Key Outstanding Issues to Discuss with Proponent

February 13, 2020

1. Use of Information From Scientific References

Issue: Some conclusions in the draft EIS and IR responses are based on misinterpretations of scientific literature.

Conclusions in the EIS have sometimes been based on incorrect, wrongly interpreted or out of context references. CWS (e.g. IR-179) and DFO (e.g. IR-114) identified several referencing discrepancies with misquoting of their research and other scientific papers. For example IR-114 In Section 9.2.2.1 of the EIS there are discrepancies between the EIS and references as follows: Bay du Nord Development Project Environmental Impact Statement (draft) Response to Regulatory Review Information Requests "For example, swordfish and other pelagic fishes have been shown to be attracted to marine, (structures?) including oil platforms, fish farms, and offshore wind turbines (Franks 2000; Fayram and de Risi 2007; Arechavala-Lopez et al. 2013)." DFO noted that "Arechavala-Lopez et al. (2013) describes one incident of one swordfish observed beneath a fish farm located in the Western Mediterranean. This does not support the statement attached to it". Those references were corrected in the IR responses. In verifying IR responses and the draft EIS, the Agency also found several referencing discrepancies in random checks of concluding statements.

Example 1: In the EIS on pg. 10-16.the proponent states "*Poot et al. (2008) showed that 30 kilowatts (kW) of electric lighting affects migrating land birds out to at least 5 km, but greater distances cannot be ruled out (Poot et al. 2008; Hedd et al. 2011; Ronconi et al. 2015). Fledgling Cory's shearwaters are attracted to artificial lighting from at least 16 km away (Rodríguez et al. 2015).*" The Poot et al. paper made reference to an unidentified study that showed a 30 kW light emission effect of 3-5 km from a production platform located 70 km offshore. The Poot et al. study evaluated changing light colour on a land based gas production site. That study is relevant in the context of land bird attraction to artificial lighting. Hedd et al. 2011 study was on oil spill effects, not lighting; therefore, this paper is not relevant to this discussion. Rodriguez et al 2015 study was on effects of city lights from Tenerife (Azores) on adjacent bird colonies. There is considerable uncertainty remains as to the actual zone of influence of light attraction on migratory birds. There have been no studies undertaken on the maximum light detection distance of the eyes of migratory birds. Furthermore, no studies have been undertaken that describe how far away from a light source a migratory bird must be before lights affects its behaviour. This uncertainty should be clearly stated and should be reflected in the level of confidence in the conclusions.

IR-26: In the response to this IR is was stated that: "*As described (EIS s. 10. 2.2.1) estimated zones of influence, based on scientific literature indicate that the ZOI is approximately 16 km.*" The 16 km zone of influence of lighting predicted for this project appears to be attributed to the single study by Rodriguez et al. As noted above, the Rodriguez et al. study assessed reaction of birds in colonies adjacent to a city. The Core Development Area for the proposed project is about 500 km offshore and far removed from breeding colonies, therefore it is unclear how this paper's findings relate to the proposed project. Provide a rationale for the relevance of this single research paper to establishing the 16 km zone of influence around the proposed project.

Example 2: EIS pg. 9-29 "*There is no evidence that the levels of trace metals in fish and shellfish in areas where produced water is discharged are higher than the natural background concentrations (Neff et al. 2011)*." In the Agency's review of this study, the statement referenced was not found. The Agency notes

that Neff et al 2011 states "*Marine animals near a produced water discharge may bioaccumulate metals, phenols, and hydrocarbons from the ambient water, their food, or bottom sediments."* This statement by Neff contradicts the EIS. Neff et al also state "*unresolved questions regarding aspects of produced water composition and its fate and potential effects on the ecosystem remain."* In the EIS on pg. 9-36 the concluding statement on effects of all project wastes states "*with the application of mitigation measures, the residual environmental effects on Marine Fish and Fish Habitat resulting from marine discharges and emissions are predicted to be adverse, low in magnitude, localized, long-term in duration, occurring regularly during FPSO operations, and reversible. This prediction is made with a high level of confidence."* Natural variability is not described in the EIS; therefore, there is no comparison in measureable changes within natural variability available to make this prediction of low magnitude. Also, given the literature cited, the high confidence level does not seem to be supported.

Example 3: EIS pg. 12-19 *"Increased larval mortality and change in feeding behaviour of corals has been identified due to exposure to cuttings particles (Raimondi et al. 1997, Neff 2010; Buhl-Mortensen et al. 2015; Järnegren et al. 2016; Ragnarsson et al. 2017), although some corals have higher tolerance to drill fluid deposition (Allers et al. 2013)*" . In review of the Allers et al. study, the Agency notes that this statement is a partial excerpt as the study showed that the tolerance for *Lophelia pertusa* coral exposed to reef sediment and cutting particles was short term. The Agency notes that the study showed high sediment coverage of 2 to 4 days causing mortality as the corals were dead after 48 to 72 hours of complete burial. It is also unclear which corals referred to by the proponent as "some corals" had higher tolerance and whether corals in the core and future development areas are expect to react similarly to the response of *Lophelia pertusa*. Considering that *Lophelia pertusa* are not found in the project area, clarify the relevance of this study to the conclusions on effects from drill mud and cuttings.

Example 4: IR-253 *"The following information is provided to support the use of the references for the statement "Recent SBM spills in the Gulf of Mexico and in Atlantic Canada have also shown limited environmental effects with partial recovery within weeks or months of release and full recovery within a few years."* The statement provided does not address the IR –The Agency understands that monitoring was not conducted to validate the assumptions in those reports and therefore this information is not verified. Page 16-142 in the EIS "*With spill prevention plans and response procedures in place, the potential effects of accidental SBM discharges on Marine Fish and Fish Habitat are predicted to be adverse, low in magnitude, <u>short-term in duration</u>, localized, not likely to sporadically to occur (depending on size of spill), and reversible. This was determined with a high level of confidence."* It appears the proponent has relied on the reference to three cases in the Gulf of Mexico and Atlantic Canada (but the only reference is to two SBM spills (Marathon and BP exploration drilling offshore Nova Scotia) for the determination of duration and confidence. Since environmental effects monitoring was not conducted for the Nova Scotia spills clarify how as this summary of effects statement was determined.

Example 5: *Revised Section 12 pg. 12 Section 12.2.3.1.* Proponent relies on this statement in the effects analysis. "*Released WBM and WBM-associated drill cuttings resulting from the Project have potential for low adverse effects as these materials are associated with low toxicity, have low bioaccumulation and only localized biological effects (Deblois et al. 2014).*" The Agency could not find that statement in that citation. Deblois et al. (2014) make the following statements *"Effects from discharge of WBMs, that contain low concentrations of organic compounds, and associated cuttings are usually physical, through accumulation of fine particles that might, for instance, disrupt filter feeding in bivalves (Cranford and Gordon, 1992) or bury surface-dwelling benthic organisms; although some WBMs have been known to result in sediment oxygen depletion (Trannumetal, 2009)."* The focus of the effects analysis on pages 9-

37 and 9-40 of the EIS was on drill cuttings. The EIS Guidelines required the dispersion modeling of WBM, not solely WBM cuttings, and the evaluation of the effects on water quality and marine habitat quality, in particular with the high abundance and dominance of low resilient and sensitive filter feeding species in the project area.

Example 6: IR-71 requested that the proponent correct the referencing of Bell et al. 2015 in the statement on pg. 6-55 "*Sedimentation has also been shown to have effects on sponge distribution through impacts on feeding and larval settling, however some soft bottom sponge species are highly resistant (Bell et al. 2015)*". The proponent responded "*While adaptive mechanisms and associated costs are not well understood for all species, current evidence on tropical and deepwater species indicates that most sponges have some ability for tolerance of suspended and settled sediments (Bell et al. 2015). Some sponge species also have specific adaptations for thriving in these environments where fluctuating suspended or settled sediment levels are experienced (Bell et al. 2015)*." The deepwater study by Tjensvoll et al. 2013, referenced in the Bell et al study, is on a single sponge species but has been interpreted in the EIS as "some sponges" and "most sponges" (as well as some corals, some fish, some marine mammals, etc. throughout the EIS). This is not accurate and does not consider the relevance of the studies to the species present or absent in the project area.

Example 7: Page 12-11 of revised Section 12 (Appendix G) on decommissioning states - "Recolonization of the drill cuttings pile may start as early as one year after cessation of activity with diminished effects three to 10 years after cessation of activity." Page 12-18 of Appendix G "as the Core BdN Development will last 12 to 20 years, subsea infrastructure will likely be colonized by sessile invertebrates." There are no references provided for these statements nor a description of species inhabiting this deep-water area that would be able to recolonize.

Requirement: In the revised EIS references to journal articles must be checked to ensure that effects analysis that they are used to support are credible and relevant to the project area.

Meeting Discussion: This topic was deferred to allow Equinor time to discuss with its consultants.

Action: Equinor will revert back to the Agency with an approach to addressing the issue in the next few weeks as indicated in the proponent's email (Feb 17, 2020).

2. Effects Evaluations and Significance Determination

Issue: The methodology for determining potential effects and significance of project effects described in the EIS, has not been consistently followed; therefore, the derivation of effects ratings is unclear. The effects descriptors of nature, magnitude, geographic extent, duration, frequency, reversibility and confidence are incomplete or missing for each of the project interactions (i.e. presence, lights, sound, discharges and emissions) within each project phase. Mitigation is often not applied to support the summary of residual effects statements. Without this information the derivation of the summary of environmental effects is not clear. Applies to all VC sections in the EIS.

Example 1: Lighting during Offshore Construction and Installation Activity – Table 9.5 in the EIS indicates interactions in change in food availability and quality, and change in fish and invertebrate presence and abundance from lighting effects from 13 different construction related vessels. The effects analysis is redirected to the section on FPSO effects as an equivalent light source. It is not clear how the assessment of lighting from one FPSO is equivalent to effects of lighting from 13 different vessels. The Agency is unclear if this is an accurate assumption in consideration of vessel and exploitation structures lighting requirements (illumination levels) stipulated in *Collision Regulations* Schedule 1 International

Regulations for Preventing Collisions at Sea, 1972 with Canadian Modifications; *Newfoundland Offshore Petroleum Installations; and Navigable Waters Works Regulations.*

It is unclear how the summary of effects analysis was derived for lighting effects on fish and fish habitat during Offshore Construction and Installation Activity without discussion of the following effects parameters identified in Table 9.5:

- food quantity, quality or availability
- volumes of organic waste released and consumed
- individuals and species presence and overall species diversity
- overall spatial and temporal distribution patterns
- mitigation

Example 2: Discharges and Air Emissions during Offshore Construction and Installation Activity - Table 9.5 describes potential project-related environment changes and four types of potential effects on marine fish and fish habitat. Table 9.6 identifies the interactions with the four types of potential effects. Discharge effects were noted as causing change in habitat, change in food, change in invertebrate injury/mortality and change in fish presence. It is unclear how the effects analysis and summary of effects were derived without discussion of the following effects parameters identified in Table 9.5:

- amount and quality of key habitat
- volume of discharge released
- food quantity, quality or availability
- volumes of organic waste released and consumed
- levels of fish or invertebrate injury or mortality, number of individual and species, predator numbers and levels of predation or occurrence and success of key life history stages by fish or invertebrates
- individuals and species present and overall species diversity, overall spatial and temporal distribution patterns

Example 3: EIS pg. 9-25 on Lighting from the FPSO, the proponent states "*Lighting from the FPSO may result in the attraction of fish and invertebrate species. Migrating individuals, plankton, and pelagic species may be attracted to the lighting effect on the surface water caused by lights reflecting off water surface, and invertebrates may become attached to the subsea structure as it provides a surface for colonization*" This statement on light effects from the FPSO does not provide effects ratings on nature, magnitude, geographic extent, duration, frequency, reversibility and confidence on lighting effects on plankton, finfish, etc. nor discuss any food web (ecosystem approach) effects.. On pg. 9-34 of the EIS the Summary of Environmental Effects states "*In summary, with the application of mitigation measures, the residual environmental effects on Marine Fish and Fish Habitat resulting from the presence of the FPSO and subsea infrastructure are predicted to be adverse, low in magnitude, localized, long-term in duration, occurring regularly during FPSO operations, and reversible. This prediction is made with a high level of confidence*." This conclusion is one set of residual effects ratings that is meant to capture all the different effects resulting from FPSO presence, lights, sound, and discharges. Also, the Agency notes that mitigation was not provided for presence, lights and sound effects and it is unclear how the Summary of Effects was derived, and how a high confidence concluded.

Example 4: Often the term "minor" and "very minor" is used as a descriptor that is not defined in the EIS methodology. Table 4.5 of the EIS lists negligible, low, medium and high as choices to describe magnitude of change.

- Example: IR-151 "*For Marine Mammals and Sea Turtles, the primary sensory cues for marine mammals in water are auditory. Other interactions (e.g., lighting, air emissions, and marine discharges during HUC activities) are very minor in comparison and therefore are not identified as interactions."*

- Example: IR-169 "*While these interactions may lead to increased potential for mortality or injury of individuals, the disturbances are anticipated to be negligible to minor, spatially limited and long-term during production operations."*

- *Example: IR-218 "Other potential interactions (e.g., lighting and potential attraction of fish) are negligible or very minor, and therefore are not identified as interactions with fish harvesting or other marine activities."*

Example 5: EIS pg. 10-14 - Summary of Effects – Construction and Installation
"In summary, with the application of mitigation measures, the residual environmental effects on Marine and Migratory Birds from offshore construction and installation are predicted to be adverse, low in magnitude, within the RSA due to potential effects of artificial lighting on Leach's storm-petrel breeding populations, short-term in duration, occurring regularly when these activities are ongoing, and reversible. This prediction is made with a moderate level of confidence."

It is unclear to the Agency how this summary was derived based on the following observations. The adverse rating contradicts the definition of low magnitude in Table 4.5 of the EIS which is defined as having "no associated adverse effects". A rating of low magnitude is not supported and missing information on how lights cause detectable change in migratory bird habitat, food, presence, health; or what the detectable change is in food or health by discharges and air emissions; or if that change is within the range of natural variability in migratory bird habitat, food, presence, and health. There is no description of natural variability in migratory bird habitat availability and quality, food, presence, health (ambient/baseline of lights, sound or nutrients) to support the conclusions. The geographic extent used RSA due to potential of reaching breeding colonies, but did not consider the birds foraging on the Project Area or LSA. The confidence is deemed moderate, but there are no studies cited on the efficacy of reduced lighting, directional or shading on vessels or offshore platforms; no studies cited on efficacy of reduced flaring on bird attraction; no studies cited on efficacy of using common traffic routes for vessels and helicopters for birds, etc.

Requirements: In providing a revised EIS it will be important to consistently apply the environmental effects assessment methodology used in the EIS, and provide all of the information required to substantiate the conclusions. The proponent must describe how trophic linkages may be affected and should provide the effects ratings and rationale for each project change and emission under each project activity. For example, the magnitude of predicted effects of lights from the FPSO on pelagic finfish is (low, medium or high) because… The proponent's summary statements must provide rationale and be consistent with the effects analysis ratings under each project phase activity.

The proponent indicated in 91 of the IR Responses that updates to the EIS were not required. However, clarifications provided in those responses warrant inclusion in the revised EIS to substantiate the analyses and conclusions.

Meeting Discussion: This topic was deferred to allow Equinor time to discuss with its consultants.

Action: Equinor will revert back to the Agency with an approach to addressing the issue within the next few weeks as indicated in the proponent's email to the Agency (Feb 17, 2020).

3. Probability of Blowout

Issue: The C-NLOPB has advised the Agency that it believes the information and calculations provided in relation to the probability of blowout to be inaccurate. .The current information in the draft EIS from the proponent indicates the following ranges in probabilities of blowout scenarios over a 30 year project period for both the Core Development Area and the future development area:

- a 29 to 43% probability of a moderate blowout (10 to 100 bbl) with 40 to 60 wells, respectively;
- a 26 to 39% probability of a large blowout (1,000 to 10,000 bbl) with 40 to 60 wells, respectively;
- a 23 to 35 % probability of a very large blowout (10,000 to 150,000 bbl) with 4- to 60 wells, respectively; and
- a 14 to 22% probability of an extremely large blow-out (>150,000 bbl) with 40 to 60 wells.

The IR response shows that the columns of probability by number of wells in this table were removed; however, the original probability per well remained the same. The C-NLOPB indicated that the proponent's IR response is inaccurate and not adequate for the C-NLOPB's requirements. The C-NLOPB analyzed and recalculated the probabilities and determined that the math presented is incorrect.

Requirement: The C-NLOPB has offered to provide guidance and assistance to recalculate the probabilities and ensure that these are accurately reflected in the revised EIS.

Meeting Discussion Discussions revolved around comparing Norwegian calculation methods and those methods used by Newfoundland operators; that latter being in the range of expected probabilities. The C-NLOPB is expecting a 1 to 2% probability range. There was discussion around appropriateness of including or excluding the various project phases in the probability calculations: exploration drilling, development drilling, production and workover phases. The C-NLOPB emphasized that the concept safety plan must line up with the EIS blowout probabilities.

Action: Equinor will review the calculation with its consultant and discuss and confirm the accuracy of the recalculation with the C-NLOPB.

4. Spill Trajectory

Issue: The project oil spill trajectories extend well beyond the model boundaries at thresholds above effects criteria. This, coupled with a high probability of large to very large spills events, require further analysis. For example:

- The spill trajectory graphics show isopleths of ecological and socio-economic thresholds of surface oil thickness, shoreline oiling and dissolved hydrocarbons in the water column. The probability of these thresholds are shown to be exceeding in the 10 to 90% range of probabilities, beyond the boundaries of the model domain.
- These exceedances extend predominantly to the east in international waters

- As a requirement of the EIS guidelines, the proponent was required to describe the area of anticipated effects to the extent where the thresholds are lower than the predicted ecological and socio-economic impacts thresholds.

Requirement: The proponent should expand its model domain to provide a prediction of ecological and socio-economic effects below effects thresholds.

Meeting Discussion: Equinor indicated it will discuss with its consultants before committing to any changes to the blowout modeling results in the EIS. The C-NLOPB explained that the model limits were extinguished before the exceedances in thresholds of effect were identified. Equinor explained that the model domain was dictated by a 160 day limit. The model graphics show large areas of product outside of the model domain that are above ecological and socio-economic thresholds. Considering the time and cost associated with modelling, Equinor was requested to review modeling efforts by other operators in the region such as the BP Orphan Basin exploration drilling modeling which used a model domain that took into account shoreline contact in the Azores. Equinor was also advised to review the CNOOC exploration drilling EIS as a large modeling domain was used which may show results applicable to Bay du Nord.

Action: Equinor will consult with its spill modeling consultant and revert back to the Agency and C-NLOPB with a solution to address the information requirement. Utilize relevant spill trajectory models applied in the deep water region to provide information for the fate, concentration and extent of shoreline oiling outside the model domain as it is relevant to the project site.

5. Temporal Scope for Development Well Drilling and Project Scope

Issue: The C-NLOPB has indicated to the Agency that the five-year upper timeframe to drill 40 development wells is optimistic. Equinor's assertion in IR-6 that future drilling activities would not cause any greater effect than the core development drilling period does not adequately address cumulative effects of drilling discharges or the extent of those discharges, as future developments would be in areas remote from the core project, with drilling releases possibly overlapping.

- The C-NLOPB indicated that the timeframe is possible but unlikely, given the extended time that harsh met-ocean conditions for deep water drilling has taken for other operators.
- The C-NLOPB has indicated that if the proponent does not meet this timeline it would require an updated/amended assessment as the proponent will be temporally out of bounds.
- The Agency and FAs require additional information in order to assess potential future development effects.

Requirement: The proponent should extend the timeline in its revised EIS to allow for more time to drill the 40 development wells. If this is completed the proponent must update the EIS to reflect duration of effects. Equinor needs to consider what drilling activities would occur over the life of the whole development and not just the core project to assess what the cumulative effects of the core project and future developments.

Meeting Discussion: Equinor provided updated information on the core development well drilling program. The core development area development application will account for 19 wells: 9 production wells and 10 water injection wells. Gas injection wells are not considered for the core development area. The total drilling time for the core development area will be amended in the EIS to 3.5 years. The C-NLOPB has issue with the timing for Core BdN development drilling being defined as "maximum" of 5 years. The entire duration of drilling activities should be assessed including future development. A

related issue is that setting a cap on the temporal scope may cause issues with authorization for drilling after 5 years, if the EA documents used a maximum of 5 years to assess effects.

Equinor needed to discuss with its corporate legal team the option to remove the future development area from the project scope, but was initially of the view that the option would not be favourable. Equinor was concerned that the future development part of the project was discussed with stakeholders and Indigenous communities and there could be potential issues if only the core development was presented in the EIS. The Agency offered to provide a letter to Equinor for transparency on the scope change.

The C-NLOPB explained its position on technical requirements. The C-NLOPB process allows for a revised development application. The Agency is considering if a condition can be provided in the decision statement to allow for a review of information on future development aspects, such as well centres and tie backs, once information becomes available. The Agency also suggested improving the project effects analysis and cumulative effects.

Action: Equinor followed up with the Agency and indicated that the future development project will continue to be included as part of the Project scope. Equinor concurs that the EIS requires additional information to better explain the effects assessment that was completed for activities associated with tie-back opportunities. Equinor will revise the EIS, in consultation with the Agency and FAs, to ensure it provides the level of detail needed with regard to infrastructure and activities to be undertaken as well as the rationale that supports the effects assessment and the intra-project effects. This will include more information to illustrate the linkages between effects and significance determination.

6. ***Benthic Ecosystem***

Issue: Baseline information on the existing benthic ecosystem in the core and future development areas is lacking. There is also missing information on the effects to the benthic ecosystem as the effects of large volumes of colloidal whole water-based muds released at the seafloor were not fully considered as required. Mitigation measures have not been provided to mitigate effects of drill waste discharge in areas of aggregation of sensitive corals, sponges and sea pens. The combination of this missing information makes it difficult for the Agency to determine significance of effects.

The EIS Guidelines stated the following:

Section 3.1 " In its EIS, the proponent will describe the chemical and physical composition and fate (e.g. areal extent) of drilling wastes (e.g. muds, cuttings) at various water depths and at various stages of drilling, including during riserless drilling and drilling with the marine riser in place, using dispersion modelling".

Section 3.1 "In its EIS, the proponent will describe the management or disposal of wastes (e.g. type and constituents of waste, quantity, treatment and method of disposal based on an estimated number of personnel for a typical harsh environment rated MODU) including:

- ✓ drilling muds, drill solids;

Section 7.3.1 "a discussion of how data examining the deposition of drilling-related wastes (e.g. fluid, mud residues, cuttings) and acoustic monitoring data would be collected during and after drilling operations and how this would be used to verify effects predictions."

Sections 7.3.3 and 7.3.4 "change in water column characteristics from drill muds and cuttings disposal."

Section 7.3.5 "change in marine habitat quality from drill muds and cuttings."

i. Information on existing benthic ecosystem in the core development area:

- Proponent indicated it conducted benthic community surveys in the preliminary area of subsea infrastructure and drilling in the Summer of 2018. The proponent has provided little specific data, in particular:
  - Groundtruthing was not completed and the ROV data are incomplete.
  - Most fish and benthic animals were unidentified or identified only to the Phylum taxonomic level.
  - Site specific seafloor sediments mapping were not provided as requested by in the EIS Guidelines 7.1.3 "a description and mapping of fish habitats as determined by water depths, type of substrate (sediments), aquatic vegetation, and potential use (i.e. spawning, rearing, nursery, feeding, overwintering, migration routes, etc.". Maps provided in the draft EIS that are in the order of 1:2,500,000 scale. Those large scale maps and the description in the EIS that describe predominantly soft surficial sediment contradicts the abundance of hard targets (presumably cobbles and boulders) in the MBES data.
- Proponent provided two preliminary seafloor infrastructure layout maps of MBES data showing high densities of hard targets (that were verified to support corals and sponges) and revised percentages occurrence of coral and sponges within 1500 m radius of the drill centres and beyond. These data indicate possible high abundances of corals and sponges throughout the core development area.
- DFO has stated that the approach presented by Equinor to provide additional benthic habitat baseline information once the project design has been finalized to be acceptable; however, a sufficient level of information in the EIS is required by the Agency in order to determine the significance of environmental effects and the effectiveness of mitigation, including compensation, that is being proposed.

ii. Information deficiencies on effects to benthic ecosystem:

- Information on volumes, and the fate and effects of whole water-based muds laden with bentonite and barite was not provided. Page 2-38 of the EIS notes that "*This section is drilled riserless with water-based mud (WBM), which consists primarily of seawater*", but the response to IR-35 notes that "*for seabed WBM release, Appendix I modelling already incorporates added volume of 167m^3 of the mud materials in the 60/40 mud/seawater composition*". These descriptions differ. On pg. 2-38 of the EIS the proponent states "the wellbore volume is displaced with a weighted WBM to mitigate against collapse of the wellbore during casing and cementing operations." Also on pg. 2-38 of the EIS the proponent states "*Total WBM displaced is approximately 500 m^3* ". The Agency remains unclear with regard to the anticipated volume of WBM that is not residual on cuttings that may be discharged at seafloor and its fate.
- The C-NLOPB supplied the Agency with well development drilling waste accounting on other production projects on the Grand Banks that confirms large volumes and tonnes of bentonite and barite are used. It is unknown how large volumes of colloidal whole water-based muds would affect the deep-water environment where the proposed project is located. Colloidal whole water-based mud could potentially affect filter-feeding organisms over 10s of kilometres. By example pg. 9-41 of the EIS states

"*Approximately 22 percent of drill cuttings are highly dispersed and drift more than 23 km away from the wellsite, outside the model domain*." Expected concentrations of that fine particulate material were not estimated, were not compared against natural variability in suspended particles and were not compared to concentrations that impact filter feeding organisms. The dispersion of whole water based muds was not modeled as required and the same level of effort to drill cuttings in the effects analysis was not provided.

a. Potential mitigation/significance:

- Preliminary design for two drill centres and part of a flowline of the core development area are located in a NAFO designated Valued Marine Ecosystem. Parts of the future development area intersect with other special areas.
- Proponent indicates once the final design of subsea infrastructure has been determined, it will be overlaid with the benthic data collected to date and then further benthic surveys will be done to "fill in gaps". It is unclear how this additional data will be used and how it will inform any mitigation, i.e. moving infrastructure to avoid sensitive areas, especially in light of the seemingly high abundance of hard targets.
- Current mitigation proposed by the proponent refer to avoiding reef building coral *Lophelia pertusa* complexes - a species of coral not found in this region.
- The proponent's proposed mitigation of avoiding assemblages of 5 or more corals in 100 m^2 with heights greater than 30 cm within 100 m of the discharge location seems ineffective given that on pg. 9-43, the proponent's EIS notes that drill cuttings modeling shows areas of potential permanent loss within 200 m radius of the drill centres. In the response to IR-220, the proponent comments that MBES images showed cuttings mounds at exploration drill sites extending out to 350 m. Thus, the rationale for the 100 m mitigation is questionable.
- Given the MBES information on the ubiquitous and abundant amount of hard targets confirmed to support corals and sponges in the project area, the suggested mitigation measures of moving subseafloor infrastructure or redirecting drill wastes even 100 m in any direction may be ineffective.

- If the proponent cannot avoid impacts to coral and sponge aggregations, DFO will work with the proponent to relocate, redesign, or consider site specific mitigations identified through DFO's regulatory process. If the HADD is Authorized under the *Fisheries Act*, there is a requirement under the "*Authorizations Concerning Fish and Fish Habitat Protection Regulations"* for the proponent to offset the residual impacts. All offsetting options will be proposed by the proponent and assessed by the Department before approved.

Requirement: The proponent must provide sufficient detail on the existing benthic habitat and potential effects, including a description of the effects to corals, sponges and sea pens to inform the anticipated project effects. If the data are insufficient to describe with confidence the level of effects, appropriate mitigation must be provided. This requirement is in accordance with *CEAA 2012* to allow the Minister to make decisions, specifically as follows:

- Section 19 (d) *mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the designated project.*

- Section 52 (1) *For the purposes of sections 27, 36, 47 and 51, the decision maker referred to in those sections* (The Minister) *must decide if, taking into account the implementation of any mitigation measures that the decision maker considers appropriate, the designated project*
    - *(a) is likely to cause significant adverse environmental effects referred to in subsection 5(1); and*
    - *(b) is likely to cause significant adverse environmental effects referred to in subsection 5(2).*
- Section 53 (4) *The conditions referred to in subsections (1) and (2) must include (a) the implementation of the mitigation measures that were taken into account in making the decisions under subsection 52(1)*

Meeting Discussion: Equinor commented that the volume of water based mud to be used for drilling the top sections is unknown at this time and was not included in the dispersion modeling. Equinor noted the result of EEM studies on the Grand Bank production project showing barite and bentonite extending to the farfield of the drilling centres. The Agency noted that it understood that EEM studies were not conducted specifically during riserless and riser phases and did not distinguish between muds or cuttings releases.

Action: The proponent should provide a rationale to explain why the effects assessment would not change in relation to effects to corals, sponges and sea pens from the additional volume of WBM. Equinor should provide using a literature review of concentrations of suspended solids from drilling and the effect of those levels on sensitive filter feeding species. Information on expected duration of drilling days with WBM is helpful to provide insight to potential exposure time for sensitive filter feeding animals to plumes of elevated suspended solids. Equinor will develop the mitigation plan, including an offset strategy based on deep water offshore experience, with assistance from DFO for inclusion into the EIS. The Agency will review this plan when completed.

7. Mitigation for Leach's Storm Petrel (CWS)

Issue: The location for the Bay du Nord Project is unique as the Project Area is an important foraging area for the Baccelieu colony which supports 4 million of the total global 6 million birds. The species has declined by 50% in the last 30 years, and likely to be listed by COSEWIC in the very near future.

Mitigation measures to reduce, eliminate or avoid effects to Leach's storm petrel are lacking. Other than reduced flaring and releasing stranded seabirds (a reactive approach), no further mitigation measures are provided. It is well known that the species is attracted to light and vulnerable to strandings and collisions. However, the effectiveness of opportunistic onboard searches to detect all stranded birds is unknown, as is the success of releasing stranded birds. The loss of birds to encounters with flares is also unknown. At present, it is difficult to determine the significance of effects, in particular for cumulative effects during simultaneous operations within this project, and with other projects (seismic surveys, supply vessels, and exploration MODUs). More proactive mitigation and follow-up measures are required in order to address these areas of uncertainty.

Requirements: Given the Project Area is an important foraging area for this bird species, the proponent should work with CWS on specific mitigation measures for inclusion in the EIS, including: systematic surveys of birds and appropriate releases and record keeping; confirmed means to reduce and adjust lighting; schedule of flaring; monitoring of impacts of project vessels and MODUs on birds; and the potential for research of new technologies.

Meeting Discussion: The proponent described several specific lighting options that it is considering and indicated it is willing to work with ECCC-CWS on specific mitigation measures for migratory birds.

Action: The proponent will update the EIS to provide clarity on information sharing regarding lighting design and working with ECCC to develop the seabird monitoring plan, in part, to assess efficacy of mitigation measures for migratory birds. The proponent committed to consult with ECCC-CWS to include adaptive management during detailed design phase of the project.

8. Drill Cuttings Modeling

Issue: The rationale for using two difference models for the dispersion of SBM accidental release and drilling cuttings are unanswered. For example the use of 200 m for the zone of influence minimizes potential cumulative effects as the deposition may extend to 1 or 2 km depending on the particle size distribution. For example, based on Appendix I median thicknesses above 1.5 mm are predicted up to 2 km; "The one exception to this being the base case, no flocculation simulation ('A'), where median thicknesses up to several millimetres are predicted up to about 2 km to the southwest." While the IR Response states that the base case with flocculation is based on sediment characteristics sampled in the area and likely reflective of behaviour for BdN Project, there is uncertainty in the particle size distribution and the worst-case scenario should be considered for assurance. Furthermore, the potential for direct cumulative effects on habitat by fragmentation, alteration, or contamination was not considered.

- Regarding the response, "The drill cuttings model used is an advection-diffusion model and is described in EIS Appendix I (drill cutting modeling) , Section 2.1." The IR did not state that an advection-diffusion model was not used but that the advection-diffusion approach used in Appendix F (SBM accidental release modeling) should have been used in Appendix I.
- Response H: The response provided does not satisfy the IR, which asked for an explanation as to why different approaches for ocean currents were used in Appendix F and Appendix I.
- Response J: The response does not address the IR. If one third of this cuttings is dispersed beyond the model domain, this would represent 30 to 35 x 10^3 tonnes of cuttings for the proposed 40 wells of the project. Future project development and other exploratory wells would also contribute to this unaccounted for material.

Requirements: A rationale should be provided for the use of different advection-diffusion models (Appendix F and I). An explanation is required as to why different approaches for ocean currents were used in Appendix F and Appendix I. Consequences of this large volume of sediment should be explored and rationale should be provided to support the conclusion that the fate and effects of these large volumes of suspended sediment is negligible.

Meeting Discussion: DFO indicated that the response to the IR was not satisfactory and required a rationale as to why two difference models were used for spilled SBM and cuttings dispersion modelling. The proponent noted that they used two difference consultants in the modelling and will provide the information DFO requires.

Action: The proponent is to will provide a rationale for using two different models for the dispersion modelling of cuttings and spilled whole SBM.