November 4, 2019

Gordon Grey
Environmental Impact Assessment Coordinator
Wolastoqey Nation in New Brunswick

Dear Gordon:

Re: Review of Potential Effects and Literature for the Regional Assessment of Offshore Oil and Gas Exploratory Drilling

The Canadian Environmental Assessment Agency (the Agency) has put together a Committee to undertake a regional assessment of offshore oil and gas exploratory drilling east of Newfoundland and Labrador. To inform the regional assessment, the Committee has provided brief outlines of the existing knowledge on some of the impacts from oil and gas drilling on various valued components. Management and Solutions in Environmental Science (MSES Inc) was requested by the Wolastoqey Nation in New Brunswick (WNNB) to review these outlines and literature summaries on the potential effects of offshore exploratory drilling and associated activities on marine fish (Dr. Jennifer Ings), marine birds (Dr. Ian Jones), marine mammals (Dr. Brian Kopach) and atmospheric environment (Ms. Mandy Olsgard). The briefing titled 'Module 12 Fisheries and Other Ocean Uses' was not reviewed at this time. In this review, experts provided comments on the completeness of the list of concerns/impacts and literature; and provided recommendations on any relevant literature that should be included to inform the regional assessment framework.

1.0 MARINE FISH AND FISH HABITAT (MODULE 7)

Overall, while the review did touch on the majority of potential issues, it is not a comprehensive review. The author(s) provided a lengthy list of references, most of which were current, but did not provide a satisfactory level of detail within the document. Not all cited articles were reviewed due to time constraints, but with such a robust list, there was surely more detail that could have been extracted. The authors glossed over potential effects by using statements such as "*relatively low mortality*", and "…*relatively low toxicity*…", without providing the comparison, i.e., relative how and to what? Also, gaps in knowledge (i.e. few scientific studies on the topic) should not be ignored (e.g., the effects of sound on fish and invertebrates; recolonization of benthic invertebrate communities in deep water environments). In contrast, the proponent should work on filling these gaps before making conclusions about the effects of proposed activities. All this being said, the summary did not provide sufficient detailed information to be used in decision making.

In addition to the above, more details are needed on the effects of oil spills on fish and fish habitat. While it is unlikely that a spill will occur, if such an event did happen it would by far be the most detrimental to fish and fish habitat, both inside and potentially extending beyond the borders of the study area.

We recommend that the author(s) to consider directly discussing two additional concerns:

1. **Cumulative impacts: There are a number of projects occurring in the same general area, each one cannot be considered in isolation. For example, a change in habitat use, availability, and quality becomes more of a concern if other adjacent areas are also being degraded due to other projects.**
2. **Effects of reduced fish populations on other marine animals: many fish present in the study area are in turn prey for other animals (e.g., whales). Disrupting the migration patterns of their food source through project activities may have an impact on other valued components as well. It would be worth addressing.**

As mentioned above, we were happy with the inclusion of current literature in the summary; however, insufficient information was extracted from the provided literature. It is not enough to merely list literature**. We recommend that the author(s) dive deeper into the literature to ensure they are providing the most comprehensive, relevant and accurate information possible.**

2.0 MARINE AND MIGRATORY BIRDS (MODULE 8)

In section 8.2 Planned Drilling Activities and Emissions, it is discussed that the "*Potential interactions between offshore exploratory drilling and associated activities and marine and migratory birds, and possible resulting effects on this Valued Component (VC), include:*

- *Attraction of night-flying birds to artificial lighting or flares on drill rigs and vessels, resulting in possible injury or mortality through strikes, stranding, incineration, disorientation, increased energy expenditure or increased predation…*"

The increased predation involves gulls (Herring and Great Black-backed Gulls) only so it would be useful to clarify this, by adding the bolded and underlined words:
"*Attraction of night-flying birds to artificial lighting or flares on drill rigs and vessels, resulting in possible injury or mortality through strikes, stranding, incineration, disorientation, increased energy expenditure or increased predation* **by gulls;**"

This section needs to explicitly mention exposure of diving seabirds (alcids) to fouling substances. For example, add to this section an additional bulleted point:

- **Exposure of diving seabirds (auks Alcidae in particular) to feather fouling substances (crude oil, drilling mud) released during the activity resulting in possible injury, mortality or health effects;**

In Table 8.3 (pg 4), it states that "*Petrels and shearwaters (Procellariiformes) are the seabirds most likely to be grounded by artificial light and most of these affected seabirds are fledglings grounded during their first flights from their natal nests toward the ocean (Rodríguez et al. 2015, 2017).*" There is confusion in this discussion about the seabird taxa involved which can be addressed by providing the family names for the taxa. Furthermore, it is important to acknowledge that fatal light attraction involves both adults and fledglings. We recommend the following edits bolded and underlined:
"**Storm-petrels (Hydrobatidae) and shearwaters (Procellariidae, both in the Order Procellariiformes)** *are the seabirds most likely to be* **attracted by artificial light and killed**. **Affected individuals include both adults (Warham 1990), as well as,** *fledglings grounded during their first flights from their natal nests toward the ocean (Rodríguez et al. 2015, 2017).*"

Add to literature summary, the following references:

- Warham, J. 1990. The Petrels: Their Ecology and Breeding Systems, London: Academic Press Ltd.

The summary provides this information: "• *Leach's storm-petrel (a species whose breeding colonies in Atlantic Canada have seen significant declines in the last few decades [Hedd et al. 2018]) has been identified as the most commonly found species stranded on vessels in Atlantic Canada during monitoring studies conducted offshore Eastern Newfoundland (Baillie et al. 2005; Ellis et al. 2013; ECCC 2016; Davis et al. 2017) although there is some uncertainty around mortality estimates (Ellis et al. 2013).*" Offshore oil development proponents have been routinely referring to carcass counts as 'mortality estimates' (as in the statement above) which is both misleading and pseudoscientific. Carcass counts are not mortality estimates and must not be referred to as mortality estimates. A mortality estimate requires carcass counts to be corrected for detection rate, (i.e., mortality = carcasses retrieved x 1/detection rate (Joly et al. 2009; e.g., if 100 birds are recovered and the detection rate is quantified at 50%, then the mortality estimate is 200 birds)). Because no measure of detection rate (e.g., Huso 2011) of affected individuals has been made here, the relationship of numbers reported to actual mortality is unknown and estimates are neither rigorous nor quantitative. In fact, lack of detection rate consideration leads directly to gross underestimates of mortality rate. This section needs to explicitly state that seabird mortality has not been estimated and is not being estimated. This science has been pointed out repeatedly in past environmental impact assessments, so the point should be reworded as follows:
"**The numbers of birds affected** *through mortality or injury due to interactions with offshore installations and vessels* **has not been rigorously quantified in a scientific manner. A mortality estimate would require application of a measured detection rate for birds entered into the salvage logs (e.g., Huso 2011, Durkin and Cohen 2018). This has not been attempted and in the Newfoundland offshore it is expected that** *many birds are killed but not recovered due to scavenging or falling into the sea***, or are injured and die elsewhere** *(Montevecchi et al. 1999; Ellis et al. 2013; Ronconi et al. 2015).* **Lack of detection rate quantification is known to lead directly to negative biases in estimates of mortality and spurious conclusions about patterns of wildlife death (Huso 2011).**

Add to literature summary, the following references:

- Durkin, M.M. and N.B. Cohen. 2018. Estimating avian road mortality when only a single observer is available. Journal of Wildlife Management 83(1): 100-108; DOI: 10.1002/jwmg.21563
- Huso, M.M.P. 2011. An estimator of wildlife fatality from observed carcasses. Envirometrics 22: 318-329.
- Joly, D., Heisey, D.M., Samuel, M.D., Ribic, C.A., Thomas, N.J., Wright, S.D. and E.I. Wright. 2009. Estimating cause specific mortality rates using recovered carcasses. Journal of Wildlife Diseases 45(1): 122-127.

In Table 8.3 (pg 5), it states that "*Available mortality estimates often rely on recovery of birds on platforms and vessels, and it is not known how many birds are killed by flares but not recovered due to incineration, scavenging or landing in the ocean (Hope Jones 1980; Ellis et al. 2013).*" Again here, carcass counts are being referred to as 'mortality estimates' when in fact carcass counts are not mortality estimates, as has been clearly covered in the scientific literature (Joly et al. 2009, Huso 2011, Durkin and Cohen 2018). This section needs to be explicitly revised as follows:
"No mortality estimates are available for flaring as the only relevant data is recovery of bird carcasses on offshore platforms and vessels, with no measurement of detection rate (e.g., Huso 2011). Based on the position and height of flare stacks on offshore vessels, few victims are expected to be recovered. It remains unquantified *how many birds are killed by flares but not recovered due to incineration, scavenging or landing in the ocean (Hope Jones 1980; Ellis et al. 2013).* **As for**

light attraction, lack of detection rate quantification for flaring leads directly to negative biases in estimates of mortality and spurious conclusions about patterns of wildlife death (Huso 2011).

In Table 8.4 header (pg 6), it states that "*Table 8.4 summarizes current information and knowledge from the literature and other sources on the nature and degree of the potential effects of accidental events on marine and migratory birds.*" Yet we have a severe lack of crucial science related to impacts of offshore industrial activity in Newfoundland and Labrador. Access by scientific researchers to offshore oil installations and activities has been severely restricted since the local industry began in the late 1990s, so there have been few opportunities to rigorously measure any effects of associated light and pollution in general or in relation to accidents that have occurred (especially related to seabird mortality estimates). This needs to be acknowledged explicitly, to put the review in a proper scientific perspective. Revise table header as follows:
Table 8.4 summarizes current information and knowledge from the literature and other sources on the nature and degree of the potential effects of accidental events on marine and migratory birds. **It needs to be kept in mind that access by scientific researchers to offshore oil installations and activities has been severely restricted since the local industry began in the late 1990s, so there have been few opportunities to rigorously measure any effects of associated light and pollution in general or in relation to accidents that have occurred.**

"*Birds (especially pelagic seabirds) are among the most vulnerable and visible biota to be affected by oil spills (Wiese and Robertson 2004; O'Hara and Morandin 2010; Morandin and O'Hara 2016; Boertmann and Mosbech 2011).*" Auks (family Alcidae) are by far the most vulnerable seabirds to oil spills in the northwest Atlantic and this group of birds should be named here, revise this section as follows:
Birds (**especially diving species such as auks Alcidae**) *are among the most vulnerable and visible biota to be affected by oil spills (Wiese and Robertson 2004; O'Hara and Morandin 2010; Morandin and O'Hara 2016; Boertmann and Mosbech 2011).*

In Table 8.4, (pg 7), it states that "*Once birds are exposed to oil, even with rescue and cleaning efforts, the chances of survival are often quite low (French-McCay 2009).*" The efficacy of rehabilitation-cleaning of oiled auks (family Alcidae) in the North Atlantic is well known and should be more explicitly described. Revise as follows:
Once birds are exposed to oil, even with rescue and cleaning efforts, the chances of survival **are low (Sharp 1996,** *French-McCay 2009)* **and so called 'rehabilitation' is not considered likely to mitigate oil spill mortality effects on auk populations although it may create this impression to naive members of the public, hence its popularity with politicians and responsible parties for oil spills (e.g., Sharp 1996).**

Add to literature summary, the following references:

- Sharp, B.E. 1996. Post-release survival of oiled, cleaned seabirds in North America. Ibis 138(2): 222-228.

It is stated that "*SBM* [drilling fluids/mud] *is a dense, low toxicity fluid which sinks rapidly through the water column (Neff et al. 2000; CNSOPB 2005, 2018).*" In at least one case, a drilling fluid spill caused a large surface slick of oily residue in the Newfoundland offshore (CNLOPB 2004), with characteristics likely to foul seabirds exposed to it. For example:

"After the accidental spill of SBM [drilling mud], Husky initiated its Emergency Response and Oil Spill Response procedures, referenced in the East Coast Operations Incident Coordination Plan (EC-M-99-X-

PR-00003-001). On 22 October 2004, Cougar Flight 551, while enroute to the GSF Grand Banks, was redirected by Husky to conduct an aerial surveillance flight south of the platform along the expected trajectory of the slick. Observations of the slick were made at a location approximately 40 km south of the platform. The slick was 300 m long, 150 m wide, teal in colour and moving at about 2.8 km/hr." http://www.cnlopb.nl.ca/pdfs/hejdarc/heearpt.pdf

Given the October 22, 2004 description of the accidental spill (CNLOPB 2004), the statement quoted above regarding dense, low toxicity fluid is both inaccurate and misleading. Saying SBM has "low toxicity" is misleading here as it is the likelihood of plumage fouling from a floating slick, not toxicity, that is the threat to seabirds. Please revise the statement as follows: "*SBM is a dense, low toxicity fluid* **that supposedly** *sinks rapidly through the water column (Neff et al. 2000; CNSOPB 2005, 2018).* **However, a large surface sheen was reported from at least one drilling mud spill (CNLOPB 2004) and regardless of toxicity, this substance is likely to foul seabird feathers with similar effects as for e.g., crude oil spills (references provided above).**

Add to literature summary, the following references:

- CNLOPB. 2004. Incident report, October 2004. Downloaded from CNLOPB website, April 2011. http://www.cnlopb.nl.ca/pdfs/hejdarc/heearpt.pdf

Lastly, it is stated that "*Effects on marine and migratory birds would be minimal and similar to those described above for authorized drilling discharges (see Drilling and Associated Marine Discharges).*" Drilling mud slicks are oily and represent a likely threat to exposed seabirds. Revise the statement as follows:
"*Effects on marine and migratory birds* **would be similar** *to those described above for authorized drilling discharges (see Drilling and Associated Marine Discharges)* **and could be significant for auks exposed to floating residue of a large accidental drilling mud spill (e.g., CNLOPB 2004).**

3.0 MARINE MAMMALS AND SEA TURTLES (MODULE 9)

In general the list of potential concerns/impacts is complete. What is missing is insight into how the Regional Assessment will analyze species habitat use, prey availability, and cumulative effects for impacts, such as changes in noise levels. This level of detail should be established at the next stages of this project.

The last bullet in Table 9.3 (pg 4), the Effects on Marine Mammals-Communication Masking and Behavioural Effects, discusses the lack of experiments looking at impacts of sound on marine mammals. **A statement should be included that also identifies the need for further research evaluating the cumulative effects of noise on marine mammals.**

The last point in table 9.3 (pg 8) states "*If the wellhead is left in place after the well is decommissioned, the structure may serve as a hard substrate for colonization by potential prey for marine mammals*". **The summary should provide literature to support this statement and be more specific about what prey species colonize abandoned wellheads and what marine mammals forage on them.**

Based on a high-level review of the literature cited, we are satisfied with the references used at this point. However, we were unable to find information on the purpose of this regional assessment and how the findings will be used in the future. If the purpose is to provide a region wide analysis of marine mammal and turtle ecology, including habitat selection analyses, and prey availability studies that future proponents can draw from as they develop environmental impact assessments for offshore energy development, then this is a commendable goal. Having proponents complete habitat or prey analysis on a project by project basis can have serious implications for the assessment of potential impacts on wildlife, as we found for a heavily developed region in north east Alberta (Campbell et al. 2019). **Having region wide standards for defining a species habitat is one way to limit the underprediction of impacts.**

Literature to be included:

- Campbell, MA, B. Kopach, PE Komers and AT Ford. In press. Quantifying the impacts of oil sands development on wildlife: perspectives from impact assessments. Environmental Reviews, https://doi.org/10.1139/er-2018-0118

4.0 ATMOSPHERIC ENVIRONMENT (MODULE 14)

In the introduction (Section 14.1), air temperature is identified as a component of the physical environment. While this is correct it is also incomplete. Air temperature is one factor of the meteorology which affects air quality and dispersion of contaminants released to ambient air.
Suggested revision: Remove air temperature and replace with meteorology (air temperature, wind speed, wind direction, etc.)

In addition to meteorology, terrain features affect dispersion of contaminants in air. Although terrain is not a component of the atmosphere it must be considered in air quality assessments and should be noted. **Suggested addition: Add in terrain features and link to air dispersion of contaminants released to ambient air.**

In Section 14.2, **the following studies which identified potential sources (air, noise, light) and health risks from offshore oil and gas operations should be considered in the Regional Assessment:**

- Series, O.I., 2009. Assessment of impacts of offshore oil and gas activities in the North-East Atlantic.
- Gardner, R.O.N., 2003. Overview and characteristics of some occupational exposures and health risks on offshore oil and gas installations. Annals of Occupational Hygiene, 47(3), pp.201-210.
- Martin, C., Karman, C.C. and Huwer, S., 2000. Ecotoxicological risk assessment related to chemicals and pollutants in offshore oil production. Toxicology letters, 112, pp.283-288.
- Schmidt, C.W., 2011. Arctic oil drilling plans raise environmental health concerns.
- Fraser, G.S., 2014. Impacts of offshore oil and gas development on marine wildlife resources. In Peak Oil, Economic Growth, and Wildlife Conservation (pp. 191-217). Springer, New York, NY.
- Clark, M.R., Rouse, H.L., Lamarche, G., Ellis, J. and Hickey, C.W., 2017. Preparation of environmental impact assessments: General guidelines for offshore mining and drilling with particular reference to New Zealand. National Institute of Water and Atmospheric Research.

In Table 14.1 it is unclear why:

- "Well Drilling (exploration and delineation)" is not identified as a potential effect. **Flaring may occur if well bore drilling occurs during exploration and delineation. This should be identified.**
- "Presence and Operation of Drill Rig" is not identified as a contributor to effects on atmospheric condition. **The drill rig is the source of the stressors and should be identified as a**

contributor to changes in air quality and GHG levels so that magnitude can be assessed.

Suggested revision: In Table 14.1 indicate that "Well Drilling (exploration and delineation)" and "Presence and Operation of Drill Rig" are associated with potential effects.

Table 14.2 does not provide a description of provincial (Newfoundland) or federal requirements for assessing impacts to health from air quality, noise or light. Guidance on assessing potential effects should be compared to the information provided to allow for an understanding and assessment of potential impacts. **Suggested addition: Identify applicable legislation or policy which will be used to assess predicted or measured air quality, noise and light and assess for potential impacts.**

The information presented for potential effects from "Presence and Operation of a drill rig" in Table 14.2 does not discuss the types or concentrations of air contaminants emitted during venting and flaring. Flaring was identified as a potential source of air emissions during drilling and information describing the products of incomplete combustion (benzene, toluene, ethylbenzene, xylene and other hydrocarbons and particulate matter (PM) of varying sizes) is readily available.

Table 14.2 "Well evaluation and testing" does not include particulate matter or ozone (formation through secondary atmospheric reactions of NOx, VOC, PM) as air contaminants while numerous studies have identified this as an issue (see literature below).

- McEwen, J.D. and Johnson, M.R., 2012. Black carbon particulate matter emission factors for buoyancy-driven associated gas flares. Journal of the Air & Waste Management Association, 62(3), pp.307-321.
- Fortner, E.C., Brooks, W.A., Onasch, T.B., Canagaratna, M.R., Massoli, P., Jayne, J.T., Franklin, J.P., Knighton, W.B., Wormhoudt, J., Worsnop, D.R. and Kolb, C.E., 2012. Particulate emissions measured during the TCEQ comprehensive flare emission study. Industrial & Engineering Chemistry Research, 51(39), pp.12586-12592.
- Olaguer, E.P., 2012. The potential near-source ozone impacts of upstream oil and gas industry emissions. Journal of the Air & Waste Management Association, 62(8), pp.966-977.

This section also indicates that produced water may be atomized in the flare. Produced water is generally high in salts and when chloride is combusted in the presence of hydrocarbons there is the potential for *de novo* synthesis (creation) of dioxin and furan compounds (see references below).

- Huang, H. and Buekens, A., 1995. On the mechanisms of dioxin formation in combustion processes. Chemosphere, 31(9), pp.4099-4117.
- Gullett, B and Seeker, R. 1997. Chlorinated dioxin and furan formation, control and monitoring. Presented at ICCR Meeting. Research Triangle Park. September 17, 1997. https://www.ejnet.org/dioxin/dioxinpr2.pdf.

Suggested addition: Review identified literature and update contaminants associated with flaring including particulate matter (black carbon) and the potential for generation of dioxins and furans from flaring atomized produced water in the presence of hydrocarbons.

In Section 14.3 (Unplanned Events), the following literature regarding potential risks during unplanned events was identified but not included in the Regional Assessment document. **Incorporation of this information would be useful to understand potential impacts to air quality, light and noise which may affect exposed receptors.** For example, Beyer et. al (2016) identified a need for more research on the types and concentrations of chemicals in the air directly above an oil spill and effects on marine life (turtles, marine mammals, birds) which breathe near the water-air interface.

- Patin, S.A., 1999. Environmental impact of the offshore oil and gas industry (Vol. 1). East Nortport, NY: EcoMonitor Pub..
- Beyer, J., Trannum, H.C., Bakke, T., Hodson, P.V. and Collier, T.K., 2016. Environmental effects of the Deepwater Horizon oil spill: a review. Marine pollution bulletin, 110(1), pp.28-51.

Soot emission during oil burning following accidental releases was identified. Soot is equivalent to particulate matter for which there are Canadian Ambient Air Quality Standards which would need to be considered. **Suggested revision: Review identified literature and update potential effects to air resulting from accidental releases and management options.**

In addition to air impacts there would be increased noise and light pollution from emergency response vehicles. **This should also be considered (see noise and light literature below).**

Several other assessments, reports and studies have been completed in order to understand air quality, noise and light effects from offshore drilling and were not referenced in Module 14.

Air quality

- Husdal, G., 1994, January. Air Emissions From Offshore Oil and Gas Production. In SPE Health, Safety and Environment in Oil and Gas Exploration and Production Conference. Society of Petroleum Engineers.
- Cadigan, M.F. and Peyton, K., 2005, January. Baselining and Reducing Air Emissions from an Offshore Drilling Contractor's Perspective. In SPE/EPA/DOE Exploration and Production Environmental Conference. Society of Petroleum Engineers.
- Schifter, I., González-Macías, C., Miranda, A. and López-Salinas, E., 2005. Air emissions assessment from offshore oil activities in Sonda de Campeche, Mexico. Environmental monitoring and assessment, 109(1-3), pp.135-145.
- Villasenor, R., Magdaleno, M., Quintanar, A., Gallardo, J.C., López, M.T., Jurado, R., Miranda, A., Aguilar, M., Melgarejo, L.A., Palmerın, E. and Vallejo, C.J., 2003. An air quality emission inventory of offshore operations for the exploration and production of petroleum by the Mexican oil industry. Atmospheric Environment, 37(26), pp.3713-3729.

Noise

- McCauley, R.D., 1998. Radiated underwater noise measured from the drilling rig Ocean General, rig tenders Pacific Ariki and Pacific Frontier, fishing vessel Reef Venture and natural sources in the Timor Sea, Northern Australia. Centre Marina Science & Technology Report.
- Lovaas, S., 1985. *Acoustic emission of offshore structures, attenuation-noise-crack monitoring* (No. CONF-8510159-). Norsk Hydro Research Centre, Bergen.
- Rahman, M.N. and Abdullah, H., 1991, January. Noise survey in offshore operations. In SPE Health, Safety and Environment in Oil and Gas Exploration and Production Conference. Society of Petroleum Engineers.
- Thomas, J.A., Kastelein, R.A. and Awbrey, F.T., 1990. Behavior and blood catecholamines of captive belugas during playbacks of noise from an oil drilling platform. Zoo Biology, 9(5), pp.393-402.
- Malme, C.I., Miles, P.R., Tyack, P., Clark, C.W. and Bird, J.E., 1985. *Investigation of the potential effects of underwater noise from petroleum-industry activities on feeding humpback whale behavior. Final*

report (No. PB-86-218385/XAB; BBN-5851). Bolt, Beranek and Newman, Inc., Cambridge, MA (USA).

- Life, M., 2016. Mitigation of underwater anthropogenic noise and marine mammals: the 'death of a thousand'cuts and/or mundane adjustment. Marine pollution bulletin, 102, pp.1-3.
- Weilgart, L.S., 2007. The impacts of anthropogenic ocean noise on cetaceans and implications for management. Canadian journal of zoology, 85(11), pp.1091-1116.

Light

- Marquenie, J., Donners, M., Poot, H., Steckel, W. and de Wit, B., 2013. Bird-friendly light sources: adapting the spectral composition of artificial lighting. IEEE Industry Applications Magazine, 19(2), pp.56-62.
- Marquenie, J.M., Wagner, J., Stephenson, M.T. and Lucas, L., 2014, March. Green lighting the way: Managing impacts from offshore platform lighting on migratory birds. In SPE International Conference on Health, Safety, and Environment. Society of Petroleum Engineers.

Suggested revision: Review identified literature and reflect additional information in each of the potential effects associated with atmosphere, noise and light.

<u>Conclusion</u>

I hope that this brief overview of the literature summaries to be used to inform the Regional Assessment provides the WNNB with the technical information needed to continue engaging on this project.

Yours truly,

<original signed by>

Shannon Gavin
MSES Inc.