REVIEW OF THE EQUINOR CANADA LTD CENTRAL RIDGE EXPLORATION DRILLING PROGRAM ABRIDGED EIS

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Prepared by Shelley Denny & Jennifer Sylliboy
Unama'ki Institute of Natural Resources
4102 Shore Road
Eskasoni, NS
B1W 1M4

www.uinr.ca

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1.0 Project Description Summary

In November 2018, Equinor Canada was awarded Exploration Licenses (ELs) 1159 and 1160 in the Central Ridge area of the Canada-NL Offshore Area.

The scope of the exploration drilling on ELs 1159 and 1160 includes the drilling, testing and decommissioning/abandonment of exploratory wells (including delineation wells) using one or more drilling installation, as well as associated exploration and supporting activities. Delineation and appraisal wells refer to the same activity. The distance between individual exploration well varies as they are dependent on the results from initial wells and geophysical programs. Delineation/appraisal wells are typically completed within a radius of approximately 20 kilometres (km) from the initial exploration well.

The Flemish Pass Environmental Impact Statement (EIS) environmental effects analysis considered the drilling of up to 30 wells. Wells to be drilled on ELs 1159 and 1160 would be captured within this 30-well count. The effects assessment carried out within the Flemish Pass EIS is directly applicable to ELs 1159 and 1160, and the abridged EIS focussed on new information available since the filing of the Flemish Pass EIS. No additional wells would be drilled with the inclusion of ELs 1159 and 1160. Up to twelve wells could be drilled in total on EL 1159 and EL 1160, and the total number of wells for the Flemish Pass and Central Ridge ELs (i.e., ELs 1139, 1140, 1141, 1142, 1159, and 1160) would not exceed 24 as per the Flemish Pass EIS Decision Statement.

The purpose of exploration drilling is to determine the potential for oil and gas resources on Equinor Canada-held land holdings within the Project Area. Exploration/delineation drilling is required to determine the presence, nature and volume of potential oil and gas resources within the ELs. Exploration drilling activities on ELs 1159 and 1160 also enables the licence interest holders to meet the work expenditure commitments that must be fulfilled over the term of the licence.

This report considers the Central Ridge Exploration Drilling Program Abridged EIS. Equinor Canada Ltd is referred herein as “the Proponent” and the exploration drilling as “the Project”.

2.0 Methodology

2.1 Scope

The Unama’ki Institute of Natural Resources (UINR) was contracted by Kwilmu’kw Mawklusuaqn Negotiation Office’s (KMKNO) for Mi’kmaq views regarding, but not limited to, the following key areas:

1. The potential environmental effects of the Project as described under section 5 of CEAA 2012, in particular, the potential effects from changes to the environment with respect to Aboriginal peoples on:
    - the health and socio-economic conditions
    - physical and cultural heritage
    - current use of lands and resources for traditional purposes

- any structure, site or thing that is of historical, archaeological, paleontological or architectural significance

2. The potential impacts of the Project on established Aboriginal or treaty rights of communities represented by the KMKNO, including the ability to exercise those rights.
3. The effectiveness of the proposed mitigation measures and/or follow-up programs related to potential adverse environmental effects or impacts on the potential or established Aboriginal or treaty rights of communities represented by the KMKNO.

In addition to the key areas described above, UINR proposed to:

4. Confirm potential impacts based on the operation.
5. Identify additional information that may be required from the proponent. And lastly,
6. Check facts and sources used in the EIS for correct interpretation.

2.2 Interpretive Framework: Two-Eyed Seeing and the Knowledge System Approach

it is understood that Mi'kmaq rights can be directly and indirectly impacted by proponent activities. Impacts to the social health and wellbeing of the individuals or culture as a result of one, or a combination of, the following ways i) reduction or loss of species and primary sources of prey, iii) reduction in quantity or quality, or loss of use of, habitats which impact species ability to carry outs its biological functions and/or negatively impacts species/population level survival, and iii) loss of traditional harvesting areas through competition of space or reduction in quality which results in loss of ability for which to harvest safely. Using a newly emerging theoretical lens for examining how proponent activities may impact Mi'kmaq rights (Denny & Fanning, 2016a), we also employ the concept of Two-Eyed Seeing as the chosen interpretive framework for this review.

2.2.1 Two Eyed Seeing

Two Eyed Seeing is a concept coined by Elder Albert Marshall of Eskasoni. He describes Two Eyed Seeing as (Bartlett, Marshall, & Marshall, 2012):

> The gift of multiple perspectives treasured by many aboriginal peoples and explains that it refers to learning to see from one eye with the *strengths* of Indigenous knowledges and ways of knowing, and from the other eye with the *strengths* of Western knowledges and ways of knowing, and to using both these eyes together, for the benefit of all (p. 335; emphasis in original).

Knowledge, whether it is Indigenous or western, is not only 'what' is known but includes ways of knowing. Conceptualized as a knowledge system, this approach captures the understanding that knowledge is acquired in many ways. The knowledge itself is derived from practice, adaptation, and transmission, and is informed by values derived from an underlying belief system (Giles, Fanning, Denny, & Paul, 2016; Whyte, 2013).

2.2.2 Western and Indigenous Knowledge Systems

Western knowledge is referred to as science-based knowledge (Kuhn, 2013). Generally, scientific knowledge "refers to any systematic recorded knowledge or practice" that forms the

foundation for the scientific method described as the components of hypothesis, design, execution, analysis, and interpretation (Raymond et al., 2010, p. 1768). Western knowledge is generally transmitted through written forms such as peer reviewed papers, reports and presented at discipline specific conference presentations (Giles et al., 2016). Like all systems of knowledge, scientific practices are governed by values and beliefs (Longino, 1990).

The Indigenous knowledge system is less understood by western societies (Latulippe, 2015). Indigenous societies have distinct view about what the world is like, what it consists of and why, known as a worldview (Strega, 2005). Indigenous people did not just live on the land; they believed themselves to be 'belonging' as part of an extended family of the natural landscape (Thomlinson & Crouch, 2012). The Mi'kmaq also held this belief.

The Mi'kmaq Creation Story tells a story about a web of relationships where the Mi'kmaq were simultaneously created with and from the earth. Mi'kmaq relationship was also closely linked to the animals and were referred to as brothers and sisters. Animal life is respected and not taken selfishly for fear their behaviour will be disapproved by other animals. This belief of kinship is best expressed in the Mi'kmaq phrase, "*Msit no'kmaq*" which means "All my relations" (Denny & Fanning, 2016b; Giles et al., 2016; Leblanc, 2012; McMillan & Prosper, 2016).

The governing philosophy of the Mi'kmaq was also based on relationships, not just with each other but also with neighboring nations and the natural world from which they originated. The primary means for maintaining relationships with natural resources was (and is) described through the concept of *Netukulimk*. As a Mi'kmaq value, *Netukulimk* describes the interconnection between sustainability of self, both physically and spiritually, to the natural environment. In simple terms, it is a way of life that takes into consideration the needs of those generations yet to be as a guide to prevent one from being overly indulgent or greedy. Elders describe *Netukulimk* as "take only what you need"(Barsh, 2002, p.17). The practice of *Netukulimk* is expressed as self-limitation, prevention of waste, giving back (reciprocity), and sharing of communal provisions (Denny & Fanning, 2016b). The concept of preventing harm to Mother Earth is viewed as necessary to maintain the balance and is difficult to undo once it has been done. Consequences caused by human actions may be detrimental to the collective survival of the Mi'kmaq people and great care is taken to prevent unnecessary harm through cultural teachings. The culture itself is dependent on the relationship of the Mi'kmaq to many species, such as Atlantic salmon and the American eel, where the availability of such species is tied to the Mi'kmaq identity (Denny & Fanning, 2016b; Giles et al., 2016; Wagner, Davis, Prosper, & Paulette, 2004). Elder Albert Marshall explains,

> *Mi'kmaq carry a great sense of responsibility. As all life is our relations, any loss of life is a loss of kin and spirit. The unintentional eradication of species is deeply connected to loss in cultural identity. Time on earth is merely borrowed from future generations. As such, the Mi'kmaq have the inherent responsibility to ensure all of nature's gifts are there for the next seven generations.* (Denny & Fanning, 2016b).

2.2.3 Two Eyed Seeing in Context

In our experience, Two Eyed Seeing is a potential solution where values are negotiated while the underlying beliefs of both western and Mi'kmaq knowledge systems are respected. The integration of Mi'kmaq values of Mi'kmaw relationships to culturally significant species, preventing harm and waste, protecting water quality and habitats, and acting conservatively with the Western values of rigorous scientific methods and written transmission of knowledge are the foundation to Two-Eyed Seeing interpretive framework used in this review.

While the Mi'kmaq are very much interested in the protection of all species within the area of exploration, such as marine birds, whales, and sea turtles, the focus of the review centers on the species tied to the continuity of the Mi'kmaw culture by preserving Mi'kmaq relationship to Atlantic salmon and American eel and the habitats required for their survival. Where applicable, concerns regarding the preservation of the integrity of ecologically significant areas and/or species at risk in the area.

As such, the questions guiding the review and development of recommendations are:

- How does the proponent's activities impact cultural species such as Atlantic salmon and American eel thus Mi'kmaq relationship to those species?
- How does the proponent's activities impact salmon or eel habitat, either as migratory or a feeding area, or other activities necessary to complete it life cycle?
- How does the proponent's activities compete with traditional Mi'kmaq activities? And,
- "…using both these eyes together, for the benefit of all", what recommendations can be incorporated to integrate the values identified by both knowledge systems?

2.3 Limitations

UINR relied on materials derived from NOVANET access and publicly available information, and Mi'kmaq knowledge through lived experience of the reviewers as Mi'kmaq. This report is intended as an advisory document for the KMKNO and the Assembly of Nova Scotia Mi'kmaq Chiefs (ANSMC) in preparation for the public comment period on the potential environmental effects of the Project as described by the proponent in the EIS. Given the short time frame in which to review, compile additional research, and prepare comments, this report reflects our best judgement in consideration of the information available at the time of preparation.

3.0 Results

The optional comment tracking form was used to organize the comments, rationale, request for information, and recommendations.

Comment Number	Reference to EIS (Section and page)	Context and Rationale	Specific Question/ Request for Information
1	6.1.2 Pelagic Macroinvertebrates	Long term trawl data series from the Flemish Cap lacks seasonal timing of the surveys.	Include within annual seasonal distribution patterns to assist with determining the best timing for Project activities, given a squid is one of the prey identified of Atlantic salmon when feeding at sea (Hansen & Quinn, 1998).
2	6.1.5 Finfish (Demersal and Pelagic)	Long term data series used to provide the summary of species captured does not have associated seasonal timing of the surveys.	Include annual seasonal distribution patterns to assist with determining the best timing for Project activities (conditions), given a large proportion of the catch is comprised of capelin and sand lance, two important prey species of Atlantic salmon when feeding at sea (Hansen & Quinn, 1998; Scott & Scott, 1988) and found in the majority of stomach contents as food sources for Atlantic salmon east of the Grand Banks (Reddin, 1985). Both species occur in PA and proposed ELs process in waters 0 to 600 m.
3	6.4 Special Areas	Identification of overlapping PA with numerous VMEs, Convention of Biological Diversity EBSA, and adjacency of new ELs to EBSA but lacks seasonal specifics in relation to significance of the VMEs and EBSAs	Consider seasonal specifics of environmentally sensitive areas. Provide summaries on why they are they special areas. Are there certain times of year where they are more sensitive than others?
4	Table 7.2 Indigenous Groups in the Maritime Provinces and Quebec	Comment related to “exercising rights related to endangered Atlantic salmon” at the bottom of the table is misleading. In Nova Scotia, Mi’kmaq harvest salmon from populations identified as special concern by COSEWIC.	Agreements are in place to protect endangered Atlantic salmon from Indigenous harvest that are based on the legal outcomes (*Sparrow v. The Queen*, 1990). The comment is misleading as it implies fishing for salmon while fishing commercially for other species, and the Mi’kmaq fish an endangered species. Mi’kmaq harvest Atlantic salmon from rivers that have salmon populations that meet or exceed conservation requirements established by DFO.
5	7.3.1 Concerns Expressed by Indigenous Groups	Atlantic salmon (and other culturally important species) Actions/Mitigations: Sponsoring scientific studies and sharing of results does not address Equinor Canada’s approach to	Expand on how the proponent intends to mitigate occurrence in the migration route.

		sustainability “Preventing harm to local environments” and “Respecting human rights” (1.1) There is evidence of Atlantic salmon occurring off Eastern Newfoundland and the migration route identified for multiple life stages were identified in the area considered to be the proponent’s Project area (COSEWIC, 2010). Any perceived lack of evidence or gaps in knowledge should be subjected to the precautionary principle as stated in 2.11.3.1 Project Planning, Assessment, and Implementation: Application of the Precautionary Principle.	If the proponent continues to perceive this as lacking evidence, they must address this gap in knowledge using their precautionary principle.
6	7.3.1 Concerns Expressed by Indigenous Groups	Indigenous knowledge Actions/Mitigations: Indigenous knowledge is portrayed as only one component of the knowledge system and is viewed through western eyes as knowledge that is extracted, catalogued and protected.	Expand understanding of Indigenous knowledge as a system of knowledge that is inclusive of values and beliefs and with-it ways to include Indigenous groups through collaborative governing processes for decision-making (Latulippe, 2015).
7	7.3.1 Concerns Expressed by Indigenous Groups	Potential impacts to Indigenous fisheries Actions/Mitigations: (1) While sharing of information is appreciated, this is an opportunity to include Indigenous knowledge (see above). (2) Reference to a lack of fishing in the area and minimizing potential impacts to the exercise of rights to fish minimizes the significance of Indigenous knowledge.	(1) Expand sharing of information to co-developing monitoring activities with Indigenous groups. (2) Expand understanding to include that the impact to the right to fish is not only about the impact to the activity and but the activity as an expression of the right for cultural expression, knowledge transmission, identity, and cultural preservation.
8	7.3.1 Concerns Expressed by Indigenous Groups	Cumulative Effects Actions/Mitigations: Reference to apply any new learnings does not mean the proponent will apply all new learnings.	Provide opportunities for input into what, and how, new learnings will be applied to the drilling Project and follow up for monitoring and compliance to ensure those measures were taken.
9	7.3.1 Concerns Expressed by Indigenous Groups	Lack of Original and Recent Baseline Studies Actions/Mitigations: The need for newer information is necessary, however, older data as the best available source should not be	Include the use of best available knowledge in the absence of newer baseline data.

		excluded and thus incorporated in the absence of the newer, original baseline data.	Expand on how the proponent intends to address this gap using the precautionary principle.
10	7.3.1 Concerns Expressed by Indigenous Groups	Environmental Monitoring Actions/Mitigations: Focus in on sharing the results rather than addressing the concern and desire to be involved in environmental monitoring.	Include processes for the co-development of environmental monitoring with interested Indigenous groups.
11	8.1 Environmental Assessment Study Areas and Effects Evaluation Criteria	The proponent indicates that consideration will be given to the timing of the VC presence within the PA and assessment areas such as important or sensitive time periods but did not elaborate or provide examples on the what are important or sensitive time periods or indicate when such Project activities would likely occur.	Elaborate on what constitutes 'special consideration' and what are 'important or sensitive time periods' and for what. An estimation of when Project activities may likely occur would be helpful to frame potential impacts.
12	8.3.2 Summary of Key Mitigation	Other impacts from drilling operations include anchoring. Cordes et al (2016) noted that the impact of anchors damage benthic habitats by leaving a scar along the seabed and increasing sedimentation, with an estimated 100 m wide corridor of influence.	Include mitigative measures to prevent damage from anchoring such as the inclusion of a pre-anchor survey to determine better areas to anchor.
13	8.3.2 Summary of Key Mitigation	Reference is given to the suite of research to address knowledge gaps regarding Atlantic salmon migration and discussions regarding research activities with Indigenous organizations. However, the perceived lack of evidence or gaps in knowledge should be subjected to the precautionary principle as stated in 2.11.3.1 Project Planning, Assessment, and Implementation: Application of the Precautionary Principle.	Expand on how the proponent intends to address this gap using the precautionary principle.
14	8.3.3 Presences and Operation of Drilling Installation (paragraph 3)	Reference to sensitivities to hydrocarbons for both herring and capelin (paragraph 3). A quick check of the references indicates the descriptor 'sensitivities' is not appropriate given the findings of the literature cited. i) Lethal effects on larvae were observed at lower concentrations and/or shorter exposures (1·3–7·1 mg/litre *x* days), indicating that capelin larvae were more sensitive than embryos. Furthermore, and as stated in the abstract,	Given that both herring and capelin are important forage species to aquatic life, including Atlantic salmon, transparency in the communication of the literature used is needed to discuss potential impacts and subsequent mitigation. Revise section to indicate sublethal and lethal (potential) impacts.

		"concentrations causing lethal effects on larvae or sublethal effects on embryos or larvae are much more likely to occur and persist through the developmental period, and should be the major concern where potential conflicts exist between offshore oil developments and the inshore capelin fishers" (Paine, Leggett, McRuer, & Frank, 1992, p. 159). ii) A detailed histomorphological study of newly hatched capelin larvae revealed possible sublethal effects in exposed individuals and concludes that "a potential oil spill in the vicinity of capelin spawning sites may have effects on egg/larval survival and further recruitment of the exposed population if the oil manages to contaminate the spawning substrate" (Frantzen et al., 2012) (p.51). iii) It was concluded that that the oil exposed herring larvae had morphological features (deformities) and growth significantly impaired for the oil exposed group when compared to the control/trace oil group, indicating "that long term effects of oil exposure can have sublethal effects on surviving larvae even after 2 months recovery in clean seawater. Sublethal effects can greatly affect the population dynamics of oil exposed fish larvae, as growth, mobility and development will form the ability of the larvae to capture and ingest prey and avoid predators" (Ingvarsdóttir et al., 2012) (p 74).	Propose mitigations based on these potential impacts.
15	8.3.3 Presence and Operation of Drilling Installation (paragraph 3)	Reference to enhancement of primary and secondary production from discharges sewage and food wastes. The OWTG (s.2.13) suggests that sewage and food wastes should be reduced through maceration to a particle size of 6 millimetres or less prior to discharge to sea but does not indicate how or when sewage and food waste should be discharged i.e how to plan	Provide more detail on the proponent's sewage and food waste treatment plan and actions/mitigations that may be used to respect ecological sensitives. Provide/include the opportunity to review and comment on the plan.

		discharging activities to respect ecological sensitivities.	
16	8.3.3 Presence and Operation of Drilling Installation (paragraph 3)	Reference by proponent "Discharged sewage and food wastes may enhance primary and secondary production." The statement is misleading. Larger food waste particles may also be deposited on the seafloor affecting oxygen depletion (Wilewska-Bien, Granhag, & Andersson, 2016).	While having the ability to enhance primary and secondary production, it also has the ability to reduce it. Consider other disposal or treatment options for discharged sewage and food waste and work towards zero food waste.
17	8.3.3 Presence and Operation of Drilling Installation (paragraph 4-5)	Reference to salmon swimbladders that are not involved in hearing thus not sensitive to sounds generated from drilling installation at broadband sources in the range 197dB re 1 µPa@ 1m. In Zykov (2016), it is reported as an estimated broadband source levels for the drillship and the semi-submersible platform are both 196.7 dB re 1 µPa. Atlantic salmon were sensitive to sound exposure levels of 190 dB re 1 μPa^2 s @1 m to 218 dB re 1 μPa^2 s @1 m (Bagočius, 2015). This research concluded that these levels pose a risk to the Atlantic Salmon by blocking the migration of the fish and potentially causing damage to hearing organs in proximity to the source. At further distances, noise can provoke behavioural reactions, stress and temporary hearing loss of the fish (Bagočius, 2015).	Zykov 2016 is not listed in the reference section for chapter 8.0. Transparency in the communication of the literature used is needed to discuss potential impacts and subsequent mitigation. There appears to be differences in how the sound sources are recorded. Are the correct units reported in Zykov (2016)? Revise section to provide potential impacts as sublethal and lethal. Propose mitigations based on these potential impacts.
18	8.3.3 Presence and Operation of Drilling Installation	The proponent notes that "Increased colonization opportunities and local enrichment may support faster recovery in an otherwise slow recovering environment" with claims of a minor effect given the short-term duration of drilling activities.	Where is the reference to support this statement? If decommissioning or suspension of well is to take place after exploration, why is increased colonization opportunities mentioned?
19	8.3.3 Presence and Operation of Drilling Installation (paragraph 6)	Reference to seabed as having low complexity and introduction of moorings and anchors will increase complexity is questionable. Without knowing the depth in which the activities will	Provide justification of low seabed complexity with associated depths as examples.

		occur renders this statement vague. Recovery is not always possible. For example, colonization activities, like those from coral, are impacted by presence of oil and reduces the ability of corals to transition to their adult life stage, even after they move away from oil contamination and likely has severe consequences for recruitment success (Hartmann et al., 2015).	
20	8.3.3 Presence and Operation of Drilling Installation (paragraph 7)	Potential for short term exposure and potential uptake of contaminants due to activities attracting fishes is not addressed in the summary of mitigations. It is unclear what waste discharges this may be.	Provide clarity on waste discharge. Consider mitigative measures to reduce short term exposure and uptake via attraction.
21	8.3.3 Presence and Operation of Drilling Installation (paragraph 8)	Introduction of aquatic invasive species is a concern to Indigenous peoples. Recognizing there are guidelines to prevent such introduction unless safety is compromised, further commitment to the environmental preservation is attainable. The proponent identifies "integrating sustainability in the way we do business" and "apply clean and efficient technologies to reduce the negative environmental impact of existing operations" (2.11.1.2). Such a standard can go beyond law and guidelines to creating a company standard to work with suppliers with on-board ballast water sterilization systems.	Identify if and how many suppliers use on-board ballast water sterilization systems.
22	8.3.3 Presence and Operation of Drilling Installation (paragraph 9)	Reference to Flemish Pass without specifying the details of the seasonality of the activities is vague.	Provide the time frame of activities to make it clear to the reader when activities are likely to occur.
23	8.3.4 Drilling and Associated Marine Discharges (Paragraphs 1,4)	The proponent proposes to discharge WBM without treatments and SBM following treatment. However, OWTG recommends that plans to discharge WBM and SBM are to be addressed in the proponent's EPP. The proponent lacks reference to the development, existence, or content of their EPP other than it will be submitted.	Include how the WBM and SBM will be tested, treated and discharge plans. References to the number of times drilling muds will be discharged would be helpful (hourly, weekly, monthly; continuously, intermittently). Will there be an opportunity to review and comment on the plan?

24	8.3.4 Drilling and Associated Marine Discharges (Paragraph 1)	IOGP 2016 Reference is missing.	Include the reference for IOGP and relevant information such as website and specific page.
25	8.3.4 Drilling and Associated Marine Discharges (Paragraph 1)	Neff (2010) reference should have the on-line location as part of the reference.	Include relevant information in the reference.
26	8.3.4 Drilling and Associated Marine Discharges (Paragraph 1)	The proponent states that drilling muds and cutting have low toxicity. Another interpretation of the literature used to make this claim indicate that changes to metazoan community level has been linked with smothering by drilling cuttings and increased concentrations of harmful metals such as barium (Cordes et al., 2016).	Transparency in the communication of the literature used to discuss potential impacts is needed. Revise section to provide potential impacts as sublethal and lethal. Propose mitigations based on these potential impacts.
27	8.3.4 Drilling and Associated Marine Discharges	The proponent states that WBMs have varied effects on marine organisms, but due to non-toxic nature of the drilling mud components, they are not likely to result in toxicity. Environmental concerns associated with offshore drilling discharges include burial of benthic organisms by drill cuttings, changes in the physical structure of marine sediments, oxygen depletion of sediments and overlying water through biodegradation of organic constituents in drilling muds, leading to organic enrichment and sediment toxicity, bioaccumulation of contaminants and tainting and adverse health effects for commercially important fisheries species. All drilling muds contain metals that could lead to toxic effects in high concentrations, although for the most part, drilling mud metals are not readily bioavailable (DeBlois et al., 2014).	Transparency in the communication of the literature used to discuss potential impacts is needed. Revise section to provide potential impact. Propose mitigations based on these potential impacts.
28	8.3.4 Drilling and Associated Marine Discharges (paragraph 1)	The proponent identifies that decreased light penetration caused by turbidity of the cuttings plume may temporarily decrease primary production of phytoplankton and/or particles	Include mitigative measures to reduce turbidity during phytoplankton and subsequent zooplankton blooms.

		may clog the gills or digestive tract of zooplankton located within the cuttings plume. There are no proposed mitigative measures for protecting the basis of the food web.	
29	8.3.4 Drilling and Associated Marine Discharges (Paragraph 2)	The proponent notes the use and eventual release of seawater and WBMs are not predicted to result in adverse environmental effects related to toxicity or bioaccumulation. The volume of WBM discharged usually is larger for exploratory than for development wells. The NRC (1983) estimated the ranges of WBM and drill cuttings discharge volumes from offshore exploratory wells as 211,000 to 1,320,000 gallons and 132,000 to 265,000 gallons, respectively. All WBM solids and drill cuttings, including adsorbed water-soluble drilling mud ingredients, eventually settle to and accumulate on the sea floor (Neff, 2010).	What is the seasonality of the drill cutting? Consider employing adaptive management strategies such as staggering drilling operations to allow for maximum dispersal and to minimize accumulation.
30	8.3.4 Drilling and Associated Marine Discharges	Regarding proponent's comments on the drill cutting settling area. Discharged solids accumulated near the platform during the relatively calm summer season and were dispersed over a wide area during the stormy winter months (Neff, 2010).	What is the timing of drilling cutting (season, month)? Consider employing adaptive management strategies such as staggering drilling operations to allow for maximum dispersal and minimize accumulation.
31	8.3.4 Drilling and Associated Marine Discharges (paragraph 6)	The proponent notes, it is not likely that the treated release SBM and SBM-associate drill cuttings will result in adverse effects associated with contamination of marine biota or habitats, as these materials have low toxicity, and localized biological effects. Article actually says "SBMs and associated cuttings are of additional concern because of	Referenced article does not support this statement. Discharge of OBM and SBM cuttings has been phased out gradually in the North Sea since the late 1980s, with zero discharge of OBM and SBM cuttings achieved in 2007. WBM cuttings are considered non-hazardous and are still discharged to the North Sea, because

		their higher organic content." (DeBlois et al., 2014, p.8)	of the phase out of OBM and SBM cuttings discharges, total hydrocarbon concentrations in North Sea cuttings piles have decreased by up to 70 % since 1978 (Neff, 2010). Have offshore drilling activities in Newfoundland considered phasing out the use of SBMs too? If not, why?
32	8.3.6 Wellhead Decommissioning	The proponent references the analysis and conclusions of the Flemish Pass EIS with no reiteration of what it was. As a result, the reader does not have the knowledge to be completely informed.	For clarity, provide summary statements when referencing previous EIS statements. [Note that this comment applies throughout the EIS].
33	8.3.7 Project-related Surveys	(1) Post Project VSP surveys are related to seismic noise that are short term in duration but may have impacts to surrounding fishes. (2) Zykov (2016) reference in not listed in the reference section.	(1) Adopt temporal management strategies to reduce potential impacts to fishes in addition to 'ramping up' to respect seasonal and ecological sensitivities. (2) Provide Zykov (2016) in the reference section for this chapter.
34	8.4 Species at Risk: Overview of Potential Effects (Table 8.1)	Table 8.1 Marine Fish Species at Risk: Potential Interactions with Project Components The table identified American eel eggs and larvae as potential interactions, but not as juveniles and adults. American eels spawn in the Sargasso Sea and their larvae travels along the coast in the early spring. There is a potential interaction with adults as spawning American eel leave their coastal and freshwater habitats in the late summer to migrate to the Sargasso Sea. Satellite tagging studies revealed that mature silver eels from Nova Scotia do not necessary take the shortest route but rather migrated northward before heading southward to the Sargasso Sea and utilize **both** shallow shelf areas and open ocean (Béguer-Pon, Castonguay, Shan, Benchetrit, & Dodson, 2015).	Potential interaction between eggs and larvae should be removed from the eggs and larvae columns. Additionally, potential interactions must be included in the section under Juveniles/Adults and expanded upon within the text and cited appropriately (Paragraph 6). As there was an error in the table and thus the knowledge used to identify species in the area, there are no mitigation strategies for American eel.

		American eels are panmictic. The population of eels is dependent on the success of the spawning population regardless of its origin. Reduction in the number of eels reaching the Sargasso Sea has the potential to impact eels in the US and Canada (COSEWIC, 2012). The potential for interaction with mature American eels (silver eels) as they leave coastal areas for the Sargasso Sea is possible.	
35	8.4 Species at Risk: Overview of Potential Effects (Paragraph 5)	The claims made by the proponent regarding two studies (Reddin, 2006; Sheehan, Reddin, Chaput, & Renkawitz, 2012) that no overwintering of Atlantic salmon has been confirmed by sampling and the references used to justify the statement are misleading. Lack of samples are related to the lack of surveys either during the winter or in the area of interest, such as eastern Newfoundland. For example, i) Reddin (2006) highlighted that the survey information exists only for the Labrador Sea in the spring and fall and the Grand Banks area in the spring, however, he noted that "Seasonal survey information for winter is lacking" (p.17). ii)Sheenan et al. (2012) conducted surveys in the Labrador Sea and not off eastern Newfoundland. However, the (perceived) lack of evidence or gaps in knowledge should be subjected to the precautionary principle as stated in 2.11.3.1 Project Planning, Assessment, and Implementation: Application of the Precautionary Principle.	Expand on how the proponent intends to address this gap using the precautionary principle.
36	Tables 8.2 & 8.3 Environmental Effects Assessment Summary	The summary of key mitigation focuses largely on activity management with little consideration for temporal management. Enhancing proposed mitigation with temporal management approaches are recommended to restrict impacts (Cordes et al., 2016).	Consider and enhance mitigation with ways to restrict impacts based on shared values of sustainability, precautionary principle, and respecting the rights of Indigenous peoples. For example, through the use of recommended temporal and adaptive management strategies.

37	9.3.3 Presence and Operation of Drilling Installation	Attraction of prey due to organic waste disposal, creation of new “artificial reef” habitat.	Does this increase the likelihood of interaction with other marine life? If so, how is that mitigated?
38	9.3.4. Drilling and Associated Marine Discharges	Discharge of organic wastes (sewage and food scraps) may result in enhancement of the local food supply and attraction of birds to vessels and platforms	See comment above.
39	9.3.4. Drilling and Associated Marine Discharges	The proponent’s comment regarding hydrocarbon sheens; Feather weight and microstructure changed significantly for both species after exposure to thin sheens of crude oil and synthetic drilling fluids. Thus, seabirds may be impacted by thin sheens forming around offshore petroleum production facilities from discharged produced water containing currently admissible concentrations of hydrocarbons (O’Hara & Morandin, 2010).	These types of discharges do not trigger reporting or mitigation measures. Although small in volume or low in concentration, these discharges constitute over half of the estimated input of oil pollution into the marine environment associated with maritime human activities (O’Hara & Morandin, 2010). Does the Proponent have a mitigation or response plan for operational discharges of hydrocarbon?
40	9.3.8 Supply and Servicing	The Proponent states that supply and servicing vessels will follow MARPOL requirements (e.g., food and sewage waste will not be discharged within 5.5 km of the coast).	The requirements under MARPOL came into effect in 2003 & there has been a significant increase in offshore activity. Are these requirements still applicable today?
41	Table 10.1	The proponent notes that fin whale is listed as species of Special Concern and the Potential for Occurrence and Interaction is High. Offshore waters off Canada’s East Coast have been the subject of intensive oil and gas exploration, particularly off Newfoundland and southern Labrador, where effort has increased about six fold since 2015 compared with 2000 to 2014. As previously noted, these areas are used by Fin Whales year-round and possibly host the largest numbers of Fin Whales off eastern Canada (COSEWIC, 2019).	Presence of fin whales has been noted in the Project area/RSA between May and October. Recommend limiting Project activities to months when fin whales are not known to be in the area.

42	11.4.2. Summary of Key Mitigation (first bullet)	The use of surveys for species at risk is vague.	Elaborate on the types of surveys for species at risk that may be employed and their objective.
43	11.4.2. Summary of Key Mitigation (Paragraph 2)	(1) The use of 'other mitigative measures' specific to marine fish and habitat, etc, was referenced but is vague in the text. (2) Waste discharges and impacts to special area were not addressed.	(1) Re-iterate the specific mitigative measures that were identified previously. (2) Address potential impacts to special areas.
44	11.4.3.1 Potential Zones of Influence (Drill Cuttings/Effects Assessment, Paragraph 2)	(1) Despite the overlap between the ELs and UNCBD EBSA, VMEs, and NAFO FCA, there is no additional treatment for the drill muds than previously discussed. (2) Estimations of the drilling duration of the events in the effects monitoring would be helpful to frame statements such as "short to long term in duration". (3) Drill cutting accumulation can be considered significant if habitat is impacted such as changes to the natural habitat resulting in a reduction in food resources for fish populations and changes to infauna at drill cuttings as low at 3 mm thick (Cordes et al., 2016).	(1) Additional precautions to protect benthic habitats of ecologically significant areas and vulnerable marine ecosystems should be incorporated such as the prohibition of OBM and requirement to use more environmentally-friendly based component for the selected SBM. (2) Incorporate estimates of duration within the text to enable the reader to visualize the activity within the scope of the concerns. (3) Are there mitigative responses to reducing or controlling the dispersion of drill cuttings?
45	11.5 Significance of Residual Environmental Effects	The proponent references a pre-drill coral survey prior to its drilling campaign. Other impacts from drilling operations include anchoring. Cordes et al (2016) noted that the impact of anchors damage benthic habitats by leaving a scar along the seabed and increasing sedimentation, with an estimated 100 m wide corridor of influence.	Include mitigative measures to prevent/minimize damage from anchoring such as conducting a pre-anchor survey to determine sensitive areas that are less sensitive to anchor.
46	14.1.3 Sources of Potential Cumulative Effects (Fig. 14-2)	Given the potential for significant cumulative effects as overlapping ZOIs, ZOIs are not presented in the figure.	Presentation of the overlapping ZOIs from other companies could provide a visual of where additional mitigation could occur.
47	14.2 Marine Fish and Habitat (Including Species at Risk)	Given the potential for significant cumulative effects as overlapping ZOIs, the proponent references their intent to communicate with the relevant users and other oil and gas companies to make a reasonable effort to provide appropriate spatial and temporal separation that	Adaptive strategies could result from improved governance of oil and gas companies operating in the vicinity. For example, establishing a committee to discuss, plan, and schedule activities to minimize cumulative

		is required for operational, regulatory and safety reasons. However, it is noted that temporal management is not widely applied in deep water settings (Cordes et al., 2016)	effects from such things as discharges, drilling, and seismic.
48	15.1 Spill Prevention and Response (Paragraph 2)	Numerous references to standard operating practices and but details are not provided.	Review of SOPs and other plans may be necessary to have an enhanced understanding of the preventative practice undertaken by the company.
49	15.1 Spill Prevention and Response (Paragraphs 5-6)	The proponent references the time it takes to acquire a capping stack. Given the number of oil and gas companies operating in the area and the amount of areas of ecological significance, efforts to have one closer to North American should be given higher consideration.	Coordinate with other companies to cost share a capping stack closer to the area.
50	15.1 Spill Prevention and Response (Paragraph 9)	The proponent references that Statoil will seek approval for the use of dispersants. Should this read “Equinor Canada”?	Check to see if the company is identified correctly.
51	15.5.1 Marine Fish and Fish Habitat (Including Species at Risk)	Batch spills would affect water quality around the spill site, this would be short term until the slick naturally disperses through surface wave action	What measures are in place to prevent batch spills and when they occur, how are they mitigated?
52	15.5.1 Marine Fish and Fish Habitat (Including Species at Risk) (Paragraph 3)	Lengthy discussion by the proponent on the blowout impacts to aquatic life should be supported by literature, if available.	Revise and include relevant references.
53	15.5.1 Marine Fish and Fish Habitat (Including Species at Risk) (Paragraph 4)	(1) The reference regarding impacts from the Deep Water Horizon spill also come from White et al. (2012) rather than Regnarsson et al. (2017). (2) The last statement of the paragraph lacks a reference.	(1) Combine references to correspond to respective research outcomes. (2) Add the reference for the last statement.
54	15.5.1 Marine Fish and Fish Habitat (Including Species at Risk) (Paragraph 6)	The proponent downplays the toxicity of dispersants. Dispersants are known to create additional toxicity from the dispersant and expands the range of “and/or more rapid contamination of the environment as a result of the dispersal of the hydrocarbons” (Cordes et al., 2016, p.14). Dispersants are shown to be toxic rather than “can affect”; crude oil does not appear to be as lethal to corals as does	Consider prohibiting the use of dispersants and employ other techniques for oil containment given the significant coral colonies in the area.

		dispersants (DeLeo, Ruiz-Ramos, Baums, & Cordes, 2016).	
55	15.5.1 Marine Fish and Fish Habitat (Including Species at Risk)	The proponent references dispersant use after a spill. The use of dispersants creates two additional impacts: (i) a toxic effects from the dispersant itself, and (ii) a broader and/or more rapid contamination of the environment as a result of the dispersal of hydrocarbons (Cordes et al., 2016).	Consider prohibiting the use of dispersants and employ other techniques for oil containment given the significant coral colonies in the area.
56	15.5.4 Special Areas (Paragraph 5)	The proponent references that drilling is occurring in the winter season. To provide clarity to the reader, a description of activities could be provided in Chapter 2.	Outline the seasons in which the activities are planned to be undertaken.
57	17.3 Residual Environmental Impacts (Table 17.3)	There is no estimate of recovery in the document. The significance of the residual environmental effect is evaluated at not significant residual environmental effect (adverse) for marine fish and fish habitat and Indigenous communities and activities for the operations of routine operations, accidental events and cumulative effects. Cordes et al. (2016) notes that discharged material, sediment contamination, and sedimentation persists in low energy hydrodynamic regimes thus prolonging the recovery of benthic habitats. Petroleum residues in particular can persist for decades. Furthermore, changes to the composition of benthic communities may persist for years to decades.	Provide estimates of recovery from Project activities and potential accidents.

4.0 Conclusion & Recommendations

Based on the results of this review, we conclude that there is potential to impact Nova Scotia Mi'kmaq culture and rights from the Central Ridge Exploration Drilling Program. Currently the program lacks mitigative measures for Atlantic salmon presence and failed to address the potential interactions with American eel, another significant cultural species for the Mi'kmaq. American eel was assessed by COSEWIC as 'threatened' in 2012.

This review resulted in 57 comments that are summarized into five groups of recommendations.

1. **Require additional information to improve clarity**

- include additional information requests
- improve clarity of the document by including summary statements from the original Flemish Pass EIS
- improve clarity of the presented ecological information based on seasonality of occurrence

2. **Address misinterpretation of information**

- correct statements that are misleading and those that may be perceived as harmful to the reputation of the Mi'kmaq
- Improve transparency in the communication of potential impacts from the supporting material
- support statements with references

3. **Address gaps in identified mitigation**

- additional impacts identified by the reviewers requires mitigation or justification
- review of Proponent's operation plans for consistency in mitigative strategies

4. **Expand participation of Indigenous peoples in the co-development of monitoring rather than processes for only sharing information**

5. **Improve mitigation measures based on shared values, incorporation of temporal and adaptive management strategies, and improved coordination with the adjacent oil and gas operations**

- use of the Proponent's Precautionary Principle as justification to address scientific unknowns
- adopt temporal management strategies given the proximity to ecologically significant areas and evidence of Atlantic salmon in the region
- adopt adaptive management strategies given the proximity to ecologically significant areas and evidence of Atlantic salmon in the region, and
- prohibit substances (dispersants) given the proximity to ecologically significant areas and evidence of Atlantic salmon in the region.

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