truck	33.04 m x 2.59 m	85	12 / 0 [2]	12 / 0 [2]	0	20 minutes
Closure / restoration[3]	Pick-up	5.89 m x 2.03 m	--	1 to 4	1 to 4	0	15 minutes
	Flatbed semitrailer	15.80 m x 2.54 m	MTQ's standard	5	5	0	1 h
	Semitrailer 52'	15.85 m x 2.59 m	MTQ's standard	15	15	0	20 minutes

Notes:

1 Day transportation only.

2 12 concentrate truck round trips per day are planned during the operation period. Galaxy proposes to schedule its maintenance periods as much as possible during the moose or goose hunting seasons. During these maintenance periods of 7 to 10 days, no transport of concentrate is planned.

3 During the first 18 months of closure/restoration.

Table A-QC4-75-2 Transport planned between the Cree Nation of Eastmain and the mine site

Project Phase	Vehicle Types	Dimensions of the vehicles (length x width)	Capacity of vehicles (tons)	Number of transports outward/day (daytime)	Number of transports return/day (daytime)	Number of transports (nightshift) [1]	Departure interval
Construction	Pick-up	5.89 m x 2.03 m	--	2 to 8	2 to 8	0	15 minutes
	Shuttle bus	14.00 m x 2.44 m	--	2	2		4 h
Operation	Pick-up	5.89 m x 2.03 m	--	1 to 3	1 to 3	0	15 minutes
	Shuttle bus	14.00 m x 2.44 m	--	2	2		4 h
Moose hunting season	Pick-up	5.89 m x 2.03 m	--	1 to 2	1 to 2	0	15 minutes
	Shuttle bus	14.00 m x 2.44 m	--	2	2	0	4 h
Goose hunting season	Pick-up	5.89 m x 2.03 m	--	1 to 2	1 to 2	0	15 minutes
	Shuttle bus	14.00 m x 2.44 m	--	2	2	0	4 h
Closure / restoration[2]	Pick-up	5.89 m x 2.03 m	--	1	1	0	15 minutes
	Shuttle bus	14.00 m x 2.44 m	--	1	1	0	non applicable

Notes:
1 Day transportation only.
2 During the first 18 months of closure/restoration.

QC4-76	**Given the presence of the relay at km 381 and its traffic, as well as the elevation of the road in the mine sector, road safety is an issue to consider. The proponent must present the measures that will be implemented to ensure road safety at the entrance to the mine and near the truck stop.**

A-QC4-76:

As mentioned in section 4.11.2 of the Environmental Impact Assessment, Version 2 (WSP, 2021), MTQ (Ministère des Transports du Québec – Transports Quebec) standards regarding signage, traffic control, drainage, visibility, etc. will be respected in the Billy Diamond Highway right-of-way and for access to the mine site. A traffic plan that will consider signage and speed limits, installation of protective berms and guardrails will be prepared during the project's detailed design stage. It will be ready for the construction phase. Special attention will be given to the Billy Diamond Highway intersection to ensure road safety at the mine entrance and near the truck stop.

In particular, the following measures will be considered when developing the traffic plan:

- Installation of signs to inform road users of the approach to the mine site entrance (i.e. 500 m, 250 m, 100 m, 10 m from the site entrance and in each direction of travel);
- Installation of appropriate signage at the intersection of the road and the mine site;
- Reduced speed on the approach to the mine site entrance to avoid collisions at the intersection of the road and the site entrance;
- Widening of Billy Diamond Highway to include a turn lane for safe entry and exit from the site;
- Awareness among all subcontractors, suppliers, contractors and employees to drive safely and to respect traffic laws;
- Prohibit night traffic except for emergencies;
- Rules for crossing the Billy Diamond Highway for snowmobiles and ATVs.

QC4-77	**The proponent must, in collaboration with the Société de Développement de la Baie James (SDBJ) and the Ministère des Transports (MTQ), indicate whether the road signs will have to be modified to ensure the safety of users.**

A-QC4-77:

Road signs will be modified to ensure the safety of road users. As mentioned in the previous answer (A-QC4-76), the traffic plan including the on-site and off-site rules is being prepared for the construction phase. The preliminary version is presented in the Appendix A-QC4-74.

Road signs the Billy-Diamond Road will be carried out in coordination with the SDBJ. A reserved lane will be built for the left turn to arrive at the site, as well as a reserved lane to exit the site (right turn). .

Signs will be permanently installed following the rules of the specific MTQ document for this purpose [Normes – Ouvrages routiers (MTQ), Tome V- Signalisation routière (MAJ 158, Décembre 2021)].

QC4-78	**The proponent must specify for each section of the road under the responsibility of the SDBJ and the MTQ used for transport in connection with mining activities the load and dimension standards, as well as indicate whether they will be respected for each section.**

A-QC4-78:

SDBJ informed us that since the Billy Diamond Highway is a multi-resource road and subject to regulations governing the sustainable management of Crown forest land, a permit must be obtained from the MFFP (Ministère des Forêts, de la Faune et des Parcs [Ministry of Forests, Fauna and Parks]) for the passage of heavy vehicles with loads in excess of the practicable mechanical load under normal conditions on the MTQ network (personal communication included in Appendix A-QC4-78-1). Thus, for the passage of trucks with an expected load of 85 tonnes under normal conditions, a permit will be requested from the MFFP. In addition, for the thaw period, guidelines for spring 2022 were shared by SDBJ (Appendix A-QC4-78-2). It indicates that the same restrictions as those of the road network managed by the MTQ are applied on the Billy Diamond Highway. Thus, the trucks will have to have a maximum load of 57.5 tonnes during the thaw period.

The section from km 382 to the Matagami Transfer Centre on the Billy Diamond Highway falls entirely under the above-mentioned rules. This is the only section that will be used by the concentrate trucks. The registration of these trucks will not allow them to travel off the Billy Diamond Highway when loaded. Other trucks and vehicles that will be used for mining operations from southern Quebec or to the community of Eastmain will be properly licensed and compliant with the Highway Safety Code (*Code de la sécurité routière*) (CQLR, ch. C-24.2) already required by our pre-construction procedures will continue to be a requirement of GLCI.

QC4-79	**The proponent must indicate whether agreements for the maintenance of the various sections of road under the management of the SDBJ or the MTQ are under discussion, in order to ensure the sustainability of the Billy-Diamond road and the operating activities. . The proponent must also specify whether it has provided for a financial contribution to meet the need for additional maintenance and additional security needs.**

A-QC4-79:

It is agreed that GLCI will pay for the work on the Billy-Diamond road required by the arrival of the project (i.e. widening of the road at the access to the mine site, additional needs for safety that will be defined as part of the traffic plan). However, no financial contribution is provided for the maintenance of this road or those under the responsibility of the MTQ.

The James Bay lithium mine project represents a 15% increase in traffic on the Billy-Diamond road. However, it is important to note that the pressure exerted by heavy trucks will decrease within 5 years, when the Éléonore mine closes.

QC4-80	**Land users say they park along the Billy-Diamond road in all seasons. In winter, the presence of snowbanks reduces the space along the road. The proponent must indicate whether discussions have been held with the SDBJ in order to create safer parking spaces on the sides of the road, as requested by members of the First Nation of Waswanipi (Appendix G, Tables of concerns). The proponent must present a report of its discussions with the SDBJ and the MTQ.**

A-QC4-80:

To date, GLCI has not had any discussions with the SDBJ regarding the creation of parking spaces along the Billy-Diamond road. However, this request could be discussed with the members of the monitoring committee, a committee in which the tallyman of the Waswanipi First Nation wish to participate. This monitoring committee should be set up as soon as the building permits are obtained.

QC4-81	**Mitigation measure "CIR 15" provides for monitoring accidents along the road to see if there is a recurrence, validating and determining problems, if any, and proposing corrective measures. It also plans to record all problems encountered on the road in the mine's overall incident management register. The proponent must add a mitigation measure similar to measure "CIR 15", but specifically for wildlife safety (register of wildlife sightings and incidents involving wildlife, process in the event of recurrence of incidents and all other information deemed relevant).**

A-QC4-81:

GLCI agrees to add the following mitigation measure: Maintain a record of wildlife sightings along Billy-Diamond road (km 0 to 382) and wildlife incidents. Propose corrective measures in the event of a recurrence of incidents involving wildlife.

GLCI has developed a procedure in the event of an incident involving wildlife for the pre-construction period. This is presented in Appendix A-QC4-81. It will be updated for the construction period.

19 ENVIRONMENTAL MONITORING AND SURVEILLANCE

QC4-82	**No infrastructure monitoring program, for the period of mining operations, is provided for in chapter 10 of the document *Environmental Impact Assessment, Version 2* (WSP, 2021) (Monitoring and monitoring program) of the impact study. Only a geotechnical monitoring program for the post-restoration period is mentioned in section 10.5.1. The applicant must submit a monitoring program for its infrastructures for the operating period. To this end, the proponent is invited to base the development of this program on the latest version of the document *Comment rédiger un manuel d'opération, d'entretien et de surveillance des parcs à résidus miniers et des installations de gestion des eaux*[11] by the Mining Association of Canada. This program must, in particular, allow the operator to assess the behavior of the structures and to observe the condition of each of its elements or each of its parts.**

A-QC4-82:

The implementation of an infrastructure monitoring programme is planned for the operation phase. This program, developed according to the Mining Association of Canada's How to Write a Manual for The Operation, Maintenance and Monitoring of Tailings Facilities and Water Management Facilities, will be detailed in a future phase of project development. The preparation of this programme is already provided for in the budget for the pre-operation phase. This phase will begin when construction is well underway.

The program will include monitoring of the walls of the mine pit as well as monitoring of waste rock and tailings storage facilities (WRTSFs), overburden and peat storage facility (OPSF) and water management ponds.

Geotechnical monitoring of the pit walls

The stability of the pit walls will be monitored by surveying, either using a total station and 3-D laser survey or using survey prisms. Prisms are usually installed on rock walls at a height sufficient to measure the movements of the rock mass. If the installation height of the prism is not possible with the help of machine, they are installed by spider-men once the wall is purged and inspected. The prisms are installed at 500m in areas deemed safe by engineers and can be up to a few meters from each other in areas considered at risk.

Regardless of the surveying method, the surveys are done weekly at the beginning of the opening of a pit, then depending on the risk, the surveys are adjusted to daily or monthly readings.

If we observe movements in the rock mass, it will be necessary to identify what type of movement it is, block or semi-circular slide and put in place the most effective solution to manage the situation.

Monitoring of WRTSFs, OPSF and water management ponds

As detailed in Section 5 of *Tailings, Waste Rock, Overburden and Water Management Facility Front End Engineering Design*, prepared by Golder (2021) and presented in Appendix A-QC4-8, the safe operation of WRTSFs), OPSF and water management ponds will include multi-system instrumentation and a visual monitoring approach, with well-defined threshold values and corresponding intervention measures.

[11] Association minière du Canada, 2019. Comment rédiger un manuel d'opération, d'entretien et de surveillance des parcs à résidus miniers et des installations de gestion des eaux. 51 pages + annexes

Monitoring should consist of the following:

- Visual inspections, to check for signs of instability and document normal operating conditions; and
- Instrumentation, including vibrating wire piezometers (VWPs), settlement plates and slope inclinometers

Additional instrumentation may be required to address specific field conditions that arise during operations, to provide better understanding and monitoring progression of potential instabilities which may arise, or to replace damaged or otherwise non-functional instrumentation.

In addition to the monitoring noted above, prompt and accurate survey of WRTSF and OPSF fill placements and WMP dyke construction will be required to allow for proper interpretation of the monitoring data. Surveys should be collected with sufficient detail to accurately represent perimeter slope geometries, bench crest elevation and boundaries between different material types.

As previously mentioned, a detailed instrumentation and monitoring program, including proposed instrumentation locations, monitoring frequencies, monitoring thresholds values, and response plan, will de developed at the next stage of design.

Visual inspections

Visual inspections of the facilities will be required during operation and post-closure to identify potential signs of developing instability, including:

- Development of tension cracking;
- Excessive embankment crest deformation or over-steepening;
- Tilting of embankment crests;
- Bulging of embankment slope faces;
- Excessive heave or deformation at embankment toes.

A systematic approach to the inspection and documentation of visual observations will be developed, utilizing appropriately trained and competent persons. Where possible, routine visual inspections will be carried out by a consistent team of people, to provide continuity between inspections that may aid in the early identification and warning potential instabilities. Visual inspection check lists will be developed to provide consistent formal documentation of observations.

Instrumentation monitoring

VWPs, settlement plates and slope inclinometers will provide instrumentation monitoring of the WRSTF, OPSF and WMP foundation conditions.

- VWPs will allow for monitoring of the piezometric conditions within the foundation units which are expected to develop and dissipate excess pore water pressures generated from fill placement (i.e. clay and peat layers)
- Settlement plates will allow for monitoring of ground settlement, which is expected to occur as a result of consolidation of the foundation clay and peat layers. As consolidation settlement is directly related to dissipation of excess porewater pressure, settlement plate measurements will assist in assessing the validity of porewater pressure movements obtained from the VWPs, and in verification of design values.
- Slope inclinometers will allow for monitoring of horizontal displacement within the foundation soil units during raising of the WRTSFs and OPSF, and construction and operation of the WMPs. Slope inclinometers will indicate increased displacement magnitude and rate of displacement , which may be associated with potential ground instability; in particular, if lateral displacements occurs over a relatively small vertical distance which may be indicative of shear failure surface development.

QC4-83	**As the operating conditions may differ significantly from the conceptual model, the proponent must undertake to carry out environmental monitoring specific to the accumulation area. This will allow the conditions prevailing at the disposal site to be assessed during operations, as well as adjustments to operations or design as necessary. The proponent must develop a geotechnical monitoring program for the mine tailings accumulation areas for the period of mining operations, in accordance with section 2.9.3.3 of Directive 019. This monitoring program must be presented no later than during the first application for environmental authorization under article 22 of the *Environment Quality Act* for the construction of the mining site. The results of this monitoring must be presented as part of the annual environmental monitoring report.**

A-QC4-83:

GLCI is committed to developing a geotechnical monitoring program for tailings accumulation areas for the period of mining operations, in accordance with section 2.9.3.3 of Directive 019. This monitoring program will be submitted no later than the first application for an environmental authorization under section 22 of the Environment Quality Act for the construction of the mine site. The results of this monitoring will be presented as part of the annual environmental monitoring report.

QC4-84	**It is important to emphasize that the air quality monitoring program that will be put in place is a measure that will make it possible to control and measure the impact of mining activities on ambient air quality, just like the dust management plan appended to the dispersion study. To this end, the proponent must undertake to submit, at the latest during the first authorization request for the construction of the mining site, a detailed sampling estimate including all the information relating to the monitoring program. ambient air quality, including the exact location of the stations, the sampling schedule, and the analytical devices and methods that will be used.**

A-QC4-84:

GLCI commits to submit, at the latest at the time of the first application for authorization for the construction of the mine site, a detailed sampling program including all the information relating to the ambient air quality monitoring program, including the exact location of the stations, the sampling schedule, as well as the analytical devices and methods that will be used.

It is currently planned to install in the second quarter of 2022, on the site of the km 381 truck stop, an air quality measurement station in order to obtain an initial characterization of the air quality before the start of Project works.

QC4-85	**The monitoring and follow-up program proposed by the proponent still does not include monitoring of GHG emissions. The implementation of such monitoring is required, in particular to ascertain the effectiveness of the mitigation measures that will be put in place and to improve the project, on a continuous basis, over time. Such monitoring should include monitoring of GHG emissions from mobile sources by compiling the fuel consumption of vehicles and machinery throughout the life of the project. The proponent must present the GHG emissions monitoring plan.**

A-QC4-85:

GCLI is committed to follow-up GHG emissions from mobile sources through the compilation of vehicle fuel consumption and machinery throughout the life of the project. The GHG emissions follow-up program under construction and operation is presented in Appendix A-QC4-85.

20 CUMULATIVE EFFECTS

QC4-86	**The proponent will have to carry out an assessment of the cumulative effects on wetlands. Wetlands, widely present in the territory, play an important role in maintaining ecosystems and the valued species that depend on them. The project-related cumulative effects study area is one of the areas where wetlands are most disturbed. In a context of climate change and uncertainty about the vulnerability of these ecosystems, combined with a large number of projects that have or could affect this component in the cumulative effects study area, the cumulative effects of the destruction of 305 ha of wetlands should be documented.**

A-QC4-86:

As part of the 2018 Environmental Impact Assessment (EIA), the cumulative effects section did not include a specific analysis on the valued component (VC) of vegetation and wetlands. This VC was not retained for the cumulative effects analysis following the simple impact analysis, especially since it was not related to the project challenges, as required by the MDDELCC (now MELCC) directive. It was anticipated that developing the project's infrastructure would affect 302 ha of wetlands, or 11% of the total wetlands in the study area. Wetlands represented 74.4% of the total area within the study area. After the EIA was filed in 2018, there were some comments and questions from the provincial and federal governments relating to the cumulative effects of the project. One of the requests was to add avian species at risk to the VCs considered in the assessment of these effects, but no request was made for wetlands.

Optimization of the project's design in line with the EIA analysis process by federal and provincial authorities has led to a second version of the EIA being drafted in 2021. The project modifications now anticipate that 305 ha of wetlands will be affected, or 11% of the total wetlands contained within the study area. Wetlands now represent 74.6% of the total area within the study area. Since the area of wetlands affected is similar to the area set out in the 2018 EIA, it was not considered necessary to include vegetation and wetlands in the VCs assessed for cumulative effects. Once again, this VC was not related to the project issues as identified by the MDDELCC (now MELCC) directive.

In light of the above, it is clear that wetlands are abundant in the project study area and that a relatively small area will be affected. Regionally, the study area is part of the James Bay Lowlands Natural Province, which is characterized by a large peatland bordering southern James Bay. This natural province is in fact predominantly ombrotrophic pond bogs and forested fens (Li *et al*., 2019). Thus, wetlands are also abundant in the region where the study area is located. In addition, the wetlands affected are primarily peatlands that are not in direct contact with streams, as are riparian wetlands. Although several past projects (road and power line construction, exploration and mining) have potentially affected wetlands in the area, this project will not contribute significantly to cumulative effects specific to wetlands, as 89% of the wetlands in the study area will remain in their natural state. It is therefore unlikely that the effects of this project would be additive to those of other projects. Thus, we do not consider it necessary to conduct a detailed cumulative effects assessment on this VC but we are ready to integrate this issue into a potential research project with the *Chaire Industrielle sur la Biodiversité en contexte minier*. As mentioned in answer QC4-64, GLCI intends to participate in the second phase of this chair.

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