Natural Resources Canada | Ressources naturelles Canada

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SENT BY EMAIL

Subject: Natural Resources Canada's Technical Review Comments of the Environmental Impact Statement for the Tilt Cove Project

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Dear Trevor,

In response to IAAC's May 15, 2023 request for review of the proponent's Environmental Impact Statement, Natural Resources Canada is providing the attached comments in relation to its mandate and areas of expertise in the area of oil behaviour in water.

If you have any questions regarding our submission, please do not hesitate to contact me at peter.unger@nrcan-rncan.gc.ca.

Sincerely,

Peter Unger
A/Director
Impact Assessment Division
Office of the Chief Scientists

Cc: Heather Dettman

NRCan Review Comments on the Environmental Impact Statement for the Tilt Cove Project

Section	Page	Written Text	NRCan Comments
16.3.4.2	16-21	*Deterministic results*	It is NRCan's view that the marine diesel results look appropriate. However, the waxy (Nova Terra) oil is not likely to behave and biodegrade as described. (See Nova Terra results in "ESRF084-SL-Ross-and-D-Mackay-Environmenta-Research (1).pdf" and Lee and Levy (1991) Bioremediation: Waxy Crude Oils Stranded on Low-Energy Shorelines https://doi.org/10.7901/2169-3358-1991-1-541.
16.3.5	16-31	*In addition, one must consider that the hypothetical long-term releases of oil (many months) continue to add fresh oil, which will increase the total amount of oil through time that will degrade. As time progresses, residual oil is all that remains of the early portions of the release while whole fresh oil continues to be released in later stages. In total, this may appear as though degradation rates are increasing, but it is rather a function of the static degradation rate and the increasing amount of oil (a portion fresh oil) through time.*	For non-waxy oil, the proportions of the various compartments with time, and with ongoing fresh oil addition, would depend upon the relative rates for the various processes. Evaporation tends to be the fastest process for "loss of oil", so once the oil gets to the surface the volume of oil lost by evaporation (in the atmosphere) should be the compartment that increases the most with time (e.g., if its rate of loss is faster than the rate of oil release, its rate of loss would be limited by the rate of release of fresh oil). The rate of oil biodegradation is not expected to be faster than the rate of evaporation, so it is not obvious why biodegradation appears to have faster rates than evaporation, and why its proportion keeps increasing after the proportion of evaporation plateaus. Both processes' proportions should keep increasing as long as fresh oil is released. The compounds that would be biodegraded the fastest would also be the compounds that would evaporate (i.e., C15 compounds). Compounds larger than C15 will biodegrade much slower and not completely, leaving oxidized by-products to become entrained in the

			water column. For waxy crudes like Terra Nova, both evaporation and biodegradation rates would be restricted for most, if not all, of the year due the solid nature of the oil droplets formed.
16.6.1.1.1	16-57	*This mechanism of microbial consumption of hydrocarbon compounds in conjunction with physical processes (e.g., evaporation, dissolution, dispersion, and photo-oxidation) can eventually clean up an oil spill with the end products typically carbon dioxide and water under aerobic conditions (ASM 2011).*	As explained above, only the C15 compounds are mineralized to CO2 completely. Most of the rest of the compounds become oxidized, water-entrained by-products, some of which can become a part of marine snow and sink. (Lopes Motta, et al., (2022). Chapter 4 – Microbial Degradation of Spilled Oil in Aqueous Environments: Beyond C15 Hydrocarbons. Hydrocarbon Biotechnology Challenges and Future Trends edited by W.A. Ismail and J. Van Hamme, ISBN 9781774639894; See Dettman et al., (2023) https://doi.org/10.1016/j.aquatox.2023.106582 (in press) for comprehensive discussion of oil composition.)
16.5.1	16.45	*Figure 16-16*	The diagram shown is appropriate for nonwaxy crudes. It is NRCan's view that from the testing described in "ESRF084-SL-Ross-and-D-Mackay-Environmenta-Research (1).pdf", the only mitigation techniques that could be effective for waxy oil in cold water would be in situ burning, and possibly subsea dispersant application. Note that neither response tool can be used in Canada at this time. Dispersant application at the surface is not likely to be useful on waxy crude.