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Memo

To: Katrina Lauzon, Mineral Exploration and Development Consultant, Timmins Office, Ministry of Energy, Northern Development and Mines via email: katrina.lauzon@ontario.ca

Cc: Carroll Leith, Ministry of Environment, Conservation and Parks

From: Charles Hookimaw, Attawapiskat First Nation

Date: August 18, 2020

Subject: Attawapiskat First Nation's Comments regarding De Beer's Victor Diamond Mine Revised Closure Plan Amendment #4 – ERO number: 019-2120, Ministry reference: V07 Victor Mine

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De Beers Canada Incorporated (DBC) has submitted a Mine Closure Plan Amendment for filing by the Ministry of Energy, Northern Development and Mines (ENDM) as required under the Mining Act. The location of the site is within Attawapiskat First Nation territory. The amendment proposes rehabilitation measures to be implemented during closure of De Beers Canada Incorporated's Victor Mine site. The Victor Mine ceased operations in 2019. On December 16, 2019 De Beers informed Attawapiskat First Nation (AttFN) that the focus in 2020 was shifting from progressive reclamation rehabilitation to closure of the facility.

The following are the major components of this Closure Plan Amendment as proposed by De Beers Canada Incorporated.

- waste rock dump bypass road connecting the waste rock dump to the high-grade stockpile near the primary crusher.
- greenhouse, Hydroponic System and Seed Facility.
- in Pit Sump / Settling Pond.
- extension of Run of Mine Stockpile.
- northec laydown pad and infrastructure.
- new fish pond.
- waste burn pit new location.

AttFN retained Shared Value Solutions Ltd. (SVS) in February 2019 to provide professional services related to the review of the Victor Diamond Mine (VDM) Closure Plan and ongoing technical support to the AttFN Environmental Management Committee (EMC) as the VDM proceeds through closure.

In May of 2019, SVS completed a third-party peer review of DBC's May 2018 Victor Mine Closure Plan Amendment #4 and October 2018 Human Health Risk Assessment, and provided AttFN with a draft report of compiled issues, recommendations, and conclusions. SVS presented the results of this review to AttFN Council and community members in June of 2019, and after receiving edits and comments back from AttFN, SVS provided a final report of compiled issues and recommendations to AttFN in August 2019. AttFN subsequently shared this final report with DBC. DBC indicated that the comments and recommendations that AttFN tabled for Closure Plan Amendment #4 would be addressed in Closure Plan Amendment #5, which would be released in late 2020.

On April 14, 2019 DBC provided AttFN with a comment tracking table outlining their responses to the issues, comments, recommendations and conclusions raised by AttFN via the SVS third-party review of the 2018 Victor Mine Closure Plan Amendment #4 and Human Health Risk Assessment reports. SVS provided an initial assessment of the adequacy of DBC's responses on June 10, 2020 (within the final column of the proceeding Tables 1-3, contained within this memo). To date, AttFN has received no further correspondence from DBC regarding dispositioning AttFN's comments on Closure Plan Amendment #4, and AttFN is still of the understanding that the outstanding issues it has tabled will be addressed in Closure Plan Amendment #5.

Overall, DBC's responses were imprecise and non-committal with regards to requests and recommendations for the meaningful engagement and involvement of AttFN in decision-making, training and monitoring, and inclusion of traditional knowledge, including adequate capacity for such meaningful engagement. DBC's responses generally lack a willingness to provide detail, and often fail to respond directly and meaningfully to questions and recommendations. In many cases, DBC's responses refer AttFN to review other lengthy documents rather than explaining how DBC will address the issue AttFN has raised.

Given the limited budget available for reviewing DBC's responses, it is unreasonable for DBC to expect AttFN to take hours and hours to conduct a full review of supplemental reports cited in responses, and then evaluate whether concerns have been sufficiently addressed. This is especially true when considering the track record of inconsistencies and errors that AttFN has identified in other DBC reports during the ongoing review of EMC related technical reports and documents. **Additionally, AttFN has been provided with no indication of whether our comments and concerns have been addressed within the revised Closure Plan Amendment #4 that is currently open for comment, and to date we have not received a response from DBC regarding our inquiry as to what is different in this revised version to aid in our review of the document.** Therefore, the subsequent sections of this memo reiterate our comments that were submitted to DBC on the original Closure Plan Amendment #4, alongside DBC's responses and AttFN's assessment of response adequacy. A summary of key outstanding issues related to both Closure Plan Amendment #4 and the associated Human Health and Ecological Risk Assessment is provided at the end of this document.

In addition to the issues noted below, AttFN notes that the VDM Closure Plan is dependent on a new proposed and currently unapproved demolition landfill. This additional landfill was not considered in the original Environmental Assessment for the mine. AttFN is opposed to this additional landfill. DBC is reducing or eliminating proper offsite disposal of mining project waste by substituting offsite disposal with onsite disposal of a significant unplanned quantity of waste in AttFN's territory, in contradiction to the approved Environmental Assessment. AttFN will not suffer the further impacts of this new landfill waste on top of the existing impacts of the VDM.

Table 1. Closure Plan: Comments, Responses, and Assessment of Response Adequacy

Comment #	SVS Comment	SVS Recommendation	DBC Response	Assessment of Response Adequacy
GENERAL COMMENTS				
1	The Closure Plan (Amendment #4) lacks any details on the overall fisheries offsetting/compensation plans (other than the South Granny Creek Diversion) and their current status with respect to construction and effectiveness (e.g., naturalization and connection of channels from the polishing pond and south quarry pond to the Granny Creek system).	Please provide the issued Fisheries Act Authorization and all offsetting plans for review within the context of this version of the Closure Plan to ensure that AttFN was properly consulted and involved during planning and design, and that their specific interests were included (e.g., intended usage, target species and habitat requirements).	Approval applications, including for Fisheries Authorizations and related plans from the original Victor Mine development and subsequent activities, have been provided to the Attawapiskat First Nation (AttFN) for comment at the time of development. In addition, the AttFN have been provided with copies of required reporting related to these approvals. There are no requirements under the Mining Act and associated regulations to provide details regarding fisheries offsetting / compensation measures related to Fisheries Authorizations, or details regarding other permits in Closure Plans (CP) / Closure Plan Amendments (CPA), unless they are material new works. There are no new offsetting / compensation measures proposed in CPA4.	**Addressed**
2	The Victor mine Closure Plan Amendment #4 does not contain any information on DeBeers' efforts to prevent the introduction or spread of noxious and invasive plant species during mine closure activities (e.g., rehabilitation measures). This is a concern for AttFN, as the potential introduction or spread of invasive species presents a threat to ecosystems within AttFN's traditional territory and the culturally significant flora and fauna species within it.	**2A)** DeBeers should provide a detailed description of the measures they will use to prevent and respond to the introduction or spread of invasive species during mine closure planning activities. This should include detailed equipment inspection and cleaning protocols following best management practices outlined in MNRF and Ontario Invasive Plant Council (OIPC)'s Clean Equipment Protocol for Industry (Halloran et al., 2013), and species-specific control and elimination protocols, emphasizing feasible non-chemical techniques (e.g., hand pulling, controlled burning, cutting, mowing). **2B)** In the event that mine closure activities cause the introduction or spread of noxious and invasive species, AttFN will consider DeBeers financially responsible for invasive species removal efforts using techniques that will not further harm the environment. Subsequently, DeBeers should determine the potential costs	Please see the comprehensive response issued by De Beers on March 3, 2020 subject line "SVS Review of Invasive Species Letter" and its subsequent follow up response. **2A)** De Beers appreciates your suggestions and references, and plan to implement feasible measures for preventing and responding to the introduction of invasive species during mine closure activities. **2B)** Proposed measures will be described in the upcoming Closure Plan Amendment #5 (CPA5), to be issue for comment to the Attawapiskat First Nation in the third quarter of 2020. **2C)** De Beers appreciates the willingness that the AttFN has offered in the past and continues to offer the Victor Mine, in terms of contracting and employment opportunities, and is certainly willing to discuss this potential opportunity through an appropriate venue.	Overall, the chain of recommendations and responses to the "SVS Review of Invasive Species Letter" should not be considered a "comprehensive response". Many gaps in their invasive species management measures remain, and a fulsome management plan should be prepared. See most recent SVS memo (April 23, 2020) for more details. **2A) Not Addressed:** DBC's response is imprecise and non-committal, and does not confirm whether or not the Clean Equipment Protocol for Industry will be followed. It is a widely referenced and utilized document, and should be followed by DBC. **2B) Addressed** **2C) Addressed**

		associated with invasive species management costs to ensure that their financial assurance is scoped accordingly. **2C)** DeBeers should also provide AttFN with the first right of refusal around any employment opportunities associated with invasive species prevention or control in AttFN's traditional territory.	Please also review the comprehensive response issued by De Beers on March 3, 2020 subject line "SVS Review of Invasive Species Letter".	
3	CPA Section 9.3 (Other Mine Openings). The Water Management Plan for the site is still under development and was not submitted as part of the Closure Plan Amendment #4. This Water Management Plan includes important model updates on the pit lake model, groundwater rebounding, and the overall site water management. It is important that AttFN has the opportunity to review the Water Management Plan prior to finalization.	**A)** Please provide the Water Management Plan for the site to AttFN for review. **B)** All surface and groundwater monitoring locations at the site should continue to be monitored for sulphate, mercury, methylmercury, oil and grease, and metals for at least the first 50 years post-closure (100 preferred). Attawapiskat First Nation should be engaged in the monitoring. Funding should be provided for Attawapiskat First Nation to conduct environmental and human health monitoring for the 50-year period post-closure.	**A)** A copy of the Water Management Plan will be provided for the AttFN review in the third quarter of 2020, aligned with CPA5. **B)** Surface water and groundwater monitoring will be continued at the Victor Mine in accordance with all approval requirements. Given the long history of monitoring at the site, including prior to development, a focused program for the post-operation period is proposed. De Beers has provided responses previously to comments on the program from the AttFN consultants, Shared Value Solutions (SVS). De Beers appreciates the willingness that the AttFN has offered in the past and continues to offer the Victor Mine in terms of contracting and	**3A) Not Addressed**: We requested the Water Management Plan for the VDM and DBC is not providing until Q3 2020 **3B) Not Addressed**: DBC has not agreed to comprehensive surface and groundwater monitoring of sulphate, mercury, methylmercury, oil, grease and metals as requested, and is only choosing to monitor as required by permits, not by AttFN recommendations.
4	Section 3.5 Closure Plan Objectives; Section 11.0 Expected Site Conditions Following Closure. Section 3.5 of the Closure Plan outlines the objectives established for the Closure Plan, used to describe the intent of the Victor Mine and the Closure Plan. Objective b) and c) indicate that the intent of closure activities is to "provide for the return of all affected ecosystems to a stable and safe condition" and to "provide for the return of all affected ecosystems to a functioning state."	AttFN notes that parameters of "stable and safe" conditions and "functioning state" have been left undefined in the Closure Plan Objectives and throughout the Closure Plan. AttFN has not been consulted on the definitions of these key terms. In order to be assured that closure activities will "establish as best as possible conditions that permit productive use of the affected sites and the natural resources of the area, including the possibility of carrying out traditional harvesting activities by AttFN members, similar to its original use;" clear parameters, benchmarks and thresholds must be established, in close consultation with AttFN, to measure the effectiveness of the Closure Plan in restoring predevelopment conditions. AttFN also requests that a clear commitment is included in the	De Beers appreciate this feedback and will work to better clarify these aspects in CPA5, which will be issued to the AttFN for comment during the third quarter of 2020.	**Addressed,** pending the inclusion of requested definitions in Closure Plan Amendment #5.

		Closure Plan Objectives and throughout the Closure Plan that the mine site post-closure must meet these objectives as quickly as possible.		
5	Section 4.0 Current Mine Site Conditions. In its description of current mine site conditions, the Closure Plan relies heavily on a 2004 AMEC Environmental Baseline Study and Comprehensive Study Environmental Report. This poses a particular problem to accurately characterizing environmental components subject to the cumulative effects of climate change and industrial development for the last 15 years, namely local land uses, groundwater, terrestrial plant and animal life and aquatic life.	AttFN requests that Environmental Baseline Studies are updated to reflect up- to date on-site conditions, with an equal consideration of western science and traditional knowledge through engagement of AttFN knowledge holders and land users.	Section 4 of CPA4 provides the information required by the Mining Act and associated regulations. Environmental baseline studies are by their nature pre-development and cannot be updated.	**Not Addressed:** The previous recommendation should be re-phrased. SVS understands that environmental baseline studies are pre-development and do not need to be updated within the context of characterizing mine impacts. However, baseline studies from 2004 may be outdated and should therefore not be used to characterize 2019 mine site conditions. DBC should undertake additional research (e.g. document review or surveys) to ensure Sect. 4 is more accurate.
6	Section 9.0 Rehabilitation Measures; Section 11 Expected Site Conditions Following Closure. Section 9.0 of the Closure Plan indicates that "the supporting environment on completion of closure will be different from the existing muskeg environment, and will include forested low hills and ponds, that are not currently present." With respect to Expected Site Conditions Following Closure, Section 11 further concludes that "in overall wildlife support capability, the reclaimed habitat will be more productive than the original muskeg landscape" and "habitats created at the end of mine life, through the reclamation program, will generally be more productive than the currently existing lower productivity fen and bog communities."	AttFN requires that these conclusions are confirmed with traditional knowledge holders and land users, and that habitat reclamation and construction is informed by AttFN knowledge holders and land users. AttFN must be involved in all aspects of decision making for reclamation of the project site to ensure that post-closure conditions at the site will support traditional land use interests as quickly as possible.	De Beers respects and appreciates the information that the traditional knowledge holders and land users have been willing to share over the years. Development of the Victor Mine has changed the landscape permanently as identified through the original environmental assessment and permitting process. Closure of the mine will provide a landscape of greater diversity than the surrounding landscape, consistent with the predictions made in the original Environmental Assessment and the approvals process for the mine. The closure measures proposed in CPA4 are consistent with the approach proposed to be taken for closure, that has been described since that time. De Beers appreciates the advice and comments that the AttFN has provide regarding the approach to closure of the Victor Mine through various venues prior to, and over the life of the mine, including this process.	**Not Addressed:** It is not sufficient to respect and appreciate information provided by AttFN knowledge holders and land users, DBC needs to demonstrate that Indigenous knowledge has been incorporated into the CPA documents and habitat reclamation planning process. Broadly speaking, AttFN acknowledges that forested hill habitats are more biodiverse than muskeg habitats, but the ecological importance of muskeg habitat should not be understated (e.g. provision of refuge for caribou, supports culturally important plants such as Labrador tea and cranberry). DBC should hold engagement sessions with AttFN knowledge holders and land users to document traditional use and Indigenous ecological knowledge specific to forested communities (the expected post-closure site condition) and identify ways that site reclamation can promote future land use by AttFN. For example, this could include identifying hunted forest species and their ideal habitat, and planting flora species that will support them. A record of this consultation should be provided and any

				CP amendments or supplementary reclamation plans should clearly outline how AttFN Indigenous ecological knowledge has been incorporated into reclamation planning.
SURFACE WATER IMPACTS COMMENTS				
7	CPA Section 4.4.3 (Baseline Groundwater Toxicity Testing); Table 4-13. Effluent quality data for the wellfield discharge to the Attawapiskat River only includes pH, total suspended solids (TSS), and chloride. Several important parameters are missing, including metals, sulphate, mercury, and other potential contaminants such as those deriving from fuel spills. Given that effluent from the Phase 1 settling pond likely contains hydrocarbons that would not settle out, and some effluent from the PKC facility is directed to the wellfield pipeline, a more thorough understanding of effluent chemistry is warranted. Effluent quality data would help to clarify the origins of elevated exceedances downstream of the site.	The Proponent should provide effluent quality data that includes metals (including mercury and methylmercury), sulphate, and hydrocarbons to better understand the impacts of the mine on water quality in the Attawapiskat River.	Note that effluent is no longer being discharged from the open pit mine, therefore well field waters and additional parameters cannot be tested. Additional parameters will be added to the effluent quality table in CPA5 if reasonable, as available from De Beers files.	**Partially Addressed**: We requested that DBC test wellfield discharge with an expanded suite of analytes (mercury, methylmercury, sulphate and hydrocarbons). DBC is correctly stating they are no longer discharging from the wellfield, though we should respond with a requirement to test all waters for the proposed analytes when discharged into the Attawapiskat river or to Granny Creek or the NE Fen, regardless of point of origin.
8	CPA Section 5.2.2 (Geochemistry Programs). In general, neutralization potential in mine rock and fine and coarse PK is high, and there is limited potential for acid generation and the leaching of metals at the site. However, reducing conditions at the base of stockpiles and in isolated pockets could cause the mobilization of trace metals and iron (Amos et al., 2015). Sulphide oxide and dissolution calculations indicated that concentrations of some metals may exceed PWQOs. The Proponent has assumed that native soils and the limestone rock pad installed under the low-grade ore stockpile have enough alkalinity to neutralize any acid generation. However, acid rock drainage (ARD) can take decades to occur, and even if it does not, the geochemical reactions in stockpiles can still generate neutral mine drainage that is poor quality with elevated levels of sulphate and metals (Amos et al., 2015). It is unclear that the Proponent will continue to monitor for an appropriate length of time to	The Proponent has made a reasonable assumption regarding the generation of ARD and the leaching of metals at the site, but localized impacts could still occur, and the assumption should be verified. The Proponent should continue to monitor the quality of seepage from stockpiles and the PKC facility until at least year 50 post-closure (100 is preferred) and should be prepared to monitor in perpetuity (i.e., provide adequate financial assurance) should the need arise.	De Beers appreciate your agreement with the conclusions develop through our investigations / site knowledge. Based on this work, De Beers does not believe there is a scientific basis for this request for monitoring over such a long period of time, given the extremely high level of neutralization potential and very low level of metals in the both the kimberlite and host rock. Surface water and groundwater is proposed to be monitored for a reasonable time period post-closure as agreed to with MECP and ENDM (CPA4). Note that should monitoring results indicate much poorer water quality than what is provided in Tables 10-1 and 10-2 of the CPA4, De Beers will review the need to extend and/or revise the monitoring program as appropriate.	**Not Addressed**: DBC has not agreed to a longer period of monitoring, as requested by AttFN.

	ensure that ARD does not become an issue at the site in the future. The post-closure monitoring phase is anticipated to occur for only 15 years post-closure (i.e., 2024 to 2039, as indicated in Section 9.19 of the Closure Plan Amendment #4).			
9	CPA Appendix D, Section 1.1 (Sulphate Source Investigations and Control). During closure, the Proponent is proposing to direct drainage from stockpiles to the open pit to limit contact with the muskeg. However, the Proponent's sulphate management practices are still under evaluation and development, and little information is provided on the long- term strategy for sulphate management. Phase I and Phase II site assessments are underway to better define leachate plumes and sulphate transport pathways.	The Proponent should provide the Phase I and Phase II site assessments and the details of the long-term sulphate management options for the site to AttFN for review before they are finalized.	Copies of the updated Phase I and Phase II site assessments will be provided to the AttFN when available. At this time, long term sulphate management is not anticipated to be required beyond the placement of a low permeability cover on the surface stockpiles to reduce seepage; however, further detail regarding this aspect will be provided in CPA5.	**Not Addressed**: AttFN requested that DBC provide the Phase 1 and Phase 2 ESAs. They have not provided these reports, and have given no timeline for when they may provide them. DBC offers no options for sulphate management beyond what they are already doing, despite the known connection between sulphate management, methylmercury and human and ecological health risks.
10	CPA Section 10.2.3 (Final Closure); Table 10-1. Methylmercury is not included in the list of parameters to be monitored during reclamation and post-closure.	The Proponent should include methylmercury as a parameter to be monitored in both reclamation and post-closure in receiving waters.	The parameters listed in CPA4 are consistent with the requirements of the *Mining Act* and associated regulations. De Beers agrees to monitor methylmercury where appropriate as per the existing permits and licenses. Methylmercury is currently monitored per the requirements of Certificate of Approval 3960-7Q4K2G.	**Not Addressed**: DBC has not clarified whether they will be monitoring for methylmercury during reclamation and post-closure, despite the known connection between sulphate management, methylmercury and human and ecological health risks.
11	CPA Section 10.2.3 (Final Closure). The Closure Plan Amendment #4 indicates that adjustments and reductions to the water quality monitoring program will be made where permissible and when results suggest it is appropriate. For example, water quality results will influence the progression of the monitoring schedule from reclamation to post-closure. However, it is unclear what water quality standards must be met to justify adjustments to the monitoring plan (e.g., what would trigger an increase or decrease in monitoring), and whether AttFN will be included in the decision making process about these changes.	11A) AttFN should be included in the decision-making process regarding water quality requirements that must be met before monitoring frequencies can be reduced and parameters can be removed. 11B) The Proponent should provide financial assurance that water quality monitoring, including monitoring of the pit lake, can be carried out *in perpetuity* if required.	**11A)** Surface water and groundwater monitoring will be continued at the Victor Mine. Given the long history of monitoring and extensive database, a focused monitoring program post-operations is proposed. De Beers has provided responses previously to comments on the program from the AttFN consultants, Shared Value Solutions (SVS). **11B)** Financial assurance has been provided consistent with the proposed program in CPA4. If the closure monitoring program is updated in the future, the financial assurance will also be updated as required by the Ministry of Energy, Northern Development and Mines (ie. if there is a material change).	**11A) Not Addressed**: DBC has not agreed to include AttFN in the decision-making process around changes to water monitoring programs **11B) Addressed**
HYDROGEOLOGY COMMENTS				

12	CPA Section 9.3 (Other Mine Openings); Appendix A1; Appendix A2. The objectives of the groundwater models have focused primarily on the operations stage of the mine as opposed to postclosure. The passive filling of the pit was modeled in the 2015 groundwater flow model and it was predicted that the pit lake would reach a water level of 82 mamsl five years after pumping has ceased. Later versions of the model did not update the filling of the pit lake or consider the flows that may influence the pit lake once it is filled. For example, the pit may be backfilled with fine processed kimberlite, so the final pit depth is not currently known. Additionally, it is unclear whether the contribution of seepage from stockpiles is considered in the pit lake model. The CPA indicates that an updated groundwater flow model is currently under development to better predict the timeframe for groundwater rebound and the potential need to supplement filling of the pit lake with water from the Attawapiskat River.	The Proponent should provide an updated pit lake model that more accurately predicts groundwater rebound. The model should take into account the possible backfilling of fine PK into the pit lake and the redirected seepage from the stockpiles and should consider the impacts of flows on pit lake levels over time. The Proponent should consult AttFN on the decision to supplement the pit lake filling with water from the Attawapiskat River.	A comprehensive pit lake model was prepared to support CPA4 (Appendices D-4 and D-5). There are no site changes since preparation of the model that would warrant additional modelling. De Beers does not propose to backfill the open pit with fine PK (please let us know if there is an error in the document that suggests otherwise). Note that the Central Quarry was backfilled in part with fine PK early in operations (Section 5.6.1). Copies of all of the permit applications related to supplementing the pit lake filling with water from the Attawapiskat River have been provided previously to the AttFN for comment 21 days prior to formal submission as per the Impact Benefits Agreement. This includes De Beers responses on the sediment and erosion control plan which was submitted as an appendix to the application.	**Addressed**
13	CPA Section 9.3 (Other Mine Openings); CPA Appendix A1; Appendix A2; Appendix A3. The groundwater models included in the Closure Plan do not consider the evolution of pit lake chemistry over time. The Itasca (2004) model predicted that the equilibrated chloride concentration in the pit lake would reach 500 mg/L, but the details of the pit lake chemistry and dynamics over the long-term were not included. The CPA indicates that it is likely that meromixis (layers of water that do not intermix) will occur in the pit, but a pit lake chemistry model is not provided to confirm this. The influence of ice cover; the influx of saline runoff from stockpiles and other areas; and the flow of groundwater in and out of the pit lake once it has filled (including the depth of entry/exit fractures and salinity) are not considered. These factors can be very important for the stability of pit lake meromixis (Castendyk and Eary, 2009; Pieters and Lawrence, 2014).	**13A)** The Proponent should provide the results of a pit lake model that examines the evolution and dynamics of pit lake chemistry over the long-term, including salinity, metals, and other contaminants of concern. The pit lake model should consider: • Ice formation that excludes enough salt to raise the salinity under the ice, causing mixing via double diffusion (Hamblin et al., 1999; von Rohden et al., 2010); • Gradual collapse of pit walls/rock falls that could cause mixing in the pit lake (Stevens and Lawrence, 1998; Pieters and Lawrence, 2014); • Groundwater inflow decreasing salinity or density differences between lake strata (Pieters and Lawrence, 2014); and • Influx of saline runoff from stockpiles and other areas around the mine site (Pieters and Lawrence, 2014).	Please review "*Closure of the Victor Diamond Mine: Infilling, Hydrodynamic, and Water Chemistry of the Pit Lake*" (Itasca 2019), a copy of which is provided in Appendix D-5 of CPA4 and has been provided in Attachment 1 to this response. In summary response: • Ice formation was considered in the model. • The report acknowledges that partial mixing could occur with pit highwall failure and several other atypical scenarios. • Salinity / density differences were fully considered in the model and hydrodynamic simulations of the stratification of the lake. • Runoff from the site is not saline. The pit lake was modelled with the proposed input of Attawapiskat River fresh water (Appendix D of that report) as well as remaining "as is" and naturally recharging. • The Victor Mine pit lake is predicted to be a meromictic pit lake that will remain stratified and be resistant to complete mixing.	**13A) Partially Addressed**: DBC has provided detailed info on their pit lake model, but has not provided any info on how they will manage open pit water quality if meromixis does not occur. DBC has referred AttFN to review additional documents in order to assess the adequacy of their response. **13B) Not Addressed**: DBC does not consider how pit lake chemistry may impact hydrogeologic units that are hydraulically connected to surface water bodies. **13C) Addressed**

		Should the model demonstrate that meromixis may not occur, the Proponent should provide more information on how the water quality in the open pit will be managed to prevent negative impacts to the environment, including to hydraulically connected surface water bodies. **13B)** The Proponent should demonstrate how the changing water quality in the pit lake over time will impact the quality of the surrounding groundwater. In particular, how will changes in pit lake chemistry impact hydrogeologic units that are hydraulically connected to surface water bodies, and will surface water quality be impacted via this connection to the pit over time? The model should include contaminant transport/particle tracking and define important transport pathways and plumes originating from the pit lake. **13C)** The Proponent should monitor groundwater quality in the vicinity of the pit lake and surface water quality in the Attawapiskat River and Nayshkootayaow River downstream of hydraulic connections with hydrogeologic units that are connected to the pit lake. Monitoring timeframes should extend well beyond the time predicted for the pit lake chemistry to reach equilibrium to verify that the pit lake model is accurate and to identify and address water quality issues promptly.	Note that De Beers does not consider some of the references quoted relevant to the Victor Mine, for example: • The paper quoted on double diffusion is not expected to be relevant to what will occur at Victor Mine pit lake. The study quoted is based on lakes 4.7 m and 17.4 m deep with large surface areas of 2,387m² and 165,700m² respectively. These result in very large surface area to volume ratios. The amount of surface ice relative to the volumewithin the Victor pit lake will be very low in comparison. This can still play a small part in the mixing of the upper levels and is listed as a factor (per Itasca 2019). • Pit lake mixing due to pit wall collapse is not likely to occur. Unlike the Berkley Pit described in the paper, the Victor pit lake will not have exposed highwalls, as they will be completely submerged (resulting in increased stability due to outward pressure). The period of greatest potential risk of pit wall instability was at the end of mining when the pit was maximum depth with no water. The stability has been increasing as the lake level rises. **13B)** De Beers has designed the closure of the open pit, including the addition of fresh water from the Attawapiskat River, to support establishment of a stratified pit lake, such that the surface water is of better quality (Table 7-2 in Itasca 2019). Attached Table 1 provides a comparison of the projected surface (epilimnion layer) water quality in the pit lake compared to the Provincial Water Quality Objectives / Interim Provincial Water Quality Objectives for the protection of aquatic life. The pit lake level will eventually stabilize at the local groundwater level which even after full recover is several metres below the pit berm height (Itasca 2019). No overflow channel from the pit lake to the environment is proposed to be developed. **13C)** Surface and groundwater monitoring is proposed for as long as necessary based upon results. Monitoring will occur per CPA4, and pending results,will be extended if needed.	

14	CPA Appendix D, Section 1.1 (Sulphate Source Investigations and Control). The Closure Plan states that Phase I and Phase II site assessments are underway to better define leachate plumes and sulphate transport pathways originating from stockpiles. However, it is unclear if these plumes and transport pathways will be included in groundwater models of the site.	The Proponent should develop a contaminant transport model that examines the potential impacts of sulphate from stockpiles on muskeg and watercourses. The Proponent should use the contaminant transport model to inform the long-term environmental management strategies at the site.	Copies of the updated Phase I and Phase II site assessments will be provided to the AttFN when available. Please also note that the surface water quality model includes sulphate as a parameter of interest per "*Victor Mine, Post- Closure Water Quality Model Report*" (Hatch 2019), a copy of which is provided in Appendix C of CPA4 and has been provided in Attachment 2 of this response.	**Not Addressed**: Addressing this comment depends on the Phase 1 and Phase 2 ESAs, which are not complete, and for which DBC has not provided AttFN with a timeline for transmittal to AttFN.
15	CPA Appendix A2. Two recharge values are used in the groundwater flow model to represent recharge to the bioherms (350 mm/yr) and muskeg (200 mm/yr). The flow model does not consider a range of climatic scenarios.	The Proponent should provide groundwater flow and contaminant transport simulations for a variety of climate change scenarios. The results should include climate change impacts to ice cover and the influence of ice thickness on pit lake salinity; groundwater rebound rates; the need for flow supplementation to South Granny Creek and the Nayshkootayaow River; pit lake chemistry; and stockpile leachate plumes.	Please review "*Closure of the Victor Diamond Mine: Infilling, Hydrodynamic, and Water Chemistry of the Pit Lake*" (Itasca 2019), a copy of which is provided in Appendix D-5 of CPA4 and has been provided in Attachment 1 of this response.	**Partially Addressed**: DBC has provided additional separate documentation that may provide an adequate response to the initial comment, however this requires additional time and budget in order to properly assess – and that budget is not available.
FISH AND FISH HABITAT COMMENTS				
16	CPA Section 4.6 (Aquatic Life). The text indicates that the majority of riverine systems have cool water thermal regimes and contain cool and cold-water tolerant fish species, including brook trout.	Please clarify which creeks are cool water and cold water, as their sensitivities, timing restrictions and management protections are different.	The MNRF Land Information Ontario (LIO) data shows the Attawapiskat River is a cold water thermal regime; however, the LIO data only shows one of the Nayshkootayaow River headwater tributaries as cool water thermal regime with the mainstem Nayshkootayaow River and other tributaries currently unclassified. It is likely the Nayshkootayaow River may be considered cold water habitat as it supports cold water species. The North Granny Creek and South Granny Creek systems support Brook Trout and are considered cold water habitat, although the LIO database does not currently include a thermal regime classification for either system. Protection requirements for in-water work timing window guidelines are based on species presence and as such, both the spring and fall restrictions would likely apply to all area watercourses for in-water work.	**Addressed**
17	CPA Section 4.6 (Aquatic Life). The Closure Plan references valued fishing activity in the mine area by the AttFN community; however, it is not clear where or which	Please provide or incorporate a map of these sensitive areas so that they can be buffered to remain undisturbed during mine closure activities.	The comment in CPA4 "There are no known active commercial fisheries in the Victor Mine area, although fishing is a valued activity by the local community of Attawapiskat" refers to the	**Addressed**

	reaches in particular are known fishing locations/spots or what the specific value is of each creek/river to AttFN.		general knowledge that De Beers has regarding the value placed on fishing by the AttFN. Please see Figure 4-2 provided as Attachment 3 of this response, which was issued as part of the original Closure Plan, which is adapted from pre- development investigations by Adams Heritage Consultants. The map is based on traditional knowledge provided by the AttFN prior to development of the Victor Mine. De Beers has not been provided with a map of sensitive areas valued by the AttFN.	
18	CPA Section 4.6.2 (Nayshkootayaow River) indicates that fish species were caught in July and August during 1999 environmental baseline studies, but it does not indicate if spring or fall sampling was done, which is when sensitive species and/or habitat might be revealed (e.g., brook trout, which AttFN mentioned was present).	Please indicate if spring and fall spawning surveys were conducted during baseline surveys to sufficiently document the fishery in each potentially affected system so that they are properly protected during closure activities.	There is an extensive database of aquatics information for watercourses at and near the site including for the Nayskhootayaow River to allow for future comparison as needed. The Victor Mine baseline surveys conducted prior to the development of the Victor Mine were considered very comprehensive at the time (final report in 2004) and exceeded all of the regulatory requirements. The site was very inaccessible at the time, which guided in part the baseline studies completed. The Nayshkootayaow River fish community was identified as including lake sturgeon, walleye, pike, lake whitefish, suckers, brook trout and minnow species in the Environmental Assessment report (issued in 2004) pursuant to the Canadian Environmental Assessment Act.	**Partially Addressed:** DBC has not responded to the query and has instead referenced previous baseline studies completed as part of the Environmental Assessment. It is unclear whether spring and fall spawning surveys were completed.
19	CPA Section 4.6.4 (Muskeg Ponds). The text is not clear regarding which ponds contain a fishery and which ones do not. Small-bodied fisheries in these ponds may be important to AttFN as a source of bait or for other reasons.	Please confirm and map which ponds are known to provide direct fish habitat and if they were included in the serious harm assessment pursuant to the *Fisheries Act* authorization.	Investigations were completed of the muskeg ponds during the baseline studies. Harm to muskeg ponds and fish, where present, was assessed during the development of the Victor Mine and were specifically considered in a DFO Authorization.	**Partially Addressed:** DBC has not responded to the query and has instead referenced previous baseline studies completed as part of the Environmental Assessment. It is unclear what ponds are known to support fish habitat.
20	CPA Section 5.3.2.1 (South Granny Creek Diversion). The text indicates that the banks of the diversion channel were planted with shrub cuttings and seeded with a native seed mix.	Please indicate if AttFN community members were involved in this restoration plan and had input based on their traditional knowledge of the area, including fish and wildlife species likely to benefit from such restoration.	Approval applications associated with the original Victor Mine development and subsequent activities, including for the South Granny Creek Diversion and related plans, were provided to the AttFN for comment at the time of development.	**Addressed**
21	CPA Section 5.9.4 (Water Supply) indicates that the water intake structure is fitted with a screen to exclude fish.	Please indicate if this screen satisfies the DFO Freshwater Intake End-of-Pipe Fish Screen Guideline document (http://www.dfo-mpo.gc.ca/Library/223669.pdf). This is needed to	The screen will be designed to meet the end of pipe “code of practice” or alternate criteria agreed upon with DFO.	**Addressed**

		ensure protection of the Attawapiskat River fishery, upon which AttFN relies.		
22	CPA Section 6.1.2 (Progressive Rehabilitation Measures Remaining to be Completed (2018)) suggests that "Should the water table not return to suitable levels, alternate uses for south quarry and alternate compensation options will be considered." Given that the new channel(s) will be constructed before realizing this potential water level issue, what safeguards are in place/options are proposed to ensure utilization of habitat/features already built?	Please discuss potential options with AttFN and include a suitable contingency plan/appropriate safeguards should the preferred option not be possible.	The AttFN will be provided the opportunity to comment should an alternative reclamation approach be required for the South Quarry. This is currently under review and may be revised in CPA5.	**Addressed,** pending consultation with AttFN on reclamation approaches for the South Quarry.
23	CPA Section 9.5 (Removal of Buildings and Infrastructure) states that "Fish habitat compensation plans have been accepted by the DFO and the MNR but are currently being reviewed through the updated water balance and landform design (in progress). Any potential changes to proposed fish habitat compensation measures will be discussed with DFO and MNRF."	AttFN should be given an opportunity to review the updated water balance and landform design report(s). Any subsequent changes/revisions to the DFO Authorization/Fish Habitat Offsetting/Compensation Plans must also be reviewed by AttFN prior to DFO resubmission.	Copies of these reports will be provided to the AttFN when available. Consistent with De Beers approach to date, copies of an approval applications / amendments will be provided to the AttFN for review.	**Addressed,** pending consultation with AttFN on water balance, landform design reports, and any fish habitat compensation plans.
24	CPA Section 9.5 (Removal of Buildings and Infrastructure) states that (regarding the reformed banks of the quarry ponds) "Near shore areas will be enhanced by shaping the upper overburden bench and adding structural features such as anchored woody cover and boulders. Live riparian material (willow or alder, salvaged from local creek and river margins) will be staked within 2 to 3 m of the shorelines. The average depth of the quarry ponds is expected to be in the order of 5 m, which will provide an abundance of over-wintering habitat."	Please provide evidence that the water levels in the quarries will be sufficient to submerge the nearshore areas and added structural features designed for use as fish habitat. In addition, 5 m of depth under ice may not provide sufficient dissolved oxygen levels, which may result in a die-off. Please provide more information on expected oxygen levels in the ponds and likelihood of fish surviving the winter.	The Central Quarry is currently flooded. As indicated in the text, the ability to fully flood the South Quarry remains under investigation. The AttFN will be provided the opportunity to comment should an alternative reclamation approach be required for the South Quarry. This is currently under review and may be revised in CPA5. While De Beers respects the comment regarding dissolved oxygen levels, there are many natural ponds in the Victor Mine area with much less than 5 m depth of water that have effectively maintained a fisheries resource.	**Not Addressed:** Natural ponds will have different hydrology than the flooded quarries, which may support improved oxygen during winter. Additional evidence supporting the Proponents claim on oxygen levels is requested.
25	CPA Section 9.5 (Removal of Buildings and Infrastructure) states, "The channel constructed to convey drainage from the polishing pond towards North Granny Creek during site operations will be enhanced to provide fish habitat, and to facilitate uninterrupted fish passage between the quarry pond and North Granny Creek. This naturalized creek segment will represent an additional approximate 3,000 m2 of fish habitat (Figure 9-3)."	The CPA does not include details or design information on this naturalized creek segment or what fishery/target species community was intended. Please confirm that AttFN was involved in the planning/design of this feature, and that community members are involved (or planned to be involved) in future effectiveness monitoring of the channel to ensure it is stable and functioning as intended.	De Beers is currently reviewing the overall approach and there are no specific design details available at this time. At a minimum, the existing channel will be inspected to ensure there are no barriers to fish passage, and enhancements will be placed if needed with that goal in mind.	**Not Addressed:** DBC has not confirmed involvement of AttFN in enhancement of North Granny Creek once those details are ready.

26	CPA Section 10.3.1 Aquatic Environment (Post-Closure Aquatic Monitoring) indicates that the character and quality of aquatic resources (sediment, benthos and fish communities) upstream and downstream of pond releases and discharge locations will be periodically assessed, including the success of compensatory aquatic systems within the South Granny Creek realignment.	Please clarify the frequency and rationale of assessments and consult with AttFN beforehand to obtain input and potential involvement with sampling, where appropriate.	The proposed post closure aquatic monitoring is consistent with the approach outlined through the environmental assessment and approvals process for the Victor Mine, and meets all regulatory requirements. De Beers will reach out to the AttFN during field program planning to assess interest and opportunities for involvement with sampling. Members of the AttFN have been involved in past aquatic investigations.	**Partially Addressed:** DBC has committed to involvement of AttFN members during the field program, however no details on that monitoring program has been provided.
27	CPA Section 11 (Expected Site Conditions Following Closure) states that creeks and rivers will return to pre-development conditions, except for the permanently diverted portion of South Granny Creek.	Was the existing channel alignment that is diverted considered as potential restoration habitat? Maintaining a seasonal, flooded connection to the channel via culverts under the diversion dykes following closure presents an opportunity to create spring spawning and rearing habitat (e.g., northern pike).	The diversion of South Granny Creek was part of the original design of the Victor Mine as South Granny Creek original passed very close to the open pit. The diversion was designed for long term stability / permanence. The AttFN was provided the opportunity to review and provide input into all the approval applications association with the design and construction of the South Granny Creek diversion. There are no planned changes to the fully naturalized new South Granny Creek section, including establishment of new culverts to the historic channel that could affect the long term stability of the system. The historic channel will provide offline habitat similar to an abandoned natural meander.	**Partially Addressed:** DBC has not indicated whether the diverted channel to South Granny Creek was counted as restoration habitat.
28	CPA Section 11 (Expected Site Conditions Following Closure) states, “The pit lake will not be developed as aquatic habitat, but will add to the diversity of the landscape.”	AttFN should be consulted on the future use of the pit lake to consider their opinion on its potential value to sustain aquatic life. With annual fish stocking and/or development of a connection to nearby Granny Creek, this aquatic resource could be also developed as fish habitat.	The pit lake does not have significant potential for providing aquatic habitat, due to the restricted near shore / littoral zone, overall lack of nutrients and the lack of connection to surface water systems. De Beers does not intend to stock the Victor pit lake with fish. Per response to Comment 13, De Beers does not intend to connect the pit lake with the natural surface water system, although the epilimnion water quality is anticipated to be of water quality acceptable to discharge to the environment (Itasca 2019; a copy of which is provided in Appendix D-5 of CPA4 and has been provided in Attachment 1 of this response). Attached Table 1 provides a comparison of the projected surface water quality in the pit lake with the Provincial Water Quality Objectives / Interim Provincial Water Quality Objectives for the protection of aquatic life.	**Addressed,** unless AttFN wants the pit to be connected to existing habitat.
29	CPA Section 11.3.1 (Former Quarries, Seepage Monitoring Pond, and Polishing Pond) states, “The south quarry will	Please clarify this statement as previous sections of the report indicate that the south quarry pond	With our apologies, Section 11 in the draft version of CPA4 that the AttFN received was inconsistent with the remainder of the	**Addressed**

	remain as a pond feature without enhancement as fish habitat, due to its small size and depth and isolated location."	will be developed as fish habitat via an intermittent connection to South Granny Creek.	document with regards to reclamation of the South Quarry. De Beers is currently reviewing the ability to fully flood the South Quarry and the reclamation approach may be revised in CPA5 in discussion with DFO / MNRF. The AttFN will be provided the opportunity to comment should an alternative reclamation approach be required for the South Quarry.	
30	CPA Section 11.6 (Aquatic Plant and Animal Communities) states, "It is expected that the diversion channel of South Granny Creek will naturalize and will provide an equivalent measure of aquatic habitat to that which was disrupted."	Newly created habitat equivalent in area only cannot be considered "like-for- like" habitat compensation, as new habitat is less productive and takes many years for it to naturalize to its pre-existing function. 2:1 or 3:1 compensation to loss ratios are often the benchmark for compensation planning in order to make-up for this gap in productivity. Please clarify how fisheries productivity in the new channel will be monitored and measured post-closure comparable to predevelopment conditions.	The South Creek diversion was developed prior to the development of the open pit and has a naturalized over the life of the mine. The new habitat was developed and monitored in accordance with the DFO authorizations. AttFN has been provided with copies of the associated monitoring reports.	**Partially Addressed:** DBC has provided associated monitoring reports to AttFN. However, AttFN has raised concerns with the most recent "Aquatic Resources Monitoring Report" regarding the South Granny Creek diversion, which remain to be adequately addressed by DBC.
VEGETATION, WILDLIFE, AND TRADITIONAL LAND USE IMPACTS COMMENTS				
31	CPA #4, Section 11.5, p. 192-193; CPA #4, Section 10.3.2, p. 183- 184. DeBeers asserts that the "diversity of the area will also be enhanced by ponds developed in association with the two minedout north and central quarries" (CPA, Sect. 11.5, p. 192) and further states that "traditional ecological knowledge studies indicate that waterfowl are attracted to larger pond and lake habitats" (CPA, Sect. 11.5, p. 192-192), suggesting that a goal of quarry pond rehabilitation is to attract waterfowl. However, the quarry rehabilitation measures outlined in CPA Sect 9.5 (p. 156-157) seem largely geared towards providing fish habitat compensation. It is unclear whether DeBeers intends to undertake any measures to rehabilitate mined-out quarries in a way that not only attracts, but promotes, post-closure use by waterfowl. It is also unclear whether DeBeers intends to test their assumption that waterfowl will use mined-out quarry ponds post-closure.	**31A)** Please provide AttFN with an opportunity to review DeBeer's detailed quarry rehabilitation plans, as outlined in the Site Plan for each quarry under the Project's *Aggregate Resource Act* permits. Specifically, this should include information on the future measures that will be undertaken to rehabilitate the mined-out north and central quarries in a way that promotes waterfowl use. Through these approvals or additional documentation and engagement with AttFN, DeBeers should outline which species it expects to use the ponds and ensure that all reasonable efforts are taken to create pond habitat characteristics suited to those species. Information on habitat characteristics and site preparation measures should be outlined, including consideration for suitable pond depths, bottom topography and substrate, shoreline lengths and bank slopes, vegetation cover type,	**31A)** There is very extensive waterfowl habitat across the James Bay Lowlands region, including in close proximity to the Victor Mine. While the suggestions are acknowledged, De Beers does not intend to modify the planned approach to provide additional waterfowl habitat. There are no new aggregate operations planned. The AttFN was been provided the opportunity to review and provide input into all the approval applications association with the design, construction, operation and closure of the quarries associated with the Victor Mine (none of which are active). The quarry rehabilitation plans met the requirements at the time and were approved under the Aggregates Resources Act. For clarity, the North Quarry was not developed (Section 5.5.2.2) and the Central Quarry is no longer a quarry and was converted to a polishing pond early in the mine life (Section 5.5.2.1). The South Quarry was proposed to be developed as fish habitat; however, De Beers is currently re-assessing this proposed	**31A) Partially Addressed:** AttFN acknowledges the clarity provided regarding aggregate operations and rehabilitation, including information on the North Quarry, Central Quarry, and South Quarry. AttFN also recognizes that there is extensive waterfowl habitat within the James Bay Lowlands region, but maintains that there is potential for the South Quarry to be rehabilitated in a way that promotes both fish (depending on species) and waterfowl habitat. AttFN acknowledges that DBC's re-assessed plan for the South Quarry will be provided in CPA5 and encourages DBC to consider providing additional waterfowl habitat. **31B) Partially Addressed:** If the South Quarry rehabilitation plan is considerate of waterfowl, as requested, post-development surveys should be completed at the South Quarry. DBC should provide AttFN with monitoring methodologies for further analysis.

		and whether islands will be built (and in what shape and position) for nesting and refuge. **31B)** Please also provide detailed information on the "post-development bird surveys" identified in CPA, Sect. 10.3.2, p. 184 and confirm whether these efforts will include targeted monitoring of rehabilitated quarry ponds for waterfowl use. Include information on monitoring methodologies (e.g., timing, search effort, ideal environmental conditions, etc.) for further analysis by AttFN. **31C)** DeBeers should also commit to providing capacity funding and industry- standard job training for Attawapiskat Guardians to undertake, or at a minimum participate in, all post-development bird surveys.	approach. An update will be provided in CPA5 which will be provided to the AttFN for review. **31B)** The post-development surveys will be carried out in a similar manner to the pre-development (baseline) and operational surveys in order to allow for future comparison. **31C)** De Beers is willing to discuss aspects related to capacity funding and training through an appropriate venue.	**31C) Addressed**
32	CPA #4, Section 9.18, p. 162-164. In CPA Sect. 9.18 (p. 162-163), DeBeers has provided a general, high-level outline of its post- closure reclamation/revegetation program, including the broad descriptions of vegetation to be planted (e.g., native trees, shrubs, forbs, grasses and legumes), planting methods to be used (e.g., direct-seeding, hand planting) and confirmation that vegetation assessments will be undertaken and results used to evaluate revegetation progress and, for use in the future, similar mine reclamation efforts. DeBeers also states that they are "committed through the Canadian Environmental Assessment Act EA process to work cooperatively with MNRF, ECCC, and the AttFN to develop detailed site revegetation plans that will result in self-sustaining, productive naturalized systems suitable for supporting traditional uses" (CPA, Sect. 9.18, p. 163). However, it is unclear when AttFN can expect to receive these documents, whether there are mechanisms in place to incorporate traditional knowledge from AttFN Elders and land users into revegetation planning, and whether community members will play a role in implementing revegetation activities.	**32A)** Please provide AttFN with a copy of the detailed site revegetation plan for review once it has been prepared, as well as an estimated timeline for its completion. Capacity funding should also be provided to ensure Attawapiskat can complete a fulsome, third-party review and ensure that DeBeers' plan will indeed result in self-sustaining, productive naturalized systems suitable for supporting traditional uses. **32B)** DeBeers should also commit to providing capacity funding and industry- standard job training for AttFN Guardians to undertake, or at a minimum participate in, all activities under the post-closure reclamation/revegetation program.	**32A)** A copy of the site revegetation plan will be provided to the AttFN for review when available. De Beers is willing to discuss aspects related to capacity funding and training through an appropriate venue. **32B)** As identified above, De Beers is willing to discuss aspects related to capacity funding and training through an appropriate venue.	**Partially Addressed:** See assessment of response to comment #6

33	CPA #4, Section 10.1.1, p. 177; CPA #4, Section 9.3 (p. 154-155); CPA #4, Section 7.2, p.148. Section 10.1.1 states that "If a phase of temporary suspension is carried out then the site will be maintained in such a manner so as to prevent harm to humans and wildlife" (p. 177). However, there are no apparent effective measures in place to exclude wildlife from the open mine pit during either the Temporary Suspension or Final Closure phases of the Project. Specifically, DeBeers intends to place a "barricade such as an earthen berm" around the perimeter of the open pit which "may or may not be complete" at the time of Temporary Suspension, as well as a fence around the entrance ramp. During Final Closure, DeBeers only intends to secure the open pit entrance with "a barricade of tightly placed boulders" (CPA, p. 154) and has no plan to develop an emergency egress for wildlife. It is expected that the open pit will take an estimated 5 years to passively fill with water from natural sources (e.g., natural groundwater inflow and surface runoff).	AttFN recommends that temporary exclusion fencing be installed around the open pit to ensure long-term safety for terrestrial wildlife that may try to access the open pit (e.g., as a water source) during Temporary Suspension. Semi-permanent exclusion fencing should also be installed around the open pit after Final Closure for the estimated five years that it will take the pit to passively fill, similarly, to prevent harm to wildlife that may attempt to access the open pit. DeBeers should provide Attawapiskat with detailed information on exclusion fencing design considerations (e.g., target species or families, height, post spacing, materials used). These fences should also be inspected regularly for damage stemming from adverse weather conditions or due to wildlife.	CPA4 includes reference to Temporary Suspension as required by the Mining Act and associated regulations. The mine is now closed with the open pit mainly flooded, and temporary suspension is no longer possible. There has been no history of wildlife entering the pit during operations, and there would be no reason for this to change while the site is being actively reclaimed. The flooding open pit does not pose a specific attraction to wildlife as there is no shortage of surface water sources near the Victor Mine. Fencing is not proposed to be installed. Note that during the pit filling phase there remains a sloped entrance that allows egress. After flooding has been completed, wildlife access to the pit is not seen as a risk as the water level will be at ground elevation, with shallow upper slopes of the pit mostly submerged. This similar to other lakes and ponds in the area.	**Addressed**
34	CPA #4, Section 9.7 (p. 158). DeBeers states that "all roads (access roads and haul roads) not required for long-term monitoring post-closure or other land users will be scarified, culverts removed to facilitate natural drainage patterns, covered with overburden, and revegetated" (p. 158) and that the South Winter Road will be allowed to passively naturalize" (p. 158). However, it is unclear whether the "land users" described refers to AttFN traditional land users (e.g., those harvesting fish and wildlife, or gathering edible and medicinal plants) and whether DeBeers has undertaken further consultation to determine whether AttFN wishes to maintain Project roads to facilitate land use practices (e.g., fish and wildlife harvesting, edible and medicinal plant gathering) within, or in areas adjacent to, the Project area.	DeBeers should undertake further consultation with AttFN community leadership and membership to determine whether they wish to maintain Project transportation corridors in order to facilitate future land use and access within AttFN traditional territory.	The Closure Plan has been prepared to meet the requirements of the Mining Act. Should the AttFN wish for any roads to be left in place, contact should be made with the Ministry of Energy, Northern Development and Mines. De Beers is not able to leave the roads in place otherwise.	**Addressed**
35	CPA #4, Section 4.5.2, p. 23-24. DeBeers has provided an overview of monitoring data obtained from their caribou and moose studies (e.g., early and later winter aerial surveys, GPS collar tracking) undertaken intermittently between 2005 and 2016. However, this description focuses	DeBeers should provide AttFN with the findings of their caribou and moose studies that pertain specifically to moose. This will provide AttFN with important information on the broader ecological context of the Victor mine site and subsequently	Moose are an important component of the aerial survey monitoring program that has been undertaken within the mine study area since 2004. All of the monitoring reports related to	**Partially Addressed.** DBC has shared their report Post-Closure Monitoring Program for Woodland Caribou, Moose, and Small Furbearers, however as per the latest memo submitted by SVS on February 4,

	exclusively on use of the Victor mine site and surrounding area by boreal woodland and eastern migratory caribou, not moose. Caribou will avoid areas that support alternative prey species, namely moose, as they present a higher predation risk (EC, 2012). Therefore, data describing moose use of the Victor mine site and surrounding area provides importance contextual information regarding the current and potential future impacts of the Project on caribou populations.	inform an overall assessment of DeBeers' post-closure rehabilitation and wildlife monitoring efforts.	caribou / large mammals prepared for the Victor Mine have been provided to the AttFN.	2020, several issues and comments raised on behalf of AttFN remain unresolved.
36	CPA #4, Section 4.5.2, p. 23-24; CPA #4, Section 9.19, p. 164-167. DeBeers has provided very little information on the seasonal timing of final mine site reclamation activities in Section 9.19, other than specifying that it will be subject to various constraints, including site access, logistics, and weather. There is no apparent consideration for scheduling potentially disruptive activities (e.g., demolition and removal of buildings and infrastructure, grading/contouring/revegetation activities) outside of sensitive periods for wildlife with the potential to occur in and around the mine site. This presents a concern for AttFN, as culturally important species such as caribou, moose, marten, bald eagles, osprey, and other migratory birds are known to occur in the area. In particular, DeBeers has documented caribou using calving areas within 10 to 50 km of the mine site and potentially closer; the effect of anthropogenic disturbance has been documented as high as 14 km for some boreal woodland caribou ranges (EC, 2012).	Please confirm that DeBeers will avoid scheduling potential disruptive activities during sensitive periods, namely caribou calving and bird nesting periods.	Reclamation scheduling and activities will meet all regulatory requirements with respect to avoidance of sensitive periods.	**Partially Addressed:** Please provide AttFN with a list of all regulatory requirements pertaining to wildlife that DBC is required to meet. Please also provide a corresponding list of any restricted activity time periods, and setback distances or buffers if applicable, that will be adhered to. If not required by law, please also consider implementing restrictions for species of cultural importance to AttFN (e.g. moose).
37	CPA #4, Section 10.3.2, p. 183-184; CPA #4, Section 4.5, p. 22-24. DeBeers asserts that the Victor mine site and surrounding area provides a relatively poor environment for wildlife because of the vast expanses of low productivity peatlands (e.g., bogs, fens). However, peatlands represent important habitat for boreal woodland-dwelling caribou, a species of cultural importance to AttFN, by providing food (e.g., terrestrial lichens) and refuge from predators (e.g., wolf,	**37A)** As proposed currently, DeBeers will complete winter aerial surveys of caribou and moose, as well as tracking surveys, both of which will be carried out in the first winter after active reclamation ceases, and at 5 and 10 years after production ceases. However, AttFN requests that winter aerial surveys be completed annually. DeBeers also proposes to continue radio telemetry studies of caribou "pending program success." AttFN does not support radio collaring	**37A)** De Beers has been an industry leader in the collection of information regarding caribou in the James Bay lowlands, and developed an extensive monitoring program including aerial surveys and satellite telemetry. As proposed currently, DeBeers will complete winter aerial surveys of caribou and moose, as well as tracking surveys, both of which will be carried out in the first winter after active reclamation ceases, and at 5 and 10 years after production ceases. As per the AttFN request, De Beers has ceased the satellite telemetry program. De Beers is willing to	**37A) Partially Addressed:** Please provide AttFN with a detailed, science-based rationale for why <u>annual</u> monitoring of caribou through winter aerial and tracking surveys is not required (or why Year 1, 5, 10 monitoring will suffice). The proper documentation of traditional ecological knowledge requires time and money – DBC should provide AttFN with capacity funding to undertake a traditional ecological knowledge study specific to caribou, to ensure their post-closure monitoring is

	bear) (EC, 2012; Bowman et al., 2010; Rettie & Messier, 2000). Caribou require large tracts of undisturbed habitat and are highly sensitive to habitat alteration stemming from anthropogenic disturbance, including mines such as the Victor Mine. Since DeBeers has disturbed an area of 982 ha, most of which was suitable foraging or refuge habitat for caribou (e.g., bog and fen communities) and intends to replace it with less compatible caribou habitat (e.g., slightly or substantially elevated upland communities), this represents a considerable threat to the local caribou population. Natural regeneration of peatlands occurs very slowly and is often insufficient to restore its key ecological functions (e.g., peat- accumulating and hydrological functions) (Ray, 2014), therefore AttFN recognizes the potential technical challenges and limited feasibility of restoring disturbed peatlands of the Victor mine site for caribou habitat. However, AttFN remains concerned about caribou use of the mine site and surrounding area post-closure and therefore requires DeBeers to develop an enhanced post-closure monitoring program for caribou.	of caribou due to potential injury or death of the animal(s) and is requesting that DeBeers investigate other options/methods of tracking caribou movements in the area with the MNRF. In addition, DeBeers should gather traditional ecological knowledge data (e.g., through focus groups, customized apps, key informant interviews) from AttFN land users to complement the above western scientific methods of monitoring caribou use of the mine site and area. **37B)** DeBeers should also provide more detailed information on how they intend to use post-closure caribou monitoring programs to determine whether or not mine closure activities are disturbing caribou and to evaluate the success of wildlife habitat restoration. Please provide information on key indicators, population thresholds, and action thresholds that will be used to determine whether additional mine rehabilitation measures are required to support local caribou populations. **37C)** DeBeers should commit to providing capacity funding and industry- standard job training for AttFN Guardians to undertake, or at a minimum participate in, all post-closure caribou (and wildlife) monitoring activities.	supplement this information with any traditional knowledge that the AttFN is willing to share. **37B)** The mine reclamation and closure activities are of a much lesser scale than the mine development or operation activities. De Beers does not propose specific studies to assess whether or not mine closure activities are disturbing caribou. Data collected during the post closure phases will measure caribou occurrence in habitats created within the mine footprint through closure reclamation activities. **37C)** As identified above, De Beers is willing to discuss aspects related to capacity funding and training through an appropriate venue.	inclusive of Indigenous perspectives and values. **37B) Addressed** **37C) Partially Addressed:** De Beers' comment is imprecise and non-committal with respect to how capacity funding and training would be provided "through an appropriate venue".

Table 2. Closure Plan Conclusion and Recommendations: Comments, Responses, and Assessment of Response Adequacy

Comment #	SVS Recommendation	DBC Response	Assessment of Response Adequacy
1	It is recommended that the Proponent review and respond to all comments provided in this report and in Appendix D in the comment and response tracking table format.	De Beers have fully considered the entire report prepared by SVS, and have provided a response in a tracking table format.	**Partially Addressed:** DBC has provided responses to the comments, however many are inadequately addressed.
2	It is recommended that the Closure Plan Amendment #4 be revised to reflect and adopt any comments and revisions as recommended or otherwise that are addressed through responses from the Proponent.	All of the comments provided will be fully considered in preparation of CPA5 later in 2020.	**Not able to assess adequacy until CPA5 is released later in 2020.**
3	It is recommended that the Proponent ensure that sufficient capacity funding is available for AttFN Guardians to participate in: • all post-development bird surveys • all activities under the post-closure reclamation/revegetation program, • all post-closure caribou (and wildlife) monitoring activities, and • other reasonable monitoring and reclamation activities determined by the DeBeers-Attawapiskat Environmental Management Committee.	De Beers is willing to discuss aspects related to capacity funding and training through an appropriate venue.	**Not Addressed:** De Beers' comment is imprecise and non-committal with respect to how capacity funding and training would be provided "through an appropriate venue".

Table 3. Closure Plan Human Health and Ecological Risk Assessment: Comments, Responses, and Assessment of Response Adequacy

Comment #	SVS Comment	SVS Recommendation	DBC Response	Assessment of Response Adequacy
HHERA 1	On page 6 of the HHERA Report, it is stated that "…if estimated risk is evaluated in the Future scenario relative to the Baseline and/or Existing scenarios for human or ecological receptors (i.e., the change in risk is likely to be measurable), additional action or mitigation measures may be needed to reduce potential risks."	This statement should be revised or clarified. Based on the information provided (specifically on page 4), the HHERA Report is not evaluating existing conditions but, rather, baseline conditions (i.e., conditions up until operations began in June 2008) and a future scenario (post-closure).	Thank you for identifying a typo in the HHERA. Only Baseline and Future scenarios were evaluated in the risk assessment; risk under existing conditions (Operations) was not evaluated. Thus, the sentence should read: "…if estimated risk is evaluated in the Future scenario relative to the Baseline scenario for human or ecological receptors…".	**Addressed**
HHERA 2	The HHERA Report would benefit from Section 3.1.1 and/or Appendix A providing greater clarity, transparency, and details with respect to chemical screening and selection. The rationale provided in Section 3.1.1 and Appendix A as to why four (4) specific chemical parameters (including sulfate, chloride, mercury, and methylmercury) were selected to undergo a chemical screening/selection process is unclear and/or incomplete. Appendix A states that these four (4) chemical parameters were selected because '…these analytes have been measured at elevated concentrations during the monitoring.' These monitoring data could be summarized/tabulated such that the monitoring data can be reviewed. A table containing the summary statistics for all chemicals included in the monitoring program would allow for a complete chemical screening of COPCs in surface water.	Provide additional details, in Section 3.1.1 and Appendix A, regarding the chemical screening and COPC selection process.	The scope of work for the HHERA was based on the evaluation of parameters of concern that have been identified in previous monitoring at the Project. References to reports in which these four parameters were identified as being of concern were provided in Section 1 of the HHERA report. Data were not replicated in the HHERA from these other reports. In addition, the COPCs selected for inclusion in the HHERA align with, and are primarily based on, the screening exercise described in Section 5.2 of the Post-Closure Water Quality Model Report (Hatch 2018) for surface water. The screening exercise identified in Hatch 2018 identified mercury, methylmercury, sulfate, and chloride as the parameters of potential concern in surface water. Surface water quality predictions were only generated for this subset of four parameters, plus calcium and magnesium (used to calculate water hardness and relevant as a toxicity modifier).	**Partially Addressed:** The response provided additional rationale, however it would still be helpful to have summary statistics included for all chemicals so that the screening process used is completely transparent.
HHERA 3	It is unclear from the information provided as to whether or not the 'Baseline' monitoring dataset was restricted to chemical concentrations measured prior to the development and operation of the mine (i.e., June of 2008). This is an important point as the HHERA relies on a relative comparison between risks associated with Baseline and Future conditions. If the 'Baseline Scenario' includes surface water (and, for that matter, fish tissue concentrations) that were collected during the	Clarify if the 'Baseline Scenario' includes data collected during the operational phase. If it does, comment on the validity of using the data to compare baseline and future conditions with respect to human and ecological health.	As described in Section 2.2, only baseline data that existed prior to the operation of the Project (up to June 2008) were used in the Baseline Scenario exposure calculations for the HHERA. Fish tissue for the 75th percentile fork length was 'predicted' based on the fish tissue models for mercury, with Baseline and Future scenario water quality from the Post-Closure Water Quality Model (Hatch 2018) as the multiplier for the site-specific BCF.	**Addressed**

	operational phase, the baseline scenario, which has been defined as conditions representative of pre-mine development/operation, may be artificially inflated for some chemicals of concern. As such, the use of a comparative analysis between baseline and future conditions to comment on future health and ecological risks would not be valid.		Fish tissue samples collected during Operations were included in the development of the fish tissue models to enable the prediction of fork-length normalized tissue concentrations. This was done to ensure that there were sufficient data to support model development and to take advantage of the extensive fish tissue dataset for mercury that is available for the Project. As the reviewer notes, this may result in the fish tissue regression models being skewed upwards (i.e., towards over-prediction, which is more conservative) where fish tissue concentrations for fish of a given size have increased during Operations compared to pre-Project baseline conditions.	
HHERA 4	The HHERA Report (Section 3.1.1.1) indicates that additional (or all) chemical parameters were considered in the COPC screening for Pit Lake under Future conditions as '….it is possible a person could access the water in the filled Pit Lake for drinking or recreational purposes.' It is unclear why all chemical parameters (i.e., those considered for Pit Lake) were not also included in the chemical screening process for surface water and fish for the remainder of the study area. Presumably, an individual may also gain access to other surface water bodies within the study area.	Provide a rationale as to why all chemical parameters (i.e., those considered for Pit Lake) were not also included in the chemical screening process for surface water and fish for the remainder of the study area given an individual may also gain access to other surface water bodies within the study area.	The surface water quality model only predicted concentrations of the four parameters of concern (sulfate, mercury, methylmercury, and chloride), based on the screening process described in Section 5.2 of the Post-Closure Water Quality Model Report (Hatch 2018). Data were not available for other parameters in the predictive model results for surface water downstream of the Project. The Pit Lake is not considered to be suitable fish habitat and is not accessible from surface waters in which fish are present. Therefore, potential risks to fish were not considered for the Pit Lake. However, water quality of the upper layer of the Pit Lake was considered for human and wildlife receptors, as described in Section 1 of Appendix A of the HHERA.	**Addressed**
HHERA 5	Table 1 of Appendix A presents the chemical screening of predicted future surface water concentrations in Pit Lake with various drinking water and ecological-based standards/guidelines. The main report (page 12) speaks to the predicted concentration of chloride exceeding the drinking water standard. The HHERA Report also discusses the aesthetic basis of the Health Canada chloride drinking water standard. Although it is true that the Health Canada drinking water standard for chloride (of 250 mg/L) is based on aesthetic effects, no substantive discussion has been provided to indicate that a chloride concentration that is more	The HHERA Report would benefit from providing additional information concerning the toxicity (or lack thereof) of chloride in drinking water.	Although chloride can cause toxicity in humans if sufficient quantities are consumed, it is unlikely that a person would do this by drinking water. The aesthetic objective is based on the concentration at which people begin to perceive the taste of 'saltiness' in the water and it is unlikely that people would choose to consume surface waters with concentrations well in excess of the aesthetic guideline. However, even if we had considered alternative guidelines (e.g., groundwater used for drinking water), the maximum predicted chloride concentration of 660 mg/L in the Pit Lake (see Table 1 of Appendix A in the HHERA) is lower than the	**Addressed**

	than 2.5 times greater than the aesthetic-based standard is protective of human health.		chloride guideline (e.g., MECP 2011, most conservative standard of 790 mg/L for potable groundwater).	
HHERA 6	Table 1 of Appendix A — no health-based standards are presented for aluminum, calcium, cobalt, copper, nickel, or zinc. The HHERA Report provides no rationale or discussion for their exclusion in the HHRA.	The HHERA Report would benefit from providing a rationale as to why the aforementioned metals were excluded from further consideration despite the lack of health-based standards. It does not appear that the HHERA Report has considered the use of the MECP (2011) potable water standards (i.e., the GW1 component values). The MECP (2011) has potable standards for many of the metals mentioned above, including chloride, nickel, copper, etc.	As described in Appendix A, we included consideration of surface water quality data and guidelines that were relevant to the protection of human health from the consumption of surface water (drinking water derived from surface water sources). We did consider health- based drinking for surface water from various jurisdictions including Health Canada Drinking Water Quality Guidelines and the Ontario Drinking Water Quality Standards. We did not consider the MECP (2011) standards as they are explicitly for groundwater quality, not surface water quality. In addition, these standards are intended for use at contaminated sites. We provided rationale in Section 2.4 of the HHERA for why we did not consider the Post-Closure Scenario to be a contaminated site, as we expect that any issues identified in the Environmental Site Assessment would be resolved before Post-Closure.	**Addressed**
HHERA 7	Table 2 of the main report, and Tables 2 through 4 of Appendix A, provide summary statistics for both the Baseline and Future scenarios. The HHERA Report would benefit from clearly articulating what the Baseline scenario data represent. Do these data represent measured data and, if so, do they include measurements prior to the operation phase of the mine? There appears to be no indication of the sample size in any of the baseline statistics presented.	Provide additional detail regarding what Baseline scenario data represent.	Baseline Scenario data are representative of the conditions that existed prior to Project development (data from prior to June 2008). The water concentrations in Table 2 to Table 4 of Appendix A are the water concentrations reported as Upper Case source terms (75th percentile baseline chemistry input terms) from the Post-Closure Water Quality Model Report (Hatch 2018) for the model nodes described in the bullet lists in Section 1, Appendix A of the HHERA.	**Addressed**
HHERA 8	It is unclear from the information provided in the HHERA Report if methylmercury concentrations reported in surface water under baseline conditions were measured or approximated. All methylmercury concentrations reported to exist under Baseline conditions (Table 2 and Tables 2 through 4 in Appendix A) are exactly 100 times (or 2 orders of magnitude) less than the (presumed)	Provide detail regarding whether methylmercury concentrations reported in surface water under baseline conditions were measured or approximated.	The surface water quality predictive model used the assumption that "methyl mercury concentrations were assumed to be 1% of the dissolved mercury concentrations based on a literature review" (Section 5.1 of Hatch 2018). This assumption was carried through to the HHERA to be consistent with water quality modelling.	**Addressed,** consistent with Health Canada guidance.

	measured total mercury concentrations in surface water.			
HHERA 9	It is unclear what statistic (e.g., maximum, 75th percentile, etc.) and which scenario (i.e., Baseline versus Future) were used to screen COPCs in surface water.	The HHERA Report would benefit from clearly indicating which statistic and scenario were used as the basis for the COPC screening. The chemical screening tables would benefit from presenting only the concentrations used in the screening procedure. The maximum measured or an upper percentile (such as a 98th percentile from a dataset of sufficient size) for all chemical parameters (i.e., all chemicals included in the baseline monitoring) should be used to facilitate the chemical screening process.	Both Baseline and Future scenarios were considered in COPC screening, as shown in Table 2 of the main HHERA report. Baseline and Future scenario concentrations are based on surface water quality model inputs and outputs, respectively, for the Upper Case (75th percentile chemistries) for the preferred option (Option 2), as described in Section 3.1.1.1 of the HHERA. The maximum concentrations from the relevant model nodes were used for COPC screening, as is consistent with standard practice in HHERA; other statistical metrics are presented in Table 2 for context. As noted in response to comment HHERA #4, identification of parameters of concern was based on previous monitoring and a screening exercise done as part of the surface water quality modelling (see comment response HHERA #4 and Section 5.2 of Hatch 2018).	**Addressed**
HHERA 10	Section 3.1.1.2 (Contaminants of Potential Concern in Fish Tissue) does not represent a chemical screening exercise in fish tissue. Mercury and methylmercury were already identified as COPCs in surface water (Section 3.1.1.1). Given the properties of mercury and methylmercury, as well as the receptor group of interest, the consumption of fish and local foods would be an exposure pathway of interest.	Section 3.1.1.2 does not screen out multiple chemical parameters from further evaluation — only measured concentrations of total mercury in fish exist and, therefore, seems redundant and unnecessary.	It is standard practice in HHERA to use all available, relevant environmental quality guidelines for each environmental media or biota tissue, even if this seems redundant. A parameter may be selected based on one or more criteria and will then be considered for all exposure routes (even if it doesn't screen in for all exposure routes). There are tissue residue guidelines available for mercury in fish tissue for human consumption; therefore, these guidelines were used in the COPC screening process. This is a relevant step because it shows that mercury concentrations in fish tissue are higher than the relevant guideline (see Table 3 of the HHERA) and, therefore, mercury (and methylmercury) are important to include in the HHERA.	**Addressed**
HHERA 11	The HHERA Report would benefit from clearly articulating that methylmercury surface water concentrations (as reported in Table 1 of Appendix B) were NOT used to predict methylmercury concentrations in aquatic invertebrates (as reported in Table 2 of Appendix B). It appears that the reported 'water concentration of mercury', in conjunction with a cited BCF for total mercury (of	Provide a detailed description, and associated rationale, for how methylmercury concentrations in aquatic invertebrates were calculated.	The reviewer is correct; the second sentence of Section 1.1 in Appendix B mistakenly refers to the use of Equation 1 to calculate methylmercury concentrations in aquatic invertebrate tissue. Methylmercury concentrations in aquatic invertebrates were calculated based on the estimated proportion of methylmercury out of total mercury (44%, derived from literature sources) in invertebrate tissue.	**See assessment of response to Comment HHERA 12**

	900 L/kg) and a value of 44% (from Sanborn and Brodbery (2006) representing the proportion of total mercury in aquatic organisms that is assumed to be methylmercury), were used to predict methylmercury concentrations in aquatic invertebrates. It is unclear why the HHERA Report has not explored the possibility of applying a methylmercury-specific BCF or BAF to the site-specific methylmercury concentrations (as reported in Table 1) to predict methylmercury concentrations in aquatic invertebrates.		We relied on mercury BCFs or BAFs because we have higher confidence in the Baseline Scenario and Future Scenario surface water quality predictions for mercury. The surface water quality model used a simplifying assumption that methylmercury was 1% of the mercury concentration (see Section 5.1 of Hatch 2018). Thus, wherever possible, in the HHERA we relied on mercury concentrations in surface water, rather than the assumed concentration of methylmercury. Predicted changes in mercury concentrations were the driver for any incremental change that may occur between Baseline and Future scenarios.	
HHERA 12	A review of Sanborn and Brodbery (2006), the cited source of the assumed 44% methylmercury content in trophic level 2 biota, reveals a range of reported BAFs for methylmercury for different trophic levels. It is unclear why the HHERA Report has not considered the possibility of applying methylmercury-specific BAFs from Sanborn and Brodbery (2006). Trophic level 2 BAFs for lentic environments ranged from a combined geomean of 85,600 L/kg (from direct estimates) to a geometric mean BAF of 149,960 L/kg (based on several studies). Sanborn and Brodbery (2006) make reference to a methylmercury BAF of 104,405 L/kg for zooplankton collected on an 80 µm filter in several lakes in the Experimental Lakes Region in northwestern Ontario, Canada, derived by Paterson et al. (1998). The methylmercury-specific BAFs cited by Sanborn and Brodbery (2006) appear to be significantly greater (i.e., approximately 65 to 95 times greater) than the BCF of 900 L/kg applied in the current HHERA Report and cited as being developed by Cox et al. (1975).	Provide a rationale as to why methylmercury-specific BAFs were not used in the HHERA.	Please see response to HHERA #11. Although the BAFs or BCFs for methylmercury are higher than for mercury (e.g., by 65 to 95 times, as per the reviewer's comment), the concentration of methylmercury in water is 2 orders of magnitude (i.e., 100 times) lower than the concentration of mercury. Therefore, the difference in BAFs (65-90 fold) and difference in surface water concentrations (100 fold) for mercury and methylmercury balance themselves out. For example, the tissue concentration that results from the BAF for mercury multiplied by the surface water concentration of mercury should be the same as a BAF for methylmercury multiplied by the surface water concentration of methylmercury (i.e., lower BAF x higher concentration = higher BAF x lower concentration, yielding the same tissue concentration, regardless of which parameter is used). The concentration of methylmercury in both water and tissue should not be greater than the concentration of total mercury (other than due to analytical uncertainties associated with chemical analysis). In addition, because the BAF (and any assumptions about the proportion of methylmercury of the total mercury tissue concentration) was applied to both Baseline and Future scenarios, the relative incremental change, in percent, would be the same, regardless of the proportion assumed.	**Partially Addressed:** Rationale provided, however, the sensitivity analysis referred to could not be found in the HHERA document. Please provide.

			Regardless, we did a sensitivity analysis to see what would happen if we removed the assumption of 44% of the mercury being in the methylmercury form, and re-ran the food chain model, exposure calculations, and HQ calculations assuming 100% of the mercury is in the methylmercury form in aquatic invertebrates. This change would only affect the HQ calculations for higher tropic level consumers of aquatic invertebrates (i.e., red fox, American mink, tree swallow, and common loon). It would not affect the HQs or assessment for aquatic invertebrates, since this was based on water exposures. Results of this sensitivity analysis are in Attachment 1 [of that document] (Sensitivity Analysis #1); results show that the change in HQs is negligible, HQs are still well below the benchmark of 1.0 and the change in assumptions for aquatic invertebrates would not affect the conclusions of the HHERA regarding incremental change between scenarios.	
HHERA 13	Environment Canada (2002) cites Cox et al. (1975) as the source of a BCF for methylmercury of 29,000 for dragonfly nymph from a stream in South Carolina. The BCF of 900 L/kg (as cited in the HHERA Report) is cited by Environment Canada (2002) as being developed by Smith et al., 1975 for dragonfly nymphs taken from a contaminated lake (Clay Lake). It is noted that Environment Canada (2002) indicated that the BCFs cited above are based on measurements pre-dating modern collection and analytical techniques.	Provide additional details and rationale for the use of the chosen BCF in the HHERA.	Please see response to HHERA #11 and HHERA #12. We selected a BCF that we considered reasonable. There can be a large range in BCFs for an individual species, reflecting site-specific conditions. Regardless, we did a sensitivity analysis assuming a BCF of 29,000 kg/L (as per the reviewer's comment) for aquatic invertebrates. Results are provided in Attachment 1 [of that document] (Sensitivity Analysis #2). Although the HQ is higher for some receptors (e.g., American black duck, tree swallow where aquatic invertebrates are a substantial proportion of the diet), the results in Table 1 show that the HQs are still below the benchmark of 1.0 and the change in BCF would not affect the conclusions of the HHERA regarding incremental change between scenarios.	**Partially Addressed:** Rationale provided, however, we request the Sensitivity Analysis referred to in the response.
HHERA 14	As part of deriving site-specific BAFs for total mercury, the HHERA Report normalized mercury fish tissue concentrations by fish fork length. The HHERA Report provides no references or studies to support the statement that "…since the concentration of mercury in fish tissue is known to	Provide references and studies to support the statement that mercury concentrations in fish tissue are known to be dependent on fish fork length.	Since this approach is standard, generally accepted practice, no references would typically be provided. Mercury concentrations in fish tissue, particularly for large-bodied fish, typically increase with age of the fish; age is typically represented by fork length or weight (e.g., Scott and Armstrong 1971, Depew et al. 2013, Lockhart et al. 2005, and	**Addressed**

	be dependent on fish fork length…". Although this statement is generally known to be true, the HHERA Report would benefit from providing relevant references and studies supporting this statement. It is noted that a 2004 US EPA report entitled 'Results of the Lake Michigan Mass Balance Study: Mercury Data Report' (US EPA, 2004) found a strong relationship between the length of adult lake trout and adult Coho salmon and mercury content with r2 values of 0.856 and 0.824, respectively. In other words, 85.6% and 82.4% of the variation observed in fish tissue mercury concentrations among adult lake trout and Coho salmon were attributed to fish length.		additional references in each of these papers). This relationship between mercury tissue concentrations and age, length, or weight is why fish consumption guidelines in Ontario are based on the size of the fish.	
HHERA 15	Appendix B (Section 2.2) states that '… baseline and operational phases of the Project (1999-2017) were used to generate linear regression model that used fork length to explain the variation in mercury concentrations in fish tissue.' The discussion concludes that the models show that '…there is a significant relationship between mercury concentrations and fork length ($p<0.001$) for each species and water body combination; therefore, the model was used to predict mercury concentration in fish.' It is noted that the results (in Figures 1 through 7 of Appendix B) do not report the associated p-value for each of the seven (7) linear regression models presented.	Provide the associated p-value for each of the linear regression models.	As stated in the text, p-values were less than 0.001 for each model ("each species and waterbody combination").	**Addressed**
HHERA 16	If the p-model value for each regression analysis presented is <0.001, as suggested above, this is only an indication that the explanatory variable (i.e., fork length) is statistically significant (i.e., the slope of the linear regression model is significantly different from zero and that the explanatory variable has an effect). A low p-value is not an indicator that fork length is a strong predictor of mercury concentrations in fish.	Provide additional context around the statistics used to assess fork length as an indicator of mercury concentrations in fish.	As the reviewer identifies, a p-value of <0.001 indicates that the relationship (slope of the line) between fork length and mercury concentrations in fish tissue is significantly different from zero. p-values that are less than the typical alpha level of 0.05 are considered to be meaningful for use in modelling as it suggests that the explanatory variable (fork length) has a relationship with the response variable (mercury tissue concentration). Although we did not describe it in Appendix B, we considered various models that included single or multiple explanatory variables (e.g., fork length, weight, or both together). We	**Addressed**

			considered the Akaike information criteria (AIC), which is an estimator of the relative quality of different models for the data. We chose the best model based on either the highest AIC or the least complicated model when multiple models had similar AICs that were very close to each other (e.g., the delta AIC was less than 2). For each fish species and waterway combination where a model was developed, the fork length-based model had the best AIC or a delta AIC less than 2 compared to the other models.	
HHERA 17	The coefficient of determination (or r2 value) is a statistical measure of how close the data are to the fitted regression line. The models presented (in Figures 1 through 5 of Appendix B) show very poor relationships between the mercury concentrations in Pearl Dace taken from the Nayshkootayaow River, North Granny Creek, and South Granny Creek (Figures 2, 3, and 4) with r2 values of 0.1, 0.048, and 0.08, respectively. In other words, 10%, 4.8%, and 8% of the variation observed in mercury concentrations among Pearl Dace were explained by fish fork length in Nayshkootayaow River, North Granny Creek, and South Granny Creek, respectively. The linear regression models presented for Pike, Walleye, and White Sucker (Figures 5 through 7) indicate that approximately 50%, 60%, and 50% of the variation observed in the mercury tissue concentration in Pike, Walleye, and White Sucker can be explained by fish fork length. In the case of Walleye, the data appear highly heterogenous and the slope of the regression line is likely influenced by a select few datapoints. Unlike the data presented by the US EPA (2004), these relationships show that fork length is a very poor predictor of mercury concentrations, particularly among Pearl Dace and Trout Perch. The reason for this may be that fish data from both baseline and operational conditions were used to develop the linear regression models. It is possible that the mercury-to-fork length relationship under baseline and	Given this poor fit (i.e., the inability for fork length to explain the variation in fish tissue mercury concentrations), the development of 95% upper and lower confidence intervals around each of the fitted linear regression models presented in Figures 1 through 7 should be considered. The confidence interval intervals could be used to develop a range of potential mercury concentrations at a given fork length. However, for Pearl Dace and Trout Perch, the fit is so poor that the confidence intervals may be so large that little benefit from normalized fork length concentrations might be realized. In Table 3 of Appendix B, the use of predicted fish tissue mercury concentrations for Pearl Dace and Trout Perch should be reconsidered, given the very poor fit observed in the linear regression models discussed above. If fork-length normalized baseline concentrations are to be used for Northern Pike, Walleye, and White Sucker, it is recommended that the HHRA consider using upper and lower confidence limits to develop a range of potential fork length-normalized baseline tissue concentrations. It is also recommended that the HHRA re- visit the fork length/mercury data for Walleye as it appears that the relationship (slope of the linear regression) is overly influenced by a few individual data points.	With field-derived data over a narrow range in water concentrations, it is not unusual to see wide variation in data and to have significant regressions with a relatively poor fit. This is because there are many variables that can influence mercury bioaccumulation in tissue, particularly in fish that are mobile and may have different micro-habitats or food preferences between individuals. The relationship between fish tissue and fork length from baseline to Operations may change if concentrations in fish tissue had increased during Operations relative to baseline, as has been noted in monitoring reports for small-bodied fish in Granny Creek and the Nayshkootayaow River (e.g., Wood 2016, 2017). Inclusion of the data collected during Operations would, therefore, increase the conservatism in the regression relationship (i.e., increase the slope) as tissue mercury concentrations would be skewed higher for fish of the same fork length. In the HHERA, rather than using upper confidence limits, we have compensated for uncertainty associated with a poorer-fitting model by using an upper percentile of fish length for normalizing concentrations. In the HHERA, we used a 75th percentile of the length data for normalizing tissue concentrations, rather than a median (which is more typical). We also used Upper Case water quality predictions for mercury concentrations based on 75th percentile chemistry (rather than a Base Case, which is more typical) to predict	**Addressed**

	operational conditions are significantly different from one another.		fish tissue concentrations, further increasing the conservatism of the fish tissue estimates. The alternative to deriving these regression relationships and normalizing the fish tissue concentration to a particular size of fish would be to calculate a simple bioaccumulation factor (i.e., mean or median fish tissue concentration divided by mean or median water concentration) that does not account for any explanatory variables that are known to influence mercury bioaccumulation in fish. Calculation of a BCF would have relied on fish tissue data collected only during baseline studies or at reference sites (thus would rely on a much smaller dataset than was used in the regression relationships) where water and fish tissue data were co-collected. This alternative approach will tend to underestimate the tissue concentrations in larger fish and overestimate the concentration in smaller fish, particularly if the dataset includes a greater number of smaller fish. Since we are most concerned (from a human health perspective) about larger fish that would typically be consumed, we prefer to use models that are less likely to underestimate tissue concentrations in larger fish.	
HHERA 18	Appendix B (Section 2.2) and the main HHERA Report indicate (on several occasions) that methylmercury was not measured in fish during baseline and operational conditions and, therefore, it was assumed that 100% of the total mercury in fish was in the form of methylmercury '…which is both a recommended (Health Canada, 2007) and a conservative estimate of methylmercury concentration in tissue.' It is agreed that if concentrations of total mercury in fish tissue are directly measured, it is appropriate to assume that methylmercury makes up 100% of the total mercury measured in fish tissue. Data exist that suggest that this assumption is a reflection of reality rather than a conservative approximation. Bloom (1992) examined approximately 230 edible fish tissue samples from both freshwater and	The HHERA should clarify that the assumption that 100% of total mercury in fish was in the form of methylmercury is reflective of actual and typical conditions rather than a conservative approximation.	As the reviewer notes and as described in the HHERA, various studies have found that the proportion of mercury in fish tissue in the methylmercury form can be less than 100%. Assuming 100% methylmercury is not necessarily reflective of actual and typical conditions as we do not have site-specific data available to support this conclusion. In the absence of site-specific data, we have assumed that all mercury in fish tissue is present in the methylmercury form when we could have argued that this may not be the case. Thus, it is a conservative assumption and is consistent with recommendations in Health Canada (2007).	**Addressed**

	saltwater fish species. The observed proportion of total mercury as monomethyl mercury ranged from 69% to 132%. Bloom (1992) concluded that, for all fish species studied, virtually all of the mercury present in fish tissue (i.e., greater than 95%) is present as monomethyl mercury. Kannan et al. (1998) found that methylmercury contributed, on average, 83% of the total mercury measured in fish tissue. As such, in the absence of measured methylmercury, total mercury should be used as proxy for methylmercury levels.			
HHERA 19	The HHERA Report appears to rely on predicted total mercury surface water concentrations and site-specific BAFs for total mercury (as derived in Appendix B) to predict total and methylmercury fish tissue concentrations under Baseline and Future conditions. For the HHRA, it appears that the predicted average 75th percentile fork length normalized baseline mercury tissue concentrations for three (3) large fish species (Northern Pike, Walleye, and White Sucker) were used to represent total and methylmercury concentrations under Baseline conditions for large-bodied fish. The resulting Baseline mercury and methylmercury concentrations (as reported in Table 6) are 0.35 mg/kg ww. The site-specific mercury BAFs (derived in Appendix B) of 168,640 L/kg, 337,764 L/kg, and 92,345 L/kg ww for Northern Pike, Walleye, and White Sucker, respectively, were used in combination with the predicted Future 'mercury water concentration' of 0.0000022 mg/L to derive mercury and methylmercury concentrations in large-bodied fish tissue under Future conditions. Although the HHERA Report has assumed, as recommended, that the total mercury concentration predicted to occur in fish tissue is methylmercury, the HHERA Report has not explored the implications of applying methylmercury-specific BAFs (taken from the scientific literature) to the reported site-specific	The HHERA Report would benefit from providing a clear description of how the baseline methylmercury concentration in surface water were derived. The HHERA Report should also explore the implications of applying methylmercury-specific BAFs (from the scientific literature) to site-specific methylmercury surface water concentrations, as methylmercury BAFs can be significantly greater than those derived for total mercury, as illustrated above. It is also noted that the range of BAFs for total mercury cited above (419,000 to 584,000 L/kg) is approximately 2 to 3 times greater than the site-specific total mercury BAF (199, 583 L/kg) used to derive mercury and methylmercury concentrations in large-bodied fish.	In regards to baseline concentrations of methylmercury in surface water, the water concentrations in Table 2 to Table 4 of Appendix A are the water concentrations reported as Upper Case source terms (75th percentile baseline chemistry input terms) from the Post- Closure Water Quality Model Report (Hatch 2018) for the model nodes described in the bullet lists in Section 1, Appendix A of the HHERA. In regard to the use of mercury BAFs, please also see response to HHERA #12. Using mercury as a surrogate for methylmercury was considered the best approach because mercury concentrations were measured in both water and fish tissue, while methylmercury was not measured in fish tissue. In addition, the surface water quality model predictions for methylmercury assumed that it was a percentage of the mercury concentration (Section 5.2 of Hatch 2018); mercury predictions were the primary driver for evaluating incremental changes in both mercury and methylmercury concentrations. While the BAFs for methylmercury are higher than for mercury (e.g., 34 times higher, as per the reviewer's comment), the water concentrations are lower by 100 times (Hatch 2018). Thus, as noted in the response to HHERA #12, where methylmercury in tissue is assumed to be 100% of the total mercury concentration, the tissue concentrations would be essentially the same whether we use the mercury surface water concentration multiplied by the mercury BAF or the	**See assessment of response to comment HHERA 12**

	methylmercury surface water concentrations reported under Baseline and Future conditions. It is well known that methylmercury has the ability to accumulate and magnify through the food chain to a much greater degree than other forms of mercury. The US EPA Mercury Study Report to Congress — Volume III: Fate and Transport of Mercury in the Environment (US EPA, 1997) recommended, in the absence of site-specific methylmercury data, a methyl mercury BAF in trophic level 4 fish of 6,800,000 L/kg. For comparison purposes, the average site-specific BAF for total mercury derived for Northern Pike, Walleye, and White Sucker (and ultimately used in the HHRA to characterize future methylmercury fish tissue concentrations) is approximately 199,583 L/kg (average of 168,640, 337,764, and 92,345 L/kg, respectively) — the US EPA (1997)-recommended BAF for methylmercury in trophic level 4 fish is approximately 34 times greater than the site-specific BAF for total mercury used to derive future methylmercury concentrations. The US EPA (1997) recommended methylmercury BAF of 6,800,000 L/kg represents the geometric mean of field data presented in four (4) studies from water bodies in upper New York state, Manitoba (Canada), Lake Michigan, and Clear Lake (California). The methylmercury BAF values from these four (4) study locations varied between 4,000,000 to 11,400,000 L/kg. The BAF values for total mercury from these studies were observed to range from 419,000 to 584,000 L/kg (Pascoe and Connelly, 2002). As previously indicated, it is unclear whether the baseline methylmercury concentrations in surface water reported in the HHERA Report were measured or approximated, nor is it clear whether these data represent total or dissolved concentrations.		methylmercury surface water concentration multiplied by the methylmercury BAF. In regards to the use of literature-derived vs. site-specific BAFs, the use of site-specific data (i.e., the BAFs calculated using site-specific models) is always preferred to using literature values, as there can be site-specific factors that can influence the fate, transport, and uptake of COPCs. Since the site-specific models were used to estimate both Baseline and Future scenario fish tissue concentrations, changing to a literature-derived BAF would not affect the evaluation of incremental change (since the relative change would remain the same) and would not take advantage of the availability of site-specific data.	

HHERA 20	The first paragraph on page 23 speaks to the consumption rates used in the HHRA, as provided by Chan et al. (2014). The HHRA indicates that to '…be conservative, the highest consumption rate between Ecozone 3 and the provincial level data for each country food was used in the HHERA'. After an examination of Chan et al. (2014) and the country food consumption rates used in the HHRA (as presented in Table 4), it is unclear where the consumption rates used in the HHRA have come from. Tables 9b through 10e of Chan et al. (2014) were reviewed in conjunction with the adult consumption rates presented in Table 4 for moose meat, moose kidney, moose liver, hare, duck/goose, and fish. None of the intake rates (provided in Table 4) could be identified in Chan et al. (2014).	The HHERA Report would benefit from providing a detailed account as to the source of the country food intake rates presented in Table 4 of the HHERA Report.	The reviewer is correct in that we did not provide a detailed accounting of the assumptions we used to derive the various consumption rates. For example, the consumption rate for moose meat included both moose and caribou meat. In some cases, the consumption rate included data from both consumers and non-consumers. We used data from a number of tables/sources throughout Chan et al. (2014) to compile the summarized version of consumption rates provided in Table 4. See response to HHERA #21 and Attachment 2 [of that document].	**Not Addressed:** Please provide Attachment 2 for review.
HHERA 21	The adult fish consumption rate used in the HHERA of 3.9 g/day (or 0.0039 kg/day as reported in Table 4) is significantly lower than any of the total fish intake rates reported by Chan et al. (2014). Table 9b (of Chan et al., 2014) reports daily consumption of traditional food by category (and by top 3 species per category based on seasonal frequency) and gender, for average and heavy (95th percentile) consumers only. The total daily consumer-only fish consumption rate (among men and women – average consumer) for all First Nations in Ontario was reported to be 23.64 g/day, while the rate for heavy consumers (95th percentile) was reported to be 117.12 g/day. Table 10d (of Chan et al., 2014) provides the same consumption rate data for Ecozone 3, with average and heavy consumer-only fish intake rates of 13.38 g/day and 65.39 g/day, respectively.	The HHRA would benefit from providing a detailed discussion as to exactly where in the Chan et al. (2014) report the cited fish consumption rates were taken from.	In the interests of transparency and consistency and to address multiple reviewer comments regarding country food consumption rates, we have re-run the exposure calculations and risk characterization with updated country foods consumption rates. The consumption rates were derived from Tables 9b and 10d of Chan et al. (2014), with the highest rate between those two tables used as the country foods consumption rate in the calculations. Details and additional risk characterization can be found in Attachment 2 [of that document].	**Not Addressed:** Please provide attachment 2.
HHERA 22	The HHERA Report indicates that '…average consumption rates were used for the HHERA as these rates are most representative of the population.' The HHERA Report should expand on the rationale provided as to why the average intake	The HHRA should provide a discussion concerning how intake rates were derived and why, if applicable, the average consumer-only intake rates are considered 'most representative' of the given population.	While the use of 'average' consumer data for country foods consumption rates may underestimate the potential risk to an individual 'heavy consumer', this is offset by the assumption that 100% of the country foods a person eats annually comes from the small study area considered in the	**Not Addressed:** It is unclear how this would be "offset". Provide Attachment 2.

	rates (presumably consumer-only intake rates) are more 'representative' of the population. Typically, exposures and related health risks are approximated for the most sensitive and/or vulnerable segment of a given population. This may include the segment of the First Nations population classified as heavy consumers of fish. By considering only the average consumer-only intake rates in isolation, exposures (from the consumption of country foods) may be under-estimated for the segment of the population classified as heavy consumers of country foods.		HHERA. Please see response to HHERA #21 and Attachment 2 [of that document] for additional details.	
HHERA 23	The HHRA would benefit from a discussion that compares, contrasts, and discusses fish intake rates currently used to characterize intake rates among First Nations members (of 3.9 and 1.9 g/day for adults and children, respectively) with those intake rates recommended by Health Canada (2010) as taken from Richardson (1997) and those cited by Chan et al. (2014). By way of example only, Richardson (1997) reports a recommended consumer-only arithmetic mean fish intake rate among 'Native Canadians (Amerindians and Inuit combined)' of 95 g/day for toddlers (7 months to 4 years). The Richardson (1997) fish intake rate is approximately 50 times greater than the value currently used in the HHRA.	Provide detailed discussion around fish intake rates used in the HHERA, including a comparison of chosen rates with those available in the literature.	A complete literature review of all possible country foods consumption rates was out of scope for the HHERA. As indicated in the HHERA (Section 3.2.1), site-specific or region-specific data are preferred to generic consumer data that are from other parts of Canada or other countries. As noted in Attachment 2 [of that document], while the absolute values of the HQs will change if different consumption rates are used, the relative incremental change between Baseline and Future scenarios remains the same. This is because the same consumption rates are used in both Baseline and Future scenarios, resulting in the relative incremental change being the same. Thus, the conclusions of the risk assessment would remain unchanged in regard to the incremental change between the scenarios.	**Not Addressed:** Provide HQs associated with consumption rates that are representative of Attawapiskat FN members. According to Chan et al. (2014), for Ecozone 3, the consumption rates are 13.38 and 65.39 g/day for average and heavy consumers, respectively. Provide Attachment 2.
HHERA 24	On numerous occasions, the HHERA Report cites surface water concentrations of both mercury and methylmercury under Baseline and Future conditions. It is unclear from the information provided whether measured and predicted surface water concentrations represent the dissolved phase or total suspended concentrations of mercury and methylmercury.	Clarify if measured and predicted surface water concentrations represent the dissolved phase or total suspended concentrations of mercury and methylmercury.	As per Hatch (2018), the concentrations are dissolved phase.	**Addressed**
HHERA 25	This section makes reference to Appendix C, which describes the food web model for mercury and methylmercury that was used to provide concentrations of mercury and methylmercury in	The HHERA Report would benefit from providing additional information and data to support the assumption that mercury concentrations in the terrestrial environment would be equal to, or less than, those predicted in the aquatic	This issue is identified as an uncertainty in Section 5.3 of the HHERA. Calculating tissue concentrations for terrestrial plants and invertebrates from soil using terrestrial BTFs was not possible as there were no or insufficient baseline data	**Partially Addressed:** Section 5.3 states that this is likely to be a reasonably conservative approach. Additional rationale should be

	various country foods (e.g., moose, hare, and duck/goose). Section 2 of Appendix C indicates that in '…terrestrial plants and terrestrial invertebrates, tissue concentrations were assumed to be the same as aquatic plants and aquatic invertebrates, respectively, in the Baseline scenario. This assumption was made because there were no site-specific tissue data available for terrestrial plants or terrestrial invertebrates. Furthermore, for terrestrial plants and terrestrial invertebrates, their tissue concentrations are assumed to be unchanged between Baseline and Future scenarios.' It is noted that direct measurements of mercury and/or methylmercury in aquatic plants and invertebrates do not exist — concentrations in aquatic plants and organisms were also predicted.	environment. The HHERA Report provides no supporting information to indicate that this assumption is reasonably conservative/protective. The concentration in terrestrial plants and invertebrates has a direct impact on the predicted concentration of methylmercury in country foods and ecological risks. The HHERA Report would benefit from also providing a rationale as to why baseline concentrations of mercury and methylmercury in soil were not used in combination with terrestrial BTFs to predict baseline concentrations in terrestrial plants and invertebrates.	available for mercury in terrestrial environments, including soil chemistry. In addition, since the assumption in the HHERA (Section 3.1.4.2) was that the soil and terrestrial vegetation concentrations will remain unchanged between Baseline and Future scenarios, the incremental change is zero, regardless of what concentrations or BTFs are used.	provided to support the assumption that this approach is conservative.
HHERA 26	The HHERA Report indicates that '…uptake from soil or sediment was not directly considered, as this was not identified as an operable exposure pathway. Soil and sediment concentrations are expected to remain the same between Baseline and Future scenarios (see rationale in main document) and, therefore, would not contribute to the incremental changes in tissue concentrations between scenarios.' The rationale provided to exclude soil and sediment from the exposure assessment appears flawed, in that (although concentrations among terrestrial plants and invertebrates were assumed not to change) these two media were included in the exposure assessment. If, as described above, it was assumed that terrestrial concentrations are unchanged between Baseline and Future scenarios, it is unclear why the HHERA Report has assumed that terrestrial plant and invertebrate concentrations are equal to aquatic organisms, which do change between Baseline and Future scenarios.	If it was assumed that terrestrial concentrations are unchanged between Baseline and Future scenarios, provide clarification as to why the HHERA Report has assumed that terrestrial plant and invertebrate concentrations are equal to aquatic organisms, which do change between Baseline and Future scenarios.	In both the Baseline and Future scenarios, the terrestrial plants and invertebrate concentrations were assumed to be the same as the Baseline Scenario aquatic plants and invertebrate concentrations (as shown in Table 16 of the HHERA). The tissue concentrations in terrestrial plants and invertebrates did not change between Baseline and Future scenarios as per rationale in the main document (Section 3.1.4.2), while the tissue concentrations in aquatic plants and invertebrates were calculated to change based on future predicted water chemistry. The alternative to this approach would have been to exclude exposure from the terrestrial food chain entirely (e.g., eliminate terrestrial plants, invertebrates, and any consumption of these in the diets of wildlife receptors). This would have skewed the risk estimates (HQs) downwards by excluding the terrestrial portions of diets for wildlife receptors that consume a mix of aquatic and terrestrial food items. This would be a less conservative approach than was used in the HHERA.	**Addressed**
HHERA 27	Comment number missing from Appendix D comment tracking table.	Not applicable	Not applicable	

HHERA 28	Comment number missing from Appendix D comment tracking table.	Not applicable	Not applicable	
HHERA 29	The HHERA Report indicates that the trophic transfer factor (TTF) of 0.66 derived by Durkalec et al. (2014), used to predict moose tissue concentrations, assumed that all of the '…COPC in an animal's tissue came from diet, so uptake from water is not considered separately from diet.' From this statement, it is unclear if the HHERA Report has considered exposure (albeit not separately) from water intake for moose. The TTF derived by Durkalec et al. (2014) should inherently include exposure from diet and water because the TTF is defined as the ratio of the metal concentration in a specific tissue divided by the metal concentration in the gastric or rumen content. As such, exposure from the consumption of surface water should be included as part of Equation 4.	Clarify if the HHERA has considered exposure from water intake for moose.	Equation 4 is used to calculate the tissue concentration of a COPC in an animal, not to estimate the animal's exposure dose. The TTF is derived by dividing the tissue concentration of a parameter by the parameter concentration measured in the gut contents (which would include both food and water). The tissue concentration (and gut content) used to calculate the TTF accounts for the uptake of COPCs from all exposure routes so there isn't a need to sum up exposures from other routes with uptake from diet to calculate the tissue concentration. Therefore, uptake from water was not included separately in the calculation of the COPC concentration in moose tissue in the food chain model using Equation 4 in Appendix C. The moose tissue concentration was used for calculating exposure doses for other receptors that eat moose (e.g., humans), but was not used to determine the exposure or risk for moose. Exposure assessment is based on the amount of COPC taken in by the animal in mg/kg/day, not based on the animal's tissue concentration in mg/kg. In the exposure assessment for moose (i.e., calculation of dose for moose from all exposure routes), uptake from water was considered and the dose of COPCs from water was added to the dose from diet (as described in Appendix E and shown in Table 17 of the HHERA). The contribution of direct uptake from drinking water to the exposure dose for moose is negligible compared to uptake from the diet (orders of magnitude lower, see Table 17 in the HHERA).	**Addressed**
HHERA 30	It is unclear why the HHERA Report has not used data from Durkalec et al. (2014) to predict mercury concentrations in the liver and kidneys of moose. As previously discussed in Section 2.3 of Appendix C, the HHERA Report used a mercury TTF developed for roe deer to predict mercury concentrations in the muscle tissue of moose. Rather than using mercury TTF values in roe deer for liver and kidney, as developed by Durkalec et al. (2015), the HHERA	Provide a rationale for how mercury concentrations were predicted in the liver and kidneys of moose.	The data from Durkalec et al. (2015) were used to derive a TTF for moose, based on surrogate data from roe deer. This was done because data for moose were not available. However, where possible, it is preferable to use data for the species being considered as there can be inter-species differences in uptake and how COPCs are partitioned between body tissues. Therefore, to determine the partitioning of the COPCs between meat, kidney, and liver in moose, data that were available in literature for moose were	**Addressed**

	Report has developed its own values from other literature.		used to derive ratios that were specific to moose. In addition, the data used to determine the ratios were from Canadian studies and are likely to be more relevant to the study area and species under consideration (moose) than European roe deer.	
HHERA 31	This section of the HHERA Report lacks a substantive discussion of the various regulatory toxicity reference values (TRVs) available for use in the HHRA. Mention is made to Health Canada, the Ontario Ministry of Environment, Conservation, and Parks (MECP), and the United States Environmental Protection Agency (US EPA); however, little to no information is provided as to how each regulatory agency developed their respective TRV (e.g., inclusion of critical effect, point of departure, uncertainty factors applied, critical study, etc.). The HHERA Report simply states that TRVs from Health Canada and MECP were preferred as they '…are most relevant to the jurisdiction where the project is located'.	In this section, the HHERA Report would benefit from providing a brief review of the various TRVs available, including how they were derived by each mainstream regulatory agency (e.g., WHO, California EPA, ATSDR, Texas, etc.) in the event that more recent and scientifically-defensible TRVs have been established.	The TRVs used in the human health risk assessment were from standard sources. A brief description of the rationale for their selection and the underlying studies was provided in Section 3.3, along with citations for where to find additional information (such as the information that the reviewer is suggesting be included in text). Since we did not deviate from standard sources recommended by federal and provincial guidance documents or attempted to derive TRVs de novo, additional information is not needed in this section.	**Addressed**
HHERA 32	Methylmercury is considered a development toxicant and, as such, the MECP does not permit (within the context of Ontario Regulation 153/04) for exposure estimates to be amortized (or averaged) over a given exposure duration, as the HHERA Report has done with exposures resulting from surface water consumption. In other words, the MECP does not allow practitioners (under Ontario Regulation 153/04) to adjust exposures of developmental toxicants for less than continuous exposure (e.g., 12 weeks/52 weeks). As such, risk estimates associated with drinking water consumption would be approximately 4.3 times greater than those stated when adjusted for continuous exposure.	Clarify the use of amortization in the calculation of exposures resulting from surface water consumption.	As noted in Section 2 of the HHERA, it was assumed that any issues at the Project identified during the Environmental Site Assessment would be resolved prior to Post- Closure. Therefore, in Post-Closure the regulation related to contaminated sites (Ontario Regulation 153/04) would not apply. Thus, while guidance from MECP was considered in the risk assessment, it was not strictly applied and other guidance documents (e.g., guidance from Health Canada or Environment Canada) were considered. In risk assessments, amortizing the exposures over the period of a year is commonly done to align with the TRVs used in the toxicity assessment, which are based on chronic, long- term exposures. The use of a shorter exposure period with no amortization would mean that an acute or sub-chronic TRV would be needed instead of the chronic TRV that was used in the HHERA. Typically, acute or sub-chronic TRVs are higher than chronic TRVs as people (and other biota) may be able to tolerate higher concentrations of COPCs over a	**Partially Addressed:** The approach used is flawed with respect to use of amortization, however, this is unlikely to alter the results of the HHERA

			short period of time compared to longer term exposures at lower concentrations. Regardless, even if the exposures were not amortized for drinking water, uptake of the COPCs from drinking water is negligible compared to the uptake from country foods (fish in particular, see Table 8 of the HHERA). The exposure doses from water are four to five orders of magnitude (thousands of times) below that of fish and would have no influence on the total exposure dose or the summed total HQ if they were four times higher.	
HHERA 33	The statement on page 28 that '…there is no notable incremental change in total HQs between the Baseline and Future scenarios, as the HQs for each receptor group are the same between the two scenarios.' is somewhat misleading (due, in part, to the number of significant figures provided in Table 8). Table 8 also shows a 100% increase (or doubling) in fish consumption-related HQ estimates for mercury between Baseline and Future conditions for the Toddler.	Clarify the statement that 'there is no notable incremental change in total HQs between the Baseline and Future scenarios, as the HQs for each receptor group are the same between the two scenarios' given the comments above.	In the HHERA, the HQs for mercury from fish consumption in toddler were 0.14 and 0.17 in Baseline and Future scenarios, respectively. However, the Baseline Scenario HQ rounded down to 0.1, while the Future Scenario HQ rounded up to 0.2. Both are at or below the benchmark of 0.2, indicating the potential risk of adverse effects to toddlers is low, and the relative incremental change is small between scenarios. We presented only one significant figure in the table as the uncertainties in calculating HQs don't warrant additional significant figures (i.e., using more significant figures suggests that there is higher accuracy and precision in the HQ estimates than is realistic). We agree this does skew the perception of incremental change but does more accurately reflect the level of confidence in the absolute values of the HQs.	**Not Addressed:** Provide additional significant figures so that changes in HQs are transparent.
HHERA 34	The personal communications cited in the text with regards to Table 9 (i.e., MEPC fish advisory data) are not provided in the reference list. The predicted range of mercury concentrations in Northern Pike, Walleye, and White Sucker stated on page 29 do not match those reported in Table 3 of the main HHERA Report or Table 3 of Appendix B.	Provide all references for personal communications cited in the text. Review the text and Table 3 (main text and Appendix B) for any discrepancies.	The personal communication reference was provided in the reference list under the heading "Personal Communications" on page 74 of the HHERA. The ranges provided in the text on page 29 are referring to the ranges from the Ontario's guidance for fish consumption advisories shown in Table 9, not the range of concentrations of mercury in fish tissue from Table 3. The fish tissue concentrations in Table 3 fall within the range from Ontario's guidance (from Table 9) listed for each fish species in the bullet list. There are no discrepancies that we could identify.	**Addressed**

HHERA 35	As described previously, there is a large degree of uncertainty associated with the site-specific fish BAFs for total mercury. As pointed out in previous comments, generic BAFs for mercury and methylmercury in fish (as recommended by regulatory agencies) appear to be greater than those predicted and applied in the current HHERA Report. As such, predicted concentrations of methylmercury in fish remain highly uncertain and, therefore, it is not advisable to follow the '…recommended number of meals per month in both Baseline and Future scenarios for the three fish species…' cited on page 29 of the HHERA Report.	Given the uncertainty associated with predicted concentrations of methylmercury in fish, comment on the use of the recommended number of meals per month, as provided in the HHERA.	To compensate for uncertainties a number of conservative assumptions were used in the HHERA that are likely to result in higher estimates of fish tissue concentrations (e.g., 75th percentile fork-length normalized predictions, use of Upper Case water quality model predictions) or exposure estimates (e.g., 100% of the country foods a person consumes originates from within the study area). The recommended number of meals per month on page 29 of the HHERA Report are based on Ontario's guidance for fish consumption advisories. We used this information as one way to contextualize the risk for each scenario and the incremental change between scenarios. We recommend contacting MECP regarding their approach to deriving these criteria for fish consumption advisories.	**Addressed**
HHERA 36	The HHERA Report speaks to three (3) reasons why the HHERA Report has likely overestimated fish tissue concentrations, including: 100% of fish consumed comes from the study area; the upper case water quality model predictions were used to predict fish tissue; and upper percentile fork length (75th percentile) was used to approximate tissue concentrations. These reasons appear overly simplistic and potentially misleading. The first assumption is only valid if mercury concentrations in fish tissue are known to be significantly greater for fish taken from within the study area relative to fish caught outside of the study area. Methylmercury concentrations in surface water, in combination with methylmercury-specific BAFs, were not used to predict methylmercury in fish tissue concentrations. Predictions of total mercury in water were used in combination with total mercury BAFs to predict total mercury and methylmercury in fish and wild game tissue. Methylmercury-specific BAFs are potentially orders of magnitude greater (10 to 1,000 times greater) than BAFs for total mercury. This uncertainty has not been explored in the HHERA Report. As pointed out in previous comments, fish fork length was often a poor predictor of mercury fish tissue	The statement that the HHERA report likely overestimates fish tissue concentrations warrants further discussion and supporting rationale, given the concerns detailed above.	We believe that the assumptions used in the HHERA are reasonable and, on the whole, are likely to overestimate the potential risk to human and ecological receptors. The first premise (100% of fish consumed comes from within the study area) will introduce conservatism because concentrations of mercury and methylmercury are predicted to be higher close to the Project site (e.g., Granny Creek) and decrease with distance downstream. Since water concentrations were not predicted in the Nayshkootayaow River, lower Granny Creek water quality predictions from the RWQN-CONF node were used to predict fish tissue concentrations in the Nayshkootayaow River. This is an overestimate, as it does not account for the additional flows in the Nayshkootayaow River that would decrease the concentrations of mercury and methylmercury in water towards background levels. In addition, people are unlikely to collect, hunt, or fish for all of their country foods on an annual basis within the small study area considered in the HHERA. As the proportion of country foods collected outside of the study area increases, the risk would proportionately decrease towards that of the Baseline Scenario.	**Not Addressed:** It is acknowledged that while some assumptions used in the HHERA could be considered conservative in nature, other assumptions used have varying degrees of uncertainty or may be less conservative. See comments above regarding fish consumption rates, for example.

	concentrations and is associated with a large degree of uncertainty. The range of plausible fish tissue mercury concentrations at a given fork length could vary significantly within a given species. The HHERA Report has not considered the use of upper confidence limits when developing these relationships (i.e., fork length versus fish tissue concentration).		As discussed in previous comment responses (see HHERA #11, #12, and #13 for aquatic invertebrates and HHERA #19 for fish), while the BAFs for methylmercury are higher than those for mercury (e.g., 35 to 95 times higher), the water concentrations of methylmercury are much lower than those for mercury (100 times lower). Where the assumption is that 100% of the mercury is present as methylmercury and where methylmercury is 100 times lower than mercury concentrations in surface water, the differences in BAFs between the two parameters are 'cancelled out'. Predicted tissue concentrations would be the same in this case, regardless of whether BAFs for methylmercury (multiplied by methylmercury in water) or BAFs for mercury (multiplied by mercury in water) were used. As discussed in comment responses for comments #14, #15, #16, and #17, we have compensated for uncertainty associated with a poorer-fitting model by using an upper percentile of fish length for normalizing concentrations. In the HHERA, we used a 75th percentile of the length data for normalizing tissue concentrations, rather than a median (which is more typical). We also used Upper Case water quality predictions for mercury concentrations based on 75th percentile chemistry (rather than a Base Case, which is more typical) to predict fish tissue concentrations, further increasing the conservatism of the fish tissue estimates.	

The following subsection provides a summary of the key outstanding issues related to Closure Plan Amendment #4 and the associated the Human Health and Ecological Risk Assessment.

Closure Plan Amendment #4

CORRESPONDENCE LOG	
Date on DBC document:	May 2018
AttFN comments:	August 29, 2019
DBC response:	April 14, 2019
AttFN response:	June 10, 2020
DBC response:	*Outstanding*

- DBC has indicated that there is no long-term requirement for sulphate management on site, despite the known connection between sulphate management, methylmercury formation, and human and ecological health risks. DBC has indicated that Phase I and Phase II site assessments are underway to better define leachate plumes and sulphate transport pathways, however they have not provided these reports or given a timeline for when they might be provided for AttFN's review.

- DBC's plan for rehabilitation does not include the promotion of additional waterfowl habitat.

- DBC has indicated that their reclamation schedule and activities will meet all regulatory requirements with respect to avoidance of sensitive periods (e.g., breeding and migration periods for birds and other wildlife), however they have not indicated whether they will also implement restrictions for species that are of cultural importance to AttFN that may not necessarily be required by law.

- DBC has not provided AttFN with a detailed, science-based rationale for why annual monitoring of caribou through winter aerial and tracking surveys will only occur at 5 and 10 years after production ceases, and not annually as requested.

- AttFN has requested that sulphate, mercury, methylmercury, oil and grease, and metals be monitored in groundwater and surface water for at least the first 50 years post-closure, with 100 years preferred. DBC has not agreed to this, and has stated that they will monitor according to their permit requirements and that a "focused program" is proposed for the post-operations monitoring, because they have a long history of monitoring at the site. The current proposed post-closure monitoring phase is only 15 years.

- Methylmercury is not included in the list of parameters that DBC will be monitoring during mine reclamation and post-closure. DBC has indicated that the parameters they will be monitoring are consistent with requirements under the *Mining Act* and associated regulations, and that they will monitor methylmercury "where appropriate as per the existing permits and licenses". They have not explicitly confirmed whether or not the monitoring for methylmercury will continue during reclamation and post-closure.

- DBC has not provided any information on how they will manage the open pit water if the layers of water in the pit do end up mixing (all of DBC's models indicate that the layers of water will

never intermix). Mixing could change the overall dynamics of the pit lake water chemistry over the long-term.

- The Closure Plan relies heavily on baseline data from 2004, which does not account for the effects of the mine (and potentially also climate change) over the past 15 years. DBC should be doing additional research to ensure that the "Current Mine Site Conditions" used for Closure assumptions is reflective of the current, 2020 site conditions.

Human Health and Ecological Risk Assessment

CORRESPONDENCE LOG	
Date on DBC document:	October 2018
AttFN comments:	August 29, 2019
DBC response:	April 14, 2019
AttFN response:	June 10, 2020
DBC response:	*Outstanding*

- The fish consumption rate used in DBC's Human Health and Ecological Risk Assessment (HHERA) was 3.9 g/day, whereas literature shows that the consumption rate in this Ecozone is likely 13.38 g/day for average consumers and 65.39 g/day for heavy consumers. The low fish consumption rate used in DBC's HHERA may greatly underestimate the human health risks to AttFN members, especially members of the population that are classified as heavy consumers of country foods.

- There are certain assumptions used in the HHERA that have some uncertainty and may not be as conservative as they should be. However, DBC states that they believe the assumptions used in the HHERA are reasonable and likely overestimate the potential risks to human health and ecological health. Additionally, AttFN has not been provided with the Sensitivity Analysis for the HHERA, which provides details on the calculations and assumptions used for determining the risk of methylmercury to wildlife that are higher up in the food chain.