From: Kirstein,Friederike [CEAA]
Sent: June 3, 2016 7:27 PM
To: Didillon, Loic
Cc: Vidito,Lyndsay [CEAA]; Mariana Trindade; Howse Mine / Mine Howse (CEAA/ACEE); 'Mackenzie, Armand'; Atkinson,Mike [CEAA]
Subject: Information Requests (Part I) following review of EIS - Howse Property Iron Mine Project

Dear Mr. Didillon,

The Canadian Environmental Assessment Agency (Agency) has conducted a technical review of the Environmental Impact Statement (EIS) and associated EIS Summary for the proposed Howse Property Iron Mine Project and determined that addition information is required. Accordingly, please find attached Part I of the Agency's Information Requests. The Information Requests have been compiled with consideration of comments from provincial and federal expert departments. The timeline for the environmental assessment is hereby paused while information described in the attached document is being collected.

Please prepare responses to the attached Information Requests. Once you have submitted complete responses to all Information Requests, the Agency will take a period of up to 15 days to form an opinion on whether the requested information has been provided. If, at that time, the Agency determines the responses to be complete, it will commence a technical review of the additional information and the timeline for the environmental assessment will resume the following day. If the responses are determined to be incomplete, you will be notified at that time.

Please note that the Agency will be providing you with additional Information Requests shortly (e.g. air emissions, current use of lands and resources by Aboriginal peoples, caribou).

You are strongly encouraged to discuss attached Information Requests with the Agency prior to submission of your responses.

In the interim, Lyndsay will follow up with you next week to see if you have any questions.

Kind regards,

Friederike Kirstein

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Howse Property Project
EIS Technical Review: Part I
June 3, 2016

IR Number	Dept Number	Effects Link to CEAA 2012	Link to EIS guidelines	EIS Reference	Context and Rationale	Specific Question/ Request for Information
General						
CEAA 1	CEAA	5(1)(a)(i) Fish and Fish Habitat 5(1)(a)(ii) Aquatic Species (marine plans) 5(1)(a)(iii) Migratory Birds 5(1)(b) Federal Lands /Transboundary 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions 5(1)(c)(ii) Aboriginal Physical and Cultural Heritage 5(1)(c)(iii) Current Use of Lands and Resources for traditional purposes 5(1)(c)(iv) any Structure, Site or Thing of Historical, Archaeological, Paleontological or Architectural Significance	3.3.3	7.1, table 7-1 7.4.3.4, Page 7-212 7.3.4.1, Page 7-73	The EIS Guidelines require that spatial boundaries be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community and Aboriginal traditional knowledge, current land and resource use by Aboriginal groups, ecological, technical and social and cultural considerations. Accurate definition of the Local Study Area (LSA) is important in enabling reviewers to understand the maximum extent of potential effects on valued components.	• Confirm that LSAs are the maximum distances for all potential effects from the Project on valued components or re-define boundaries, as appropriate. For example: a. For avifauna, the LSA was defined by the watershed (based on potentially effected food sources). State whether the LSA boundary also reflects the maximum distances of other potential effects on birds (e.g. noise, dust, light), recognizing, for example, that the light assessment indicates that project lighting would extend 25 km. b. Although individual micromammals may not move outside the operations sector/project area, could effects of the Project occur on populations located further away (i.e. could air quality or light changes affect micromammals located outside of the footprint)? If yes, identify the species affected, their location, and the effects/cause of the effects (and provide maps showing the area where affected species are located). If no, provide rationale for concluding there would be no effects on micromammals populations located farther away. c. Provide a rationale that the effects of noise

Information requests directed to the proponent

IR Number	Dept Number	Effects Link to CEAA 2012	Link to EIS guidelines	EIS Reference	Context and Rationale	Specific Question/ Request for Information
						from blasting would be limited to the 15 km radius zone for perceived effects on caribou or update the analysis, as appropriate. d. The light assessment indicates that Howse project lighting would extend beyond the LSA (25km). Although the assessment for caribou indicates they are sensitive to noise and light, the EIS (i.e. LSA) also states effects of the Project on caribou would only have an effect within 15 km of the project. What is the maximum extent of effects on caribou? Refine the LSA accordingly. Clarify the maximum extent of effects on caribou, provide associated rationale, and redefine the LSA for the species, as appropriate.
CEAA 2	CEAA	5(1) and 5(2)	6.4	Throughout EIS	Mitigation measures should be specific, measurable, attainable, relevant, and time-bound. Many of the mitigation measures included in the EIS do not conform to these requirements, which creates a challenge in understanding potential effects on valued components. Furthermore, mitigation measures should be environmentally-focused, with respect to reducing an environmental effect. A commitment to developing plans or establishing/maintaining committees is not considered a mitigation measure. Though important in following up on the efficiency of a mitigation measure, It does not contribute directly at mitigating an environmental effect or measuring the efficiency of a measure at reducing a potential effect.	• Review proposed mitigation measures in relation to all valued components and provide updated lists of mitigation measures that are specific, measurable, attainable, relevant, time-bound for each valued component. • Update analysis and determinations of significance, as appropriate, based on revised mitigation measures.
CEAA 3	CEAA	5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions 5(1)(c)(ii) Aboriginal Physical	6.3.4	Section 7.5.2.1.3	The Canadian Environmental Assessment Agency (Agency) received a letter from New Millennium Iron Corp with its position on information presented in the EIS. The EIS states that mining claims covering	• Clarify mineral claims surrounding Irony Mountain and confirm plans for future management or protection of the area.

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		and Cultural Heritage 5(1)(c)(iii) Current Use of Lands and Resources for traditional purposes 5(1)(c)(iv) any Structure, Site or Thing of Historical, Archaeological, Paleontological or Architectural Significance			Irony Mountain would be transferred to the local communities by the government of Newfoundland and Labrador and designated as a no-mining area. However, New Millennium Iron Corp stated that it is not planning to transfer the claims to the communities but will ask the government of NL what options are available for the long-term protection, should New Millennium Iron Corp divest itself of its claims.	
Water Quality &Quantity, Fish & Fish Habitat						
CEAA 4	ECCC-IR-12	5(1)(a)(i) Fish and Fish Habitat	6.2.2, 6.3.1	Appendix IV - Technical Note, Water Management Plan- Conceptual Engineering for Howse Water Management Plan. Section 8	<u>Water Balance Model</u> The water balance model is used to characterize the existing stream flow regime in local streams, to assess the project's effects on surface water quantity (and hence fish habitat), as well as to quantify the volume of monthly mine-drainage water to be treated by the sedimentation ponds. In the water balance model, water losses appear to be overestimated, possibly underestimating the monthly volumes of mine-drainage water to be treated, and the estimates of existing and post-development flows in the local streams. The results of the water balance model for Sedimentation Pond Howse A are examined. Based on the water balance model methodology (Section 8.1) runoff is obtained by multiplying total precipitation by a runoff coefficient, in this case 1.0 for months where the ground is generally frozen, and 0.4 for the months of June to September. The precipitation that does not run-off is referred to as "infiltration" (refer to the 4th column of Table 8-2). The above method to estimate runoff volume is current practice, as combining all water abstractions	• Review analysis and confirm if water balances were underestimated or provide a rationale on why they are appropriate. Provide additional references or sources of information if needed to support rationale. If the balances were underestimated, revise and update the analysis and determination of significance.

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					(sublimation, evaporation, transpiration, etc.) into a single parameter (i.e. the runoff coefficient) minimizes the complexity and hence errors associated with estimating several hydrologic components. The part of the methodology that is questionable is the abstraction of evapotranspiration (6th column) from runoff, as this water abstraction would be already accounted for in the "infiltration" column. As such, there seems to be a double-counting of water losses, which would result in an underestimation of the runoff quantities. Indeed, the estimated annual inflow (7th column, 271,610 m^3 / year) appears to be on the low side. The estimated volume translates to a runoff depth of 460 mm, which is about 30% lower than the value quoted from the 1997 regional analysis by K. Rollings "The Hydrology of Labrador", i.e. 650 mm (reported on page 11, Section 2.5). We note that in a more recent regional analysis by Statistics Canada "The Water Yield for Canada as a Thirty-year Average (1971 to 2000)", even larger runoff volumes are estimated for the area, for instance approximately 700 mm (refer to Map 13).	
CEAA 5	ECCC-IR-13	5(1)(a)(i) Fish and Fish Habitat	6.2.2, 6.3.1	Appendix IV - Technical Note, Water Management Plan- Conceptual Engineering for Howse Water Management Plan. Section 2.4	**<u>Hydrologic Parameter:</u>** The evapotranspiration is one of the hydrologic parameters used in the water balance model to estimate the quantity of mine-drainage water and flow rates in local streams. The estimated evapotranspiration values appear to be underestimated, which could affect validity of the model results. The evapotranspiration is assumed to be equal to 35% of lake evaporation (i.e. 111 mm/yr). This estimation is based on the proponent's experience	• Review analysis and confirm whether evapotranspiration was underestimated or if it remains adequate, and provide associated rationale. Provide additional references or sources of information if needed to support rationale. If the rate was underestimated, revise and update the analysis and determination of significance.

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					with similar projects; however, no references or data are given to support this estimation. Based on the Hydrological Atlas of Canada, the annual evapotranspiration (Plate 25) in the vicinity of the mine site is approximately 240 mm and the mean annual lake evaporation (Plate 17) is around 290 mm (which corroborates well with lake evaporation estimates for Churchill Falls the proponent provided in Table 2-10). Using the Atlas values, the ratio of evapotranspiration to lake evaporation would be around 83%, which is more than twice the value considered in Section 2.4.	
CEAA 6	ECCC-IR-14	5(1)(a)(i) Fish and Fish Habitat	6.2.2, 6.3.1	Appendix XVIII Surface Water Modelling Climate Variability - Water Balance Computations for Typical Wet and Dry Years. Section 3.0 Methodology	Data from specific years were used as inputs to the water balance model to estimate wet and dry years. However, the data do not present extreme (i.e. maximum) wet/dry years, they represent average wet/dry years. There is considerable inter-annual variability in snow cover and precipitation in the study area, related to long term atmospheric circulation patterns (see Brown (2010) and Vincent et al (2015)). **References:** 1. Brown, R. D., 2010: Analysis of snow cover variability and change in Quebec, 1948-2005. Hydrol. Processes, 24, 1929–1954, doi:10.1002/hyp.7565. 2. Vincent, L. A., X. Zhang, R. D. Brown, Y. Feng, E. Mekis, E. J. Milewska, H. Wan, and X. L. Wang, 2015: Observed Trends in Canada's Climate and Influence of Low-Frequency Variability Modes. J. Climate, 28, 4545-4560, doi: 10.1175/JCLI-D-14-00697.1.	• Provide variability analysis and modelled results for extremely wet or dry years, not typical wet or dry years. Based on results and as required, update the analyses of environmental effects including: a. the effects of the environment on the project, b. accidents and malfunctions, and c. fish and fish habitat.
CEAA 7	CEAA	5(1)(a)(i) Fish and Fish Habitat 5(1)(c)(iii) Current Use of	6.3.1 6.3.4	7.4.9.4, 7-278	The effects analysis must focus on the effect as opposed to the source of the effect. An effect may persist long after the source of the effect has ceased.	• Provide an assessment of the *reversibility* of environmental effects on fish and update the significance determination, as appropriate.

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		Lands and Resources for traditional purposes 5(1)(c)(i) Aboriginal Peoples Health/ socio-economic conditions			In relation to aquatic fauna, effects were determined to be *partially reversible* as water quality was predicted to return to normal within a few months from the end of operations. However, *reversibility* needs to also address the reversibility of effects on species not just water quality (e.g. water quality may be returned to baseline, but fish may no longer be present).	
CEAA 8	CEAA	5(1)(a)(i) Fish and Fish Habitat	6.3.1	7.4.9.3, 7-275 Table 7-99	Table subtitle: "management of ore, rock piles, waste rock, tailings and overburden". Mitigation measures also address tailings management. It is unclear why this information was provided as tailings facilities are not included in the project.	• Confirm that no tailings management is proposed and remove mitigation measures related to tailings management from the list of mitigation measures. If tailings management is proposed, contact the Agency as soon as possible for guidance for additional assessment requirements.
CEAA 9	DFO-IR-02	5(1)(a)(i) Fish and Fish Habitat	6.3.1	Ex. Summ. page 34 (table 5) and EIS page 7-181 (table 7-68).	The "proposed specific mitigation measure" under "water quality" states "divert sedimentation pond HowseA into the pit".	• Explain what is meant by the statement and how this would mitigate the effects of the Project.
CEAA 10	DFO-IR-04	5(1)(a)(i) Fish and Fish Habitat	6.3.1	7.3.9.4.1, Page 7-168	The document states "An inflow decrease is beneficial from an ecosystemic perspective, because an oligotrophic lake like Pinette Lake could benefit from a longer water renewal time."	• Provide an analysis to support the prediction that Pinette Lake would benefit from a longer water renewal time/decrease in inflow. The analysis should include consideration of applicable environmental components (e.g. fish and fish habitat, wetlands).
CEAA 11	DFO-IR-09	5(1)(a)(i) Fish and Fish Habitat	6.3.1	EIS page 7-127 Summary 2.1.1, page 7	Final pit dimensions are not consistently presented in the EIS and EIS summary. It is important to have clarity on this aspect as it impacts understanding of dewatering, and water balance.	• State final pit depth – 160m or 195m, and provide revisions to analysis of dewatering and water balance, as appropriate.
CEAA 12	DFO-IR-10	5(1)(a)(i) Fish and Fish Habitat	6.3.1	Page 7-278	Potential effects on fish and fish habitat related to the timing of discharge from sedimentation ponds were not accurately characterized. The release of sediments in Spring is not beneficial for the receiving environment as eggs and fry would still reside in the substrate.	• Update the analysis, mitigation measures, and determination of significance with consideration of the adverse effects of sediment releases on the receiving environment.

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CEAA 13	DFO-IR-11	5(1)(a)(i) Fish and Fish Habitat	6.3.1	9.1.4, Page 9-32/33	It is important to measure and monitor both the water quality and water quantity in order to determine any potential effects on fish and fish habitat.	• Present a strategy for monitoring water quality and quantity and explain how resulting information would be used to determine potential effects on fish and fish habitat. State whether (1) all water monitoring stations would be updated to real time water quality monitoring stations or (2) a robust schedule for visual monitoring of water quantity would be developed and presented. • For station NF03OB0040, state whether the proponent intends to either move this station downstream of the HowseB sedimentation pond final discharge point **or** replicate this station downstream of HowseB sedimentation pond final discharge point. Provide a rationale for selecting the preferred monitoring point.
CEAA 14	NRCan IR 1	Information and data	7.3.8	Appendix K (Oct. 2014) Vol. 1 (section 6.7.8 and Fig. 6.20, Feb. 2015) Chapter 7 Effects Assessment Physical Environment (section 7.3.8) Appendix J-1 (Oct. 2015) Appendix J-2a (Nov. 2015), J-2b, J-2c (2005)	The latest assessment of permafrost occurrence seems to only consider elevation, historical and current data of ground temperature (for the Howse deposit only) to infer the absence of permafrost for the Howse project. For other areas, other than the Howse deposit, the proponent indirectly infers that permafrost should not exist below the surface elevation of 660 m based on the fact that the terrain is less exposed (to winds) and partly forested or if small remnants of permafrost exist, they would occur deep within the bedrock and have low ice contents (Chapter 7, 7.3.8). Natural Resources Canada has advised that it agrees that based on elevation only (below the threshold of 660 m) and ground temperatures, permafrost is probably absent in the Howse deposit. However, it remains uncertain about the presence or absence of permafrost, as vegetation/type of soil (wetlands/forest/ organic material) can suggest its occurrence (observed elsewhere in northern Canada under similar conditions, e.g., Morse et al., 2015). In fact, the proponent did provide a permafrost potential map	• Explain how the permafrost potential map (Fig. 6.20, Volume 1) was produced and clarify if the map is still valid according to the latest assessment of permafrost (Chapter 7, 7.3.8, and Appendix J-1). If not valid, please explain why. • Provide information on whether direct field validation (e.g. ground stratigraphy, ground temperatures) is available to infer the absence of permafrost under areas such as the waste dump, the overburden stockpile, and the upgrade of the mine haul road. - If direct validation is available, provide ground temperature and ground ice conditions, if permafrost is present. - If direct validation is not available, explain why if small remnants of permafrost exist, it would only occur deep within the bedrock and have low ice contents.

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					(very low to very high permafrost potential) in their earlier assessment (Volume 1, Fig. 6.20); the map was based on topography, vegetation (related to snow cover), and historical data. It is unclear if this map is still valid. In addition, the proponent mentions that there are some ecotypes/types of terrain (Appendix K) where permafrost could occur. For instance, it is mentioned that relic permafrost may be present at high elevation beneath areas of thick sphagnum moss. These organic terrain are associated with ecotype MSF10 (upgrade of the mine haul road) and MSF14 (proposed ditch). In Fig. 6.20 (Volume 1), the waste dump (ecotypes MSF05 and MSF08) was mapped as having medium permafrost potential and the overburden stockpile (ecotype MSF05) as having high permafrost potential. Especially for ecotypes associated with fine-grained sediments and organics (MSF08, 10, 14) permafrost can exist at shallow depths and it is not restricted to the deep bedrock layer (e.g., Morse et al., 2015). Because the occurrence of permafrost and its ground ice content might have impacts on the project (see below), it is important to confirm with direct field validation its presence or absence. **Reference**: Morse, P.D., Wolfe, S.A., Kokelj, S.V, and Gaanderse, A.J.R. 2015. Permafrost occurrence in subarctic forests of the Great Slave region, Northwest Territories, Canada. In the proceedings of GEOQuébec 2015, 68th Canadian Geotechnical Conference and 7th Canadian Permafrost Conference, September 20-23, 2015, Québec city.	
CEAA 15	NRCan IR 2	Information and data	7.3.8	Volume 2 (all sections)	If road sections, the waste dump or the overburden stockpile happen to be on permafrost (with excess ice	a. Provide information on the design parameters for roads (e.g., mine haul road, the new sections of the

IR Number	Dept Number	Effects Link to CEAA 2012	Link to EIS guidelines	EIS Reference	Context and Rationale	Specific Question/ Request for Information
				Volume 3 (all sections) Appendix V (WMP, Jan, 2015, sections 5.0, 7.0 and Appendix C)	at shallow depths) then its thawing can cause settlement and movement of stockpiles, waste, and containment facilities. Design parameters, monitoring, and mitigation strategies are not specified in case permafrost is encountered. The installation of thermistor cables in the areas noted above (i.e. waste rock dump, overburden stockpile, roads) is suggested. If the presence of permafrost is confirmed at the waste dump and/or stockpiles, the installation of monitoring instruments / devices to measure and monitor the instability (e.g., inclinometers) of these areas is recommended.	bypass roads – alternative 2) that could be built on warm permafrost. - Describe the mitigation measures that would be in put in place if the permafrost thaws and road damage occurs. b. Specify if there is a plan to use a liner under the waste dump. If yes, describe mitigation measures that would be put in place if the permafrost thaws (e.g., if the performance of the liner is compromised by thaw settlement). - Describe the monitoring and mitigation strategy that would be put in place if ground thawing causes the movement of stockpiles, waste, and containment facilities. c. State whether the proponent commits to installing thermistor cables in recommended areas (i.e. water rock dump, overburden stockpiles, roads), and if so, when cables would be installed and how monitoring would occur. d. State whether monitoring instruments / devices to measure and monitor the instability (e.g. inclinometers) of these areas would be installed if the presence of permafrost were to be confirmed at the waste dump and/or stockpiles.
CEAA 16	NRCan IR 3	Information and data	7.3.6	Chapter 7, section 7.3.6 Appendix B GEOFOR Hydrogeology and MODFLOW Modelling Appendix XVII	The following questions related to information required for a basic understanding of the hydrogeology of the area have major implications for assessing the impacts of open pit dewatering: - How can lakes, streams and swampy areas be so frequent in the Howse region if groundwater is only present at depths greatly below lake and wetland levels? -How can groundwater levels be only found at these	• Provide additional evidence and better explain the presence of lakes, streams, and wetlands in the Howse region (i.e. LSA/RSA). • Confirm whether the Sokoman Formation (whose thickness ranges from 110 to 120 m) is less fractured and thus less permeable between its top (interface with the surficial sediments) and bottom (its interface with the Wishart Formation)? The hydraulic conductivity (K) values provided by fieldwork (9×10^{-6} m/s on average)

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				Ground Water Modelling Climate Variability Nicholson, F.H. 1979. Permafrost spatial and temporal variations near Schefferville, Nouveau-Québec, Géographie Physique et Quaternaire, volume XXXIII, no 3-4, Special issue on permafrost in Quebec – Labrador, les Presses de l'Université de Montréal, p. 265-277. Grandberg, H.B. 1989. Permafrost mapping at Schefferville,	depths (between 40 to 90 m below the surface in the future open pit) if surficial sediments are composed of relatively permeable sandy till and if annual precipitation is on the order of 700 mm? In such a context, lakes and swampy areas cannot be disconnected from groundwater. Their presence suggests that there is another shallower water table, much closer to the surface than the one observed in the deep boreholes. Two hypotheses could explain this context: the presence of either permafrost underneath the planned open pit or that of a much lower permeability unit within the surficial sediments (i.e. overburden) or in the Sokoman (iron) Formation. This would allow water to infiltrate down to this nearly impermeable unit, and then flow horizontally at its surface to "feed" lakes and wetlands. However, available data does not point to either of these hypotheses. On one hand, thermal sensors seem to indicate that temperature is above 0˚C below the planned open pit. Nonetheless, Nicholson et al. (1979), who has extensively studied this region for a number of years, had indicated that, there is widespread permafrost just north of Schefferville . Vertical temperature profiles from these regions presented in Nicholson (1979) and Granberg (1989) show that negative temperatures are much more common than positive ones. On the other hand, borehole logs, although not detailed, do not report the presence of a nearly impermeable stratum that could underlie a large area and hydraulic conductivity	appear to make it a rather permeable unit. Provide additional information to support information and conclusions on the Sokoman Formation from these statements.

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				Quebec, *Physical Geography,* 1989,10, 3, pp. 249-269.	values do not seem to be available for the Sokoman Formation, except near its bottom which was found to be the most fractured and thus permeable zone. The fact that a groundwater level was found in one of the wells drilled into surficial sediments (HW-RC-15-WE01B) and close to the top of bedrock, is a good indication that a shallower "aquifer" is present and that a much less permeable horizon within the Sokoman Formation could be present somewhere between its top and bottom. Indeed, almost no fractures were reported above the zone close to the interface between the Sokoman and Wishart formations. Granberg (1989) noted that iron formations in the Schefferville area are poorly cemented and "can be crumbled by hand", but maybe iron formations can be much less permeable when located well below ground surface. In addition, the aquifer within the Wishart Formation appears to be confined, the piezometric surface being higher than the fractured horizon and mostly above the roof of the Wishart Formation (page 7-108 of Chapter 7 "The observed groundwater table shown in Figure 7-14 is everywhere over the water bearing fractures indicating a confined aquifer in artesian condition."), supporting the hypothesis of the presence of a much less permeable unit above. Contrary to what is written on p. 39 of Appendix B ("wetland do not have a link with groundwater"), NRCan does believe that wetlands and lakes are fed by shallow groundwater, not by groundwater from a "deep" formation (the Wishart Formation and its	

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					interface with the Sokoman Formation).	
CEAA 17	NRCan IR 4	Information and data	7.3.6	Chapter 7, section 7.3.6 Appendix B GEOFOR Hydrogeology and MODFLOW Modelling	Even if the "lower aquifer" located in the Wishart Formation is confined, dewatering of the open pit will likely create a link with the upper aquifer. Shallow groundwater could circulate through faults or percolate through lake and wetland bottoms as well as through the Sokoman Formation, as a very large hydraulic gradient will be created, especially when the open pit floor reaches its lowest level (160 m below the ground surface). Contrary to what is written on p. 39 of Appendix B ("The dewatering will have a null effect on those wetlands."), Natural Resources Canada has advised that it believes that open pit dewatering, while drawing from the "deep" confined aquifer, would have an impact on wetlands and lakes. The maximum drawdown obtained during pumping tests performed for this environmental assessment is on the order of 10 m, while the maximum drawdown during dewatering will be on the order of 70 m. There may also be impacts on lands around the site, since this intensive pumping in a confined aquifer could result in compaction.	• Conduct tests and provide information on more wells, both in the surficial deposits (or first few meters of bedrock) to investigate on the potential shallow aquifer and in the unfractured part of the Sokoman Formation to identify a potential confining unit. Hydraulic tests in these wells should be performed, with other available wells used as observation wells. Water levels in lakes and creeks should also be monitored during these tests. The unfractured part of the Sokoman Formation could also be tested using available wells with packers if they are not cased all along. • Redraw the piezometric map of Figure 8 in Appendix B (showing values from the deep aquifer) close to Irony Mountain, which is considered a recharge area (p. 7-100 of Chapter 7); hence piezometric contours would be perpendicular to flow coming from the Mountain).
CEAA 18	NRCan IR 5	Information and data	7.3.6	Chapter 7, section 7.3.6 Appendix B GEOFOR Hydrogeology and MODFLOW Modelling	Recharge is considered to be 20% of the precipitation minus evapotranspiration and sublimation, based on a reference for a similar area (p. 7-101 from Chapter 7: "The runoff value of 80 % of the total precipitation has been taken from the waste management plan section of SNC-Lavalin"). The basis for this estimate is not provided and no other justification is presented. Recharge could likely be larger than 109 mm/y (Table 7-40, Chapter 7) given the composition of the surficial	• Provide a water budget based on values acquired in the study area that would take into account the possibility for recharge to the shallow and deeper aquifers. • Appendix B (p.35) also states that: "Groundwater probably discharges through a southwest set of fractures southwest of Triangle Lake." Please explain how the proponent came to this conclusion and provide supporting documentation or references if applicable.

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					deposits, generally described as sandy or even gravelly (likely till, although not described that way). However, given the widespread occurrence of lakes and wetlands, it is probable that most of the infiltrated water supplies these features in topographic lows and that recharge in the deeper formations (in the Wishart Formation and its interface with the Sokoman Formation) is limited to areas where the Wishart Formation outcrops or lies directly below surficial sediments (see geological map of Figure 7-13 from Chapter 7). While the EIS (p. 35 Appendix B) states that: "In summary, the groundwater recharge is occurring in the Fleming 7 deposit area where the highest groundwater elevations are found and from the high elevation terrains along the Quebec-Labrador boundary", NRCan wishes to remind the proponent that recharge is not restricted to where piezometric levels are high. These zones often indeed correspond to preferential recharge areas, but it also depends on the permeability of the surficial sediments and underlying geological formations.	
CEAA 19	NRCan IR 6	Information and data	7.3.6	Chapter 7, section 7.3.6 Appendix B GEOFOR Hydrogeology and MODFLOW Modelling Appendix XVII Ground Water	*General* There are a few things that are not clear about the current numerical model. Figures 3-2 and 3-5 of Appendix B show that surficial sediments do not cover the entire model and that they are absent from the future open pit. The absence of cover is surprising since all the well logs provided in Appendix I (Well diagrams with simplified geology) and Appendix II (Geology of overburden wells) of Appendix B show a thickness of surficial sediments ranging from 6 (HW-	a. Based on new knowledge that will be acquired to better understand and assess the hydrogeological context, provide a revised numerical model. b. Provide a map of the thickness of surficial sediments, along with the available control points. c. Provide rationale to justify the choice made for the model base. d. In Figure 3-5, explain what the gray color corresponds to. e. In Figure 4-1 which shows the results of the calibration

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				Modelling Climate Variability	RC-15-WE08R) to 54 m (HW-RC-15-WE05R). Is it because this area will eventually be excavated? However, the model needs to be calibrated with present conditions to be able to match measured hydraulic heads. *Recharge* Recharge of the deep aquifer within the Wishart Formation cannot come from the surface at the location of the open pit through the thick Sokoman Formation. The "deep" aquifer is likely being recharged where 1) the Wishart Formation is at or near the surface or just below the surficial sediment cover and 2) the overlying Sokoman Formation is thin and therefore, likely quite permeable. Recharge of the Wishart Formation could be larger than 100 mm/y, but over a much smaller area. *Model boundaries* In the report, the Attikamagen Formation is said to be impermeable and to act as a barrier to groundwater flow (p. 23 of Appendix V in Appendix B). However, the calibrated hydraulic conductivity values provided in Table 4-1 from Appendix V in Appendix B show that between the overlying Wishart Formation (8 x 10^{-7} m/s) and the Attikamagen Formation (1 x 10^{-7} m/s), the difference is less than one order of magnitude, which is not enough to consider it an impermeable base. Does that mean that at lower depths, this formation is considered to be more permeable? Otherwise, the model should be extended deeper. In addition, it is not clear why the	process (Appendix V in Appendix B), explain how well HW-RC-15-WE08R can be located in layer #6, as indicated in the legend. It is only 73 m deep, while most other wells are much deeper and seem to be located in layer #5? f. Appendix V in Appendix B states the Attikamagen Formation is said to be impermeable and to act as a barrier to groundwater flow (p. 23 of Appendix V in Appendix B). However, the calibrated hydraulic conductivity values provided in Table 4-1 from Appendix V in Appendix B show that between the overlying Wishart Formation (8 x 10^{-7} m/s) and the Attikamagen Formation (1 x 10^{-7} m/s), the difference is less than one order of magnitude, which is not enough to consider it an impermeable base. Explain whether this means that at lower depths, this formation is considered to be more permeable; otherwise, the model needs to be extended deeper and analysis revised accordingly. g. Clarify why the Wishart Formation is not present at the base in Figures 3-4 and 3-5? It looks as though the base of the model corresponds to a given (constant) depth, not to the base of the Wishart Formation (or top of the Attikamagen shale Formation).

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					Wishart Formation is not present at the base in Figures 3-4 and 3-5? It looks as though the base of the model corresponds to a given (constant) depth, not to the base of the Wishart Formation (or top of the Attikamagen shale Formation). The surface area of the modelled domain appears to be too small because drawdown curves provided in the reports (Chapter 7, Appendix B and Appendix XVII) show that a 10 m drawdown is obtained very close to the model limits to the east and west, where a constant head boundary has been assigned, suggesting that a larger domain should have been modelled. Indeed, a constant head boundary forces drawdown to be zero at these limits. A much larger domain would not "force" the results and would likely show even larger drawdowns in the lakes. However, the introduction of a much less permeable layer (if relevant and applicable, based on the acquisition of new information) in the model would likely reduce this drawdown. These really restricted constant head boundaries might also be the reason why, although assigning K values that are not very low, the model is able to reproduce the very low "water table" found in the Wishart Formation. *Faults* The numerical modelling report (page 24 of Appendix V in Appendix B) states that "Fault zones with intermediate permeable values [were] assigned due	

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					to low permeability materials" . However, the role of the faults is not well known. Some seem to be more permeable and others less permeable than the surrounding formation (p. 11 of Appendix B). The K value assigned to these features (close to the other K formation values) does not, in any case, significantly influence groundwater flow. *Upper and lower aquifers* It appears that the model was not built to take into account both the upper water table observed in HW-RC-14-WE10B (in surficial deposits) and the deeper piezometric surface observed in the other wells of the future open pit. The modelled piezometric map obtained for mine dewatering shows drawdowns on the order of 10 to 20 m in the areas of the two lakes (Triangle and Pinette), indicating that there is a direct link between the surface and deeper formations in the numerical model. The hydraulic conductivity values assigned for the different formations do not allow the presence of a confining layer. However, the Wishart Formation appears to be, at least in part, a unit under confined conditions.	
CEAA 20	NRCan IR 7	Information and data	7.3.6	Chapter 7, section 7.3.6 Appendix B GEOFOR Hydrogeology and MODFLOW Modelling Appendix XVII Ground Water Modelling	*Model calibration* In Figure 4-1 of Appendix V in Appendix B, only 21 data points are presented (that can be seen at least), while 28 groundwater elevation values are provided in Table 2-3 (Piezometric results) of the same document. None of the values are above elevation 610 m in the Howse area (HW-RC-14-WE10B), while Figure 4-1 shows 9 points (from the Timmins area). It is unclear whether some of these points (boreholes) are missing from the figure.	a. Explain why some data points (boreholes) are missing from Figure 4-1 of Appendix V or provide a rationale for not including them on the figure. b. Provide modeled values in a table similar to Table 2-3 of the same document (or Table 7-38 of Chapter 7), for all observed values (including the well HW-RC-WEo10B drilled into surficial sediments). c. Given that flow rates are available at different sites, use these for model calibration, in addition to

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				Climate Variability	In addition, the borehole drilled into surficial sediments for which a water table value is available has been disregarded. It should be used in the next version of the model. The proponent should provide modeled values for all observed values. *Sensitivity scenarios* The scenarios for the sensitivity analysis should have used a much larger coefficient for the variation of K, as this parameter is known to vary quite significantly within a given area, especially in fractured bedrock formations. At least one order of magnitude (coefficient of 10) should have been used for "extreme" scenarios instead of only a factor of 2 to get a better range of potential pumping rates.	hydraulic heads. d. Provide scenarios using a factor of 10 to increase and decrease K values in the next version of the model.
Birds						
CEAA 21	CEAA	5(1)(a)(iii) Migratory Birds	6.3.2	7.4.8.2, 7-246, 250	The EIS refers to waterfowl surveys conducted by helicopter in spring and fall 2011. The EIS also states that concerns were expressed by Indigenous communities on effects of helicopters on wildlife.	• Describe potential limitations, if any, of using helicopters to carryout bird studies for birds that are noise sensitive and how this may have affected survey results and effects predictions.
CEAA 22	CEAA	5(1)(a)(iii) Migratory birds	6.3.2	Appendix XVI, Volume 1, Section 7.4.8.2, Page 7-250	The EIS states "removal of overburden and stockpiling of waste rock and other wastes will result in some loss of habitat, including some loss of wetlands that are important for certain at-risk migratory birds. Wetlands will be inspected in this area at least annually to ensure that the loss of wetland habitat does not exceed what was committed." Wetlands are particularly important for staging and	• Clarify whether traffic and heavy equipment would be permitted to enter wetlands or other areas not designated for traffic outside of the breeding season (i.e. September to April). • Provide information on when and how wetlands would be inspected, and on proposed mechanisms for adaptive management in the event that wetland habitat loss exceeds what was predicted.

IR Number	Dept Number	Effects Link to CEAA 2012	Link to EIS guidelines	EIS Reference	Context and Rationale	Specific Question/ Request for Information
					breeding waterfowl. It is not clear how wetland inspections would be undertaken. The EIS mitigation measures state that during breeding season, from mid-May to mid-August, traffic including heavy equipment shall not be permitted to enter wetlands or any area that is not designated for traffic.	
CEAA 23	ECCC-IR-01	5(1)(a)(iii) Migratory Birds	6.3.2	Volume 1, Section 7.4.8.2, Page 7-250	The EIS states "loss of habitat and disturbance associated with the project activities will mostly affect the LSA, and effects in the Regional Study Area (RSA) will be negligible or nonexistent. Disturbance in the LSA might result in bird avoidance of the LSA." Direct mortality of ground-nesting birds may occur if construction proceeds during the migratory bird breeding season in absence of appropriate mitigation. Environment and Climate Change Canada has advised that all migratory bird mitigation measure should be codified in an avifauna management plan. Prior to preparing a plan, the following document should be consulted: *"Planning ahead to reduce the risk of detrimental effects to migratory birds and their nests and eggs"* https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=1B16EAFB-1#_001	• Identify mitigation measures to address potential effects on ground-nesting migratory birds. • Explain whether an avifauna management plan would be prepared in accordance with the following document: *"Planning ahead to reduce the risk of detrimental effects to migratory birds and their nests and eggs"* https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=1B16EAFB-1#_001 . If so, describe the proposed review and approval process for an avifauna management plan.
CEAA 24	ECCC-IR-09	5(1)(a)(iii) Migratory Birds	6.3.2, 8.1.	Volume 1, Section 9.2.3, Page 9-40	The EIS states "the proponent is committed to surveying the Howse Pit vertical walls in early and mid-summer every year that the mine is in the operations phase. Should the Bank Swallow be detected, deterrence measures will be taken to render the site inhospitable (noise, plastic covering of pit walls, etc.) for nesting."	Explain whether the proponent would to commit to the following mitigation measures: • Physical deterrence measures to render the site inhospitable to Bank Swallows would only be used outside of the Bank Swallow breeding period. • The use of noise to render the site inhospitable to Bank Swallow during the nesting season would be prohibited.

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					If Bank Swallows are detected through surveys, it is very likely that they have already begun nesting and thus too late to initiate deterrence. The deployment of physical deterrence methods after the arrival of birds would have a high probability of destroying nests. The scaring of migratory birds through the use of noise is only authorized for situations where the "birds are causing or likely to cause damage to crops or other property". As this is not the case in this situation, targeted use of noise to scare birds attempting to nest would be considered disturbance and thus prohibited by regulations. Environment and Climate Change Canada has advised that: • Physical deterrence measures to render the site inhospitable to Bank Swallows should only be used outside of the Bank Swallow breeding period. • The use of noise to render the site inhospitable to Bank Swallow during the nesting season should be prohibited.	
CEAA 25	ECCC-IR-10	5(1)(a)(iii) Migratory Birds	6.3.2, 8.1.	Volume 1, Section 9.2.3, Page 9-40	Bank Swallows can re-use their burrows/nests from year-to-year, although they can re-nest when nests and burrows are destroyed. The destruction of nests outside of the breeding season could have negative impacts on future breeding success. Environment and Climate Change Canada has advised that Bank Swallow colonies not have physical deterrents installed in years during which work is not expected to be undertaken on the rock stockpile/bank in question.	• Explain whether the proponent commits to not installing physical deterrents for Bank Swallow colonies in years during which work is not expected to be undertaken on the rock stockpile/bank in question.

Information requests directed to the proponent

IR Number	Dept Number	Effects Link to CEAA 2012	Link to EIS guidelines	EIS Reference	Context and Rationale	Specific Question/ Request for Information
CEAA 26	ECCC-IR-05	5(1)(a)(iii) Migratory Birds	6.3.2	Volume 1, Section 7.4.8.2, Page 7-254	The EIS states "the Proponent is committed to surveying the Howse Pit area in early and mid-summer every year that the mine is in the operations phase (where vertical walls exist). Should the bank swallow be detected, then deterrence methods or measures should be taken to render the site inhospitable for nesting. Any nest found will be protected with a buffer zone determined by a setback distance appropriate to the species, the level of the disturbance and the landscape context, until the young have permanently left the vicinity of the nest." If Bank Swallows are detected through surveys, it is very likely that they have already begun nesting and thus too late to initiate deterrence. The deployment of physical deterrence methods after the arrival of birds would have a high probability of destroying nests.	• Explain whether the proponent commits to using deterrence methods in the form of plastic sheeting and fine meshed nets prior to (i.e. not during) the Bank Swallow breeding season. • Explain whether surveys for Bank Swallows would be undertaken prior to utilization of deterrence measures, to ensure that no early nesting is occurring and, if yes what surveys would entail.
CEAA 27	ECCC-IR-03	5(1)(a)(iii) Migratory Birds	6.3.2	Volume 1, Section 7.4.8.2, Page 7-251	The EIS states "the summer 2015 study on Pinette Lake confirmed this hypothesis, as a simulation of the water regime for Pinette Lake predicted slight changes in water level of only 2mm should not, in any case, affect breeding success in waterfowl." If larger than predicted water level changes occur during the waterfowl breeding season, destruction of nests and eggs could occur.	• Identify mitigation measures to address adverse effects on waterfowl if water levels fluctuate beyond predicted parameters.
CEAA 28	ECCC-IR-04	5(1)(a)(iii) Migratory Birds	6.3.2	Volume 1, Section 7.4.8.2, Page 7-253	The EIS states "if a nest is located, a small fence with wooden stakes and galvanized metal T-posts with colored nylon rope along the posts will be installed to identify it and prevent the machinery destroying the eggs." Environment and Climate Change Canada has advised that additional measures may improve the	• Confirm that a nest itself would never be marked using flagging tape or other similar material. If necessary, flagging tape can be placed at the limits of a buffer zone. • Explain whether and how Environment and Climate Change Canada's Avoidance Guidelines and associated technical information would be followed to help reduce the risk of incidental take of migratory birds, nests and

IR Number	Dept Number	Effects Link to CEAA 2012	Link to EIS guidelines	EIS Reference	Context and Rationale	Specific Question/ Request for Information
					effectiveness of the above mitigation. For example, a nest itself should never be marked using flagging tape or other similar material as this increases the risk of nest predation. If necessary, flagging tape can be placed at the limits of a buffer zone. The proponent should refer to: https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=8D910CAC-1 for setback ranges for different types of birds. Please note that these general examples should serve as a general starting point and be adjusted after assessing relevant factors, such as the risk of disturbance caused by industrial operations, for species at risk, ground nesting species, or the highly mobile chicks of species.	eggs - https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=AB36A082-1.
CEAA 29	ECCC-IR-06	5(1)(a)(iii) Migratory Birds	6.3.2	Volume 1, Section 7.4.8.2, Page 7-254	The EIS states "lighting of the mine will be reduced by half when weather forecasts are extreme (thick fog and snowstorms). This measure will be considered during the migration period (in May and from August to October) where migrating birds are more vulnerable to being entrapped by artificial lighting during harsh weather conditions." Attraction to lights at night or in poor visibility conditions during the day may result in collision with lit structures or their support structures, or with other migratory birds. Disoriented migratory birds are prone to circling light sources and may deplete their energy reserves and either die of exhaustion or be forced to land where they are at risk of depredation.	Explain whether the following additional mitigation would be implemented: a. The minimum amount of pilot warning and obstruction avoidance lighting would be used on tall structures. Warning lights would flash and completely turn off between flashes. Only strobe lights would be used at night, at the lowest intensity and smallest number of flashes per minute allowable by Transport Canada. b. The fewest number of site-illuminating lights possible would be used in the project area. c. Lighting for the safety of the employees would be shielded to shine down and only to where it is needed. d. LED lights would be used where possible instead of other types of lights. LED light fixtures are less prone to light trespass (i.e. are better at directing

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					Environment and Climate Change Canada has advised that it supports the measure of reducing lighting by half during the migration period.	light where it needs to be, and do not bleed light into the surrounding area), and this property reduces the incidence of migratory bird attraction.
CEAA 30	CEAA	5(1)(a)(iii) Migratory Birds 5(1)(c)	6.3.2 6.3.4	Table 4-7	The EIS states that elders have noted that irony Mountain is an important nesting site	• Provide information on species potentially occurring on Irony Mountain and the predicted effect of the Project on these species. Discuss proposed mitigation measures, if any.
CEAA 31	ECCC-IR-07	5(1)(a)(iii) Migratory Birds	6.3.2, 8.1.	Volume 1, Section 9.2.3, Page 9-40	The EIS states "the Proponent will engage in breeding birds and species at risk monitoring surveys every five years. Surveys with point count methods will allow HML to stay informed on avifauna in the area. In order to keep track of possible changes in bird populations, these surveys will be conducted in every habitat present in the Howse area, after the end of the construction phase." One of the main purposes of post-construction surveys is to verify the prediction of no significant adverse effects upon avifauna. The frequency of surveys stated in this section is too low to obtain adequate data for an effects assessment. If surveys at the current frequency show that the prediction of no significant adverse effects is incorrect, there may be insufficient time to undertake adaptive management to mitigate adverse effects. Following the initial three year post-construction period, monitoring as proposed by the proponent should be implemented to assess long-term effects.	• Present a strategy for monitoring effects and explain how resulting information would be used to determine potential effects on migratory birds. Explain whether the following would be implemented/committed to: - Undertaking post-construction monitoring every year for the first three years of post-construction in order to assess initial effects. Monitoring of migratory birds would also include monitoring for landbirds (i.e. songbirds, etc.) Methods would be comparable to those used in pre-construction surveys. - Submitting all monitoring protocols for migratory birds in the form of an Avifauna Management Plan to Environment and Climate Change Canada for review prior to implementation. • Provide information on if- and how Indigenous Traditional Knowledge would be considered in follow-up surveys for avifauna and how local communities would be involved.
CEAA 32 -	ECCC-IR-08	5(1)(a)(iii) Migratory Birds	6.3.2, 8.1.	Volume 1, Section 9.2.3, Page 9-40	The EIS states "uses of playback in proper habitat will be part of an adapted protocol…" Playback is generally a tool to use to determine absence of a species. The use of playbacks has the	• Explain under circumstances playback would be used. Confirm that playback would be used only if regular survey effort is resulting in no observations of a species, and it is necessary to confirm its absence from the area.

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					potential to disrupt natural bird behaviour. If a species is located during regular survey efforts, then there is no need to add stress to migratory birds by using playbacks. Confirm that playback would be used only if regular survey effort is resulting in no observations of a species, and it is necessary to confirm its absence from the area.	
CEAA 33	CEAA	5(1)(a)(iii) Migratory Birds	6.1.6, 6.3.2	7.4.8.4, page 7-256	The definition of the *frequency* criterion refers to timing considerations as opposed to frequency of effect: birds are more vulnerable during the breeding season or 25% of the year. As per the Agency's OPS *Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under CEAA 2012*, *frequency* is intended to describe how often an environmental effect occurs within a given time period (e.g., alteration of aquatic habitat will occur twice per year). *Geographic extent* is intended to describe the spatial area over which an environmental effect is predicted to occur. Prediction of the geographic extent should be quantitative whenever possible (e.g. hectares of habitat change).	• Review and revise the definition of *frequency* in accordance with the Agency's OPS *Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under CEAA 2012*. • Provide additional explanation for how geographic extent determinations were made, including the maximum spatial extent of effect (e.g. light, noise (including blasting), habitat loss). Also include any temporary or permanent habitat loss with respect to bird habitat.