GENERAL COMMENTS

Environment Canada

In its reply, the Proponent continues to assert application of best case conditions to an accidental release of hydrocarbons, while EC policy and best practice dictate the application of worst case scenario analysis in preparation for environmental emergencies. As such, our January 25th recommendations remain as stated.

The differences between EC and the Proponent's perspectives on this issue are highlighted in three main areas:

- Selection of very light Cohasset Crude as surrogate for an unknown reservoir;
- Selection of wind speeds; and
- The accounting for natural dispersion.

Nevertheless, we have addressed several of the Proponent's points below:

EC is aware of the geological assumptions regarding the selection of Cohasset crude as surrogate for any hydrocarbons that may be discovered at the Old Harry prospect. Although this selection is based upon reasonable analysis, it is based on limited information including a limited dataset derived from a small number of previously drilled wells, none of which are within proximity of Old Harry. Although the selected surrogate oil may be appropriate it does represent a best case assumption that has powerful influence on the results of the trajectory analysis.

With respect to wind speeds the revised modelling submitted by the Proponent apparently attempts to capture the full range of wind speeds by applying the average six-hourly wind speed and direction values extracted from the MSC 50 database on a seasonal basis. As such the input values for all seasons are greater than 10 knots (5 m/s) and the Proponent notes in their cover letter that such conditions exist in the vicinity of the Old Harry project for more than 50% of the time. Nevertheless, wind speed is less than 10 knots for significant periods of time. These periods represent a worst case scenario that should reasonably be anticipated, modelled and prepared for.

EC continues to believe that dispersion is overestimated in the models used but recognizes this is a research gap currently being addressed by NOAA. However, many of the major references on the topic do not appear to have been considered by the proponent. For example, Delvigne, whose work is referenced by SL Ross, clearly states that a companion model is needed to predict resurfacing and furthermore he states possible methods. In the Mackay model this is similarly noted. In the Audunson model, the author himself notes that model is over-stated for the Ekofisk case on which it was based. All these statements on re-surfacing by the authors were ignored in all of the Proponent's modelling work.

The Proponent has cited several cases where they claim oils have seemingly not persisted, as examples of significant natural dispersion. These include the Elgin blowout example off Scotland in 2012 and the Uniacke blowout off Sable Island in 1984, as well as the North Cape barge spill of furnace oil in 1996.

In the Elgin and Uniacke blowout examples SL Ross indicates the oil dissipates within 24 hours, i.e., "The short surface persistence of this light crude oil is supported by two actual blowout events: the Uniacke blowout off Sable Island in 1984 (Environment Canada, 1984) and the Elgin blowout off Scotland in 2012 (Government of Scotland, 2013). However, they also note that in the Elgin case; "The vast majority of the release was entering the 'atmosphere, but some of the condensate and associated liquid components were impacting the sea surface. This resulted in a silvery sheen with occasional smaller windrow patches of brown weathered material. The brown weathered material also appeared to be dispersing naturally and, during periods when the wind strength and wave height increased, this enhanced dispersion of the condensate and weathered material in the water column, reducing the quantity of material remaining on the sea surface". It could be implied that this oil is not dispersing without this increased wind and wave height. Additionally, if one reviews the remote sensing reports associated with this incident, there is a period of time for many days in late April to early May 2012 where there are slicks from 10 km^2 to over 1200 km^2 even on days with moderate conditions and winds of 26 knots (Beaufort force 6, larger waves 8-13 feet, whitecaps common, more spray), i.e;, high winds and large slicks still exist on the surface of the ocean (http://www.elgin.total.com/elgin/page.aspx?contentid=721&Ig=en).

In the case of the North Cape spill, the Proponent has acknowledged that the weather conditions were extreme "the wind and wave action was so intense on the night of the spill, the oil quickly mixed into the water column". In this spill the wind was reported to be as high as 80 km/hr. Even with a light oil, and under these extreme conditions, slicks were observed six days after the initial spill, primarily produced through the resurfacing of oil following the storm. The North Cape spill killed roughly 9 million lobsters, more than 400 loons, and 1600 other marine birds as well as over a million pounds of clams, oysters, amphipods and other species. The spill shut down the lobster industry for five months and reduced the productivity of the area's Piping Plover population.

There are places in the text of the SL Ross report where sources are misquoted or only partially quoted including Fingas from the 2011 book; "Fingas (2011) notes that "... diesel fuel and even light oil crudes can disperse significantly...."". The actual complete quote from this book provides a clearer and unbiased summary; "Natural dispersion occurs when fine droplets of oil are transferred into the water column by wave action or turbulence. Small oil droplets (less than 2 µm or 0.020 mm) are relatively stable in water and will remain so for long periods of time. Large droplets tend to rise and larger droplets (more than 50 µm) will not stay in the water column for more than a few seconds. Depending on oil conditions and the amount of sea energy available, natural dispersion can be insignificant or it can remove the bulk of the oil. In 1993, the oil from a stricken ship, the Braer, dispersed almost entirely as a result of high seas off Scotland at the time of the spill and the dispersible nature of the oil cargo.[11] Natural dispersion is dependent on both the oil properties and the amount of sea energy.[12] Heavy oils such as Bunker C or a heavy crude will not disperse naturally to any significant extent, whereas diesel fuel and even light crudes can disperse significantly if the saturate content is high and the asphaltene and resin contents are low. In addition, significant wave action is needed to disperse oil. In 40 years of monitoring spills on the oceans, those spills where oil has dispersed naturally have all occurred in very energetic seas. The long-term fate of dispersed oil is not known, although it may

degrade to some extent as it consists primarily of saturate components. Some of the dispersed oil may also rise and form another surface slick or it may become associated with sediment and be precipitated to the bottom." It is interesting to note that the light Gulfaks oil that was spilled in the Braer case was subjected to Beaufort force 8 to 10 winds - very severe weather conditions.

It should also be noted that, with respect to emulsification, EC agrees that Cohasset crude does not emulsify and emulsion formation was removed from the ADIOS modelling we provided and emulsion was never included in the Oilmap modelling.

Finally, EC wishes to point out that the proponent's modelling was carried out using deterministic trajectories rather than the generally accepted stochastic method. Also, the model used by the Proponent has not been subjected to peer review whereas the models used by EC have been peer reviewed and cited many times in the scientific literature.

This is the third time that EC has reviewed the oil spill modeling for this project and our conclusions have not been substantially altered by anything the Proponent has offered. We suggest to the CNLOPB that there is little to be gained by further iterations of this exercise.

Fisheries and Oceans Canada

Original Comment: The environmental assessment does not indicate what time of year the project will occur. While the duration is identified, the season of activity is not. This information is particularly important in terms of assessing potential impacts on the ecosystem and its components.

Proponent Response: The Environmental Assessment included the possibility of drilling in any month of the year that is ice free. The spud date of the well would likely be no earlier than March and no later than November.

Revised EA Report Check: Adequate - However DFO would like to advise that in order to minimize potential impacts, activities should be timed to avoid sensitive periods for fish and marine mammals and species at risk.

SPECIFIC COMMENTS

C-NLOPB

Original Comment: §2.10.4 Well Testing, pg 18 – "*A Well Data Acquisition Program will be submitted to the C-NLOPB in support of the well approval at least 21 days prior to the anticipated spud date. There is no regulatory requirement to test the exploration well.*" Other than declaring a significant discovery, any testing program that involves flowing the well will require its own approval.

Proponent Response: Text updated to include the information provided. Other than declaring a significant discovery, any testing program that involves flowing the well will require its own approval.

Revised EA Report Check: Text has been updated as noted.

The proponent should remove the words "Other than declaring a significant discovery" from the second sentence of the first paragraph of section 2.10.4.

For further clarification, a significant discovery is defined in the Accord Acts as "a discovery indicated by the first well on a geological feature that demonstrates by flow testing the existence of hydrocarbons in that feature and, having regard to geological and engineering factors, suggests the existence of an accumulation of hydrocarbons that has potential for sustained production."[1] In other words, any application for a significant discovery would require that a well test had been completed.

Original Comment: §2.10.4 Well Testing, pg 18 –"*If produced water occurs, it will either be flared or treated in accordance with the Offshore Waste Treatment Guidelines (OWTG) (National Energy Board (NEB) et al. 2010) prior to ocean discharge.*" Water brought to the surface as part of reservoir fluids during a testing program, and which is not discharged via the flare, is typically transported to shore.

Proponent Response: Text has been updated as noted.

Revised EA Report Check: Text has been updated as "If produced water occurs, it will either be treated prior to ocean discharge or transported to shore for disposal in accordance with the Offshore Waste Treatment Guidelines (OWTG) (National Energy Board (NEB) et al. 2010)."

This response is acceptable; however, response to 2.10.4 and 2.11.3 must be made consistent within EA report.

Original Comment: §2.11.1 Drill Mud and Cuttings, pg 20 – "*Discharged drill cuttings are required to meet the limits outlined in the OWTG for the disposal of drill solids (no limit for WBM cuttings, 6.9 g of mud or less/100 g of cuttings for SBM cuttings overboard discharge).*" See general comment on discharge limits. A discussion by Corridor regarding their plans if they cannot achieve this concentration of synthetic-on-cuttings is warranted.

Proponent Response: "Corridor will use best available technology to meet the requirements of the OWTG. Corridor will follow the practices established by other operators within the jurisdiction of the CNLOPB if the conditions of the OWTG cannot be met

Revised EA Report Check: There is no comment on this within the revised EA Report. This response is not acceptable

Original Comment: §2.11.1.2 Synthetic-based Muds, pg 22 - "*SBM cuttings may be discharged provided they do not exceed 6.9 g/100 g time weighted average of oil on wet solids (see Section 2.4 of the OWTG)*". See general comment on discharge limits. A discussion by

[1] Excerpted from http://www.cnlopb.nl.ca/land_issuance.shtml

Corridor regarding their plans if they cannot achieve this concentration of synthetic-on-cuttings is warranted.

Proponent Response: Corridor will use best available technology to meet the requirements of the OWTG. Corridor will follow the practices established by other operators within the jurisdiction of the CNLOPB if the conditions of the OWTG cannot be met.

Revised EA Report Check: There is no comment on this within the revised EA Report.
This response is not acceptable.

Original Comment: §2.11.3 Produced Water, pg 23 –Water brought to the surface as part of reservoir fluids during a testing program, and which is not discharged via the flare, is typically transported to shore.

Proponent Response: Text has been updated to remove the reference to ocean disposal.
Original Comment: §8.4.5 Calculated Blowout Frequencies for the Old Harry Project, pg 392 – This should probably be reworded. The impression that the reader is left with is that an extremely large spill probably won't occur for 25,000 years. The following wording should be considered.

- The likelihood of an extremely large oil spill (>150,000 barrel) from a blowout during drilling of an exploration well, may be calculated as (1 well drilled) x (3.97×10^{-5} spills/well drilled) = 3.97×10^{-5}.
- The likelihood of a very large oil spill (>10,000 barrel) from a blowout during drilling of an exploration well is 7.93×10^{-5}.
- The likelihood of a large oil spill (>1,000 barrel) from a blowout during drilling of an exploration well is 9.91×10^{-5}.

Proponent Response: Report has since been revised to address this concern.

Revised EA Report Check: report has not been revised.
Corridor should review the bulleted list from page 8.6 to 8.7 and then reread the comments already provided.

Original Comment: §8.7.1.2 Marine Bird Species at Risk, pg 402 - Assuming that the risk of spills from supply vessels is consistent with other shipping, it is still an incremental increase in risk. In addition, since no risk statistics have been provided for marine shipping activity in the Gulf, this statement cannot be assessed in a quantitative manner.

Proponent Response: Although an incremental risk is acknowledged, it remains a low risk and a quantitative analysis is not considered necessary for this discussion.

Revised EA Report Check: no change

The EA report does not acknowledge an incremental risk and provides no context in which to assess such an incremental change. The proponent should refer to Alexander et al.[2] and Pelot & Wootton[3]for a quantitative description of commercial vessel transits in the Gulf of St. Lawrence.

Original Comment: §8.7.2 Marine Ecosystems, pg 405 - Since no risk statistics have been provided for marine shipping activity in the Gulf, this statement cannot be assessed in a quantitative manner. Also, "low" has not been defined.

Proponent Response: Corridor refers to the previous comment in its response

Revised EA Report Check: no change
This comment was made in reference to the proponent's statement, in the last paragraph of section 8.7.2, now on page 8.22, that "The risk of any diesel spill in association with this Project is low and no greater than from any other marine shipping activity in this region." The proponent should refer to Alexander et al.[1] and Pelot & Wootton[2] for a quantitative description of commercial vessel transits in the Gulf of St. Lawrence.

In addition the word "low" is used as a qualifier of risk and has not been defined. The proponent must define what is meant by low.

Original Comment: §8.7.7 Commercial Fisheries and Other Users, pg 410 - "low" has not been defined.

Proponent Response: "Low" in this case is referring to the low level of commercial harvesting activities within the Project Area which was defined in Section 5.8.1 by the following text - "there is minimal fishing effort within and surrounding the Project. No harvesting locations were recorded within EL 1105. The closest harvest location to the Project is located just less than 10 km to the southwest of EL 1105, and was recorded for redfish. Between 10 and 12 km from the EL 1105, a couple of harvest locations were recorded for redfish and one for each cod and white hake. However, in general, the fishing effort can be summarized in the immediate vicinity of the Project as low".

Revised EA Report Check: no change.
This comment was in reference to the sentence "However, the likelihood of such an event is extremely low" on what is now page 8.26. The proponent must define what is meant by low or extremely low.

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[2] Alexander, D.W., Sooley, D.R., Mullins, C.C., Chiasson, M.I., Cabana, A.M., Klvana, I., and J.A. Brennan 2010. Gulf of St. Lawrence: Human Systems Overview Report. Oceans, Habitat and Species at Risk Publication Series, Newfoundland and Labrador Region. Pages v and 60. Available at www.dfo-mpo.gc.ca/Library/340113.pdf

[3] Pelot, Ronald & Wootton, David, Merchant traffic through Eastern Canadian waters: Canadian port of call versus transient shipping traffic, MARIN Report # 2004-09, available at http://www.marin-research.ca/english/research/publications/reports.php

Original Comment: §12.1 Potential Effects of the Physical Environment on the Project, para. 1, pg 422 – "These effects will be mitigated by using… state-of-the-art forecasting." Details should be provided on the "state-of-the-art" forecasting.

Proponent Response: Text has been revised to "monitoring government and industry24-hour forecasts".

Revised EA Report Check: revised as indicated

Grand Banks operators are required to provide site specific forecasts and this requirement will likely extend to this Gulf of St. Lawrence location.

Original Comment: §13.0 Environmental Management, 7th Bullet, pg 425 - The *Drilling and Production Regulations* require an Operator to submit a Safety Plan and an Environmental Protection Plan with the application for an authorization. One document may be used to satisfy the requirements if it meets the requirements laid out in Sections 8 and 9, of the regulation.

Proponent Response: Comment noted.

Revised EA Report Check: this section has been edited but not in relation to the comment. This comment required acknowledgement but no particular action as the proponent's proposed document will be acceptable if it meets the requirements for an EPP as described in the regulations.

<u>Environment Canada</u>

Original Comment: § 4.1.10, Storm Tracks in the Gulf of St. Lawrence - This section contains 3 figures that inadequately describe the intended subject. Figures 4.21 and 4.22 barely cover the Gulf of St Lawrence and thus cannot show. Figure 4.23 is very hard to read. It is missing the panel for the winter season (DJF); the summer panel (JJA) is repeated twice. Major storm tracks for both extra-tropical and tropical cyclones that approach from the south or southwest and track northeastwards over the Gulf of St Lawrence and the Atlantic Provinces.

Proponent Response: Tropical cyclones/transitioning tropical cyclones need to be considered (ref. below) Figures 4.21 and 4.22 were replaced with 4 figures more relevant to storm tracks in the Gulf of St. Lawrence. Figure 4.23 was separated into four figures for readability with the winter panel being corrected to show the proper season.

Revised EA Report Check: This section shows confusion between tropical and extratropical cyclones. It seems the text was not updated when the figures fro extratropical storm tracks in the previous EA Report were replaced. The captions for Figures 4.21 and 4.24 are incorrect: they say extratropical instead of tropical storm tracks. EC recommends revision of this section to correct errors.

Original Comment: § 4.2.2, Wind Climate - The wind climate was described solely from the MSC50 dataset for a single point in the Project area. This is insufficient to give a full picture of the conditions over the entire Project and Study Area. The analysis should include hourly mean

and gust wind speeds from land/island stations in the surrounding area. Local effects and elevation differences need to be considered.

Proponent Response: The MSC50 Data point gives a central data point with regards to unimpeded wind conditions. As such this point was chosen to give an overall picture of the wind characteristics in the Project and Study Area.

Revised EA Report Check: This section only uses hindcast (modelled) mean winds at a single point in the open Gulf of St. Lawrence. Additional data that would help to describe the hazardous local effects are readily available from EC archives by request. EC recommends that the EA includes analysis of measured hourly sustained and gust wind speeds from exposed stations including Wreckhouse and St. Paul Island (Auto). EC recommends that Table 4.6 for Port-aux-Basques include climate normals and extremes for wind (available from EC online).

Original Comment: § 4.3 Climate Change: This section includes discussion only of sea-level change. This section should describe changes in ice frequency that have occurred over the last few decades, and the effect of reductions in ice cover (longer fetch allowing higher waves to build, and more frequent occurrence of adverse weather)

Proponent Response: Observations over the last few decades show an increase in ice cover in the Gulf, and has not supported predictions that the area will be ice free year round. "Observations of the past decades do not support this prediction, with sea ice getting more severe in the Gulf" (Dufour and Ouelette 2007). As a result, it would not be justified to say that the Gulf has seen reductions in ice cover, allowing for increased fetch for wave propagation.

Revised EA Report Check: The response cited a paper by Dufour and Ouellet (2007) that said that ice cover was increasing. However that paper refers to a study by Parkinson (2000) based on 1979 to 1996 data only. The Historical Total Accumulated Ice Cover (TAC) for the Gulf of St Lawrence for 1968/69 to 2012113 shows an overall decreasing trend as well as considerable interdecadal variability. [This plot can be generated online at the Canadian Ice Service website http://www.ec.gc.ca/glacesice/default.asp?lang=En&n=7E34FF80-1 using IceGraph Tool 2.0). The revised section on ice, 4.2.6, also mentions a reduction in ice cover in the last few decades. Variability and trend in ice cover (while related to temporal variability on a larger scale) would contribute to variations in climate elements such as wave height and visibility. Statistics based on low ice cover years would be expected to differ from those based on the long term record. This could be of interest for future studies, if recent trends in ice cover continue.

Original Comment: § 4.1.11 Ice, Page 103, 1st paragraph, sentence 6: *"All sea ice in EL 1105 is first-year ice, ranging in its un-deformed thickness from 30 to 120 cm (SLGO 2011; Figure 4.20*). Not all sea ice in EL1105 is greater than 30cm (first-year ice), especially at the start of the winter season. Also, your reference to Figure 4.20 is in error … Figure 4.20 in the EA report is a tide map. Rephrase this sentence. Say something like "All sea ice in EL 1105 is seasonal ice, with un-deformed thicknesses normally not reaching the thin first-year ice category (30-70cm) until March. Predominant ice thicknesses greater than 70cm are generally not observed until mid-April, towards the very end of the ice season in the Gulf." Also – cite the

1981-2010 CIS Atlas for the information. See your own description at the bottom of p.108, where this is correctly described.

Proponent Response: The paragraph was updated to reflect the updated Figure 4.24 (now Figure 4.29) with information from the 1981-2010 CIS Atlas and referenced accordingly.

Revised EA Report Check: The description of the sea ice in the text has been adequately corrected. However; the incorrect tide map has been replaced with an ice chart, but the chosen ice chart is just a random example from a single date in a single year towards the beginning of the ice season (at a time when the ice extent has not even reached the Old Harry area yet). It is not a climatological chart representative of the median conditions throughout the past 30 years for the peak of the ice season when sea ice is most likely to affect the Old Harry area. *Recommendation:* This chart should be replaced with a median predominant ice type chart from the CIS Atlas for the time of peak ice extent in the Gulf (mid-February to mid-March), and the requested citation for the information given (CIS 1981-2010 Atlas) has NOT been added. *Recommendation:* Add a reference to the CIS 1981-2010 Atlas for the sea ice information.

Original Comment: § 4.1.11 Ice: Insert a new figure to replace the erroneous reference to Figure 4.20. Use a figure from the CIS online atlas, for example: http://www.ec.gc.ca/glaces-ice/default.asp?lang=En&n=AE4A459A-1&wsdoc=C3DAE7C6-0C7E-11E0-9694-185EF62D62D6

Proponent Response: The Figure 4.20 reference now refers to Figure 4.24 (now Figure 4.29) as intended which has been updated in accordance with EC-367.

Revised EA Report Check: The Figure was replaced as requested, but not with a Figure from the CIS Atlas. *Recommendation:* Add a reference to the CIS 1981-2010 Atlas for the sea ice information.

Original Comment: § 4.1.11 Ice, Page 103, 1st paragraph, sentence 7 - "*Daily graphs such as depicted in Figure 4.24 are available as a seasonal service from http://slgo.ca/en/ocean/data/ice-concentration.html, starting in December / January through May / June."Comment: The charts (not graphs, unless you meant to say graphics) published on the SLGO website are forecasts produced by a computer model. This computer model uses CIS analysis data for input. Real CIS analysis charts, NOT model forecast graphics, should be used here, where describing climatological sea ice conditions in the Gulf of St. Lawrence*
• Replace Figure 4.24. Use either the corresponding Ice Stage chart for 31 Jan 2011, found on the CIS web site archive:
http://ice-glaces.ec.gc.ca/www_archive/AOI_12/Charts/sc_a12_20110131_WIS57SD.gif

Or the one for 07 Feb 2011:
http://ice-glaces.ec.gc.ca/www_archive/AOI_12/Charts/sc_a12_20110207_WIS57SD.gif

• In these charts, note that ice stage relates to ice thickness according to last (bottom) table on the following webpage: http://www.ec.gc.ca/glaces-ice/default.asp?lang=En&n=4FF82CBD-1&wsdoc=19CDA64E-10E4-4BFFB188-D69A612A0322

• *Also - Replace the reference to SLGO with the appropriate reference to the CIS web page.*

Proponent Response: Figure 4.24 (now Figure 4.29) has been changed to the Ice Stage chart for 31 Jan 2011 from the CIS Online Atlas. References have been updated to reflect this.

Revised EA Report Check: Here, the figure was replaced correctly with one for 31 Jan 2011 as requested and the correct source was added. However, the sentence originally associated with this figure appears to have been removed from the present version of the text. Additionally, an attempt was made to now use this figure to address the comment above, which is not appropriate. The requested citation for the information given (CIS 1981-2010 Atlas) has NOT been added. *Recommendation:* Add a reference to the CIS 1981-2010 Atlas for the sea ice information.

Original Comment: § 4.1.11 Ice - Comment: The paragraphs on these pages were copied nearly verbatim from the CIS 1971-2000 sea ice climatic Atlas. Passages and phrases copied word-for-word should be in quotation marks, followed by the appropriate reference. No quotation marks are used and no references are given for the copied sentences until the end of each paragraph, making it appear that the information was paraphrased from this source or that only the last sentence is from this source.
The above is plagiarism and needs to be corrected. Simply changing a word in the copied sentence (e.g. replacing significant with substantive so that the sentence has not been copied verbatim in its entirety) is not sufficient.

Proponent Response: Paragraphs have been paraphrased where necessary and referenced correctly.

Revised EA Report Check: Most of the paragraphs have been paraphrased and correctly referenced. However, the bulk of the last paragraph on page 4.39 is still nearly verbatim from the CIS Atlas, except for a few words changed here and there to keep the text from being exactly word-for-word. A reference to the Atlas is only given in two places, after the second sentence and after the last sentence. *Recommendation:*

- The Atlas reference, in brackets, should be given after each of the first 6 sentences of this paragraph to clearly indicate where the information came from. No quotation marks are necessary since a few of the words were changed, but the text is still nearly identical to that of the source;
- The last 3 sentences should be separated into a new paragraph.
- Rephrase the first two of the last 3 sentences as: "Based on the Canadian Ice Service's Sea Ice Climatic Atlas for the East Coast 1981-2010 (Environment Canada, 2011), for the period 1981 to 2010, the most ice encountered in a single season in the Gulf occurred in 1989/1990 with the least amount of ice occurred in 2009/2010. Time series of Historical Total Accumulated Ice Coverage found in this Atlas indicate that the ice coverage varies considerably from year to year but, in general, there were *above* normal conditions from 1980/1981 to 1994/1995 and then below normal conditions from 1995/1996 to 2009/2010."
- In the last sentence, indicate that the charts shown are for **mid-**February, **mid**-March and **mid**-April, since no dates for the charts are given in the Figure captions.

Original Comment: § 4.1.11 Ice P.108, 1st paragraph, sentence 5 reads*: "EL 1105 is located in the area that has an average ice freeze up date of January 29 (Figure 4.31)." Comment: From the Freeze-up chart, the average freeze-up date is February 12, not January 29. Correct the date given in sentence 5 from January 29 to February 12.*

Proponent Response: The sentence was updated to include the correct February 12th date.

Revised EA Report Check: The table of concordance indicates that the date of freeze-up was corrected from Jan 29 to Feb 12, but inspection of the text shows that this correction was NOT made.

New CIS comments
As a result of the EA authors having to paraphrase the information they had originally copied verbatim from the CIS Atlas (to avoid plagiarism), some errors in interpretation were noted.

§ 4.2.6 Ice, Page 4.38, paragraph 2, sentence 2 - The text in the Atlas clearly states that tidal influences LIMIT fast ice formation, they do not enhance it.
Recommendation: Revise this sentence to read "As a result of the shallowness of these areas, large areas of fast ice can form. However, tidal influences in certain locations can also limit the fast ice formation (Environment Canada 2011)."

§ 4.2.6 Ice, Page 4.39, paragraph 1, sentence 1 - The directions given in the second half of the sentence are incorrect. *Please correct to:* "Winter winds from the west to north directions are generally cold and dry while those from the southwest to northeast are mild and moist (Environment Canada 2011)."

Fisheries and Oceans Canada
Original Comment: § 2.6 - While the anticipated duration of work is indicated (20-50 days) the season is not. This is information is particularly important in terms of assessing potential impacts on the ecosystem and its components (i.e. fish, marine mammals etc…).

Proponent Response: The Environmental Assessment included the possibility of drilling in any month of the year that is ice free. The spud date of the well would likely be no earlier than March and no later than November.

Revised EA Report Check: Adequate - However DFO would like to advise that in order to minimize potential impacts, activities should be timed to avoid sensitive periods for fish and marine mammals and species at risk.

Original Comment: § 2.6 - It is advised that the proponent should plan the activity around important and sensitive time periods for fish, marine mammals and species at risk.

Proponent Response: Drilling will not occur earlier than March or later than November. Specific timing will depend on a variety of variables including but not limited to rig availability and regulatory approvals. Mitigation measures, including wildlife observers and adherence to

regulatory guidelines (e.g., Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment, Offshore Waste Treatment Guidelines) will reduce effects on marine species.

Revised EA Report Check: Adequate - However DFO would like to advise that in order to minimize potential impacts, activities should be timed to avoid sensitive periods for fish and marine mammals and species at risk.

Original Comment: § 4.1.7 - While the EA acknowledges that "Knowledge of ocean currents is essential to the planning of oil and gas related operations in any area", the section on ocean currents simply states broad facts and shows maps from different sources without any proper interpretation or comparison. The currents that the EA uses in the report are cited but are never shown (i.e. Surface water current fields developed by the Ocean Sciences Division, Maritimes Region of DFO (Tang et al. 2008) were used in the spill trajectory modeling).

Proponent Response: The section on ocean currents properly describes the currents of the Gulf. The currents are shown in Figures 4.13, 4.14, and 4.16-4.19 with citations (SLGO 2011; Galbraith et al. 2011; LGL 2005b). Tang et al. 2008 was not referenced in Section 4.1.7. For more information on oil spill modeling, trajectories and the currents used to create these, please refer to the stand alone report conducted by SL Ross.

Revised EA Report Check: The section on ocean currents adequately describes long-term averages, but not sporadic wind-driven currents that can be much larger. The point was that the report acknowledges this by using a completely different source of currents in the modelling section, yet it is not presented.

Original Comment: § 4.1.8 - It is not evident that tides were used in spill trajectory modeling within the EA. If this is the case, why not?

Proponent Response: Tides were not used in the modelling because their inclusion would not have significantly altered the overall spatial footprint of the oil from the spill scenarios modelled.

Revised EA Report Check: The authors could have compared the predicted tidal displacement in the area to the modelled results. The very small footprint of 6 km (Fig 2.12-2.15) is based on the assumption that only 6 hours are required to completely disperse or evaporate the oil, otherwise they would have to factor in accumulation over longer times. At that point precise maximal instantaneous currents would be important to know. As it is, Figs. 2.12-2.15 do not show a month-long release (as stated), but a series of independent 6-hour releases, with no accumulation between them (resetting conditions to pristine after each one).

Original Comment: § 5.2.1.2 - The seasonal distributions and migrations need to be described for Atlantic Cod. This should use distribution information from summer surveys in both the southern and northern Gulf (i.e., September survey of the southern Gulf and August survey of the northern Gulf; Summer sentinel trawl surveys in both areas). Migration routes and timing and overwintering distributions should also be described.

Proponent Response: Seasonal movements and migrations of each of the Atlantic Cod populations has now been described and incorporated into the EA.

Revised EA Report Check: See general comment #1

Original Comment: § 5.2.1.2 - An increasing proportion of the southern Gulf stock occurs on summer grounds in the region between the Magdalen Islands and northwestern Cape Breton, including waters along the southern slope of the Laurentian Channel. The entire stock migrates through the Cape Breton Trough or along the southern slope of the Laurentian Channel (past EL1105) each spring and fall. The entire stock overwinters in dense aggregations along the south side of the Laurentian Channel, in particular north of St. Paul Island.

Proponent Response: Information on the Laurentian South Cod migration movements has been updated.

Revised EA Report Check: See general comment #1

Original Comment: § 5.2.1.2 - Some key sources of information include: Swain et al. (1998); Chouinard & Hurlbut (2011); Comeau et al. (2002); Benoît et al. (2003); Darbyson & Benoît (2003); and recent CSAS Science Advisory Reports and Research Documents coming from stock assessments.

Proponent Response: Up to date Canadian Science Advisory Reports and research documents coming from stock assessments have been reviewed and incorporated into the EA where deemed appropriate.

Revised EA Report Check: See general comment #1

Original Comment: § 5.2.1.3 - Only general information is presented in this section; not information focused on winter skate in the Gulf. Information is available from Swain et al. (1998); Chouinard & Hurlbut (2011); Comeau et al. (2002); Benoît et al. (2003); Darbyson & Benoît (2003); and recent CSAS Science Advisory Reports and Research Documents coming from stock assessments, as well as CSAS Res Docs 2006/003; 2006/004; Swain et al. 2009 (and the associated supplementary material).

Proponent Response: Up to date Canadian Science Advisory Reports and research documents coming from stock assessments have been reviewed and incorporated into the EA where deemed appropriate.

Revised EA Report Check: See general comment #1

Original Comment: § 5.2.1.9 - Information on seasonal distributions is lacking (see sources listed under cod for information). Winter distribution for plaice that spend the summer on the Magdalen Shallows and move into deep water in the Laurentian Channel is particularly relevant, and is not mentioned within the EA.

Proponent Response: The seasonal distribution of American plaice has been added to the EA.

Revised EA Report Check: See general comment #1

Original Comment: § 5.2.1.10 - The paragraph on Striped bass should be re-edited to reduce confusion. It starts by speaking about extirpated estuary population, and then it states the harvest restrictions put in place in 2000 seem to have assisted in recovery. Confusion exists between Estuary and Gulf populations. Please consult the recovery strategy on the SARA public registry. COSEWIC's (2004) assessment for striped bass is not a good reference nor is it used properly.

Proponent Response: The Striped Bass section has been reworded to reduce confusion and update its relevance with the Project area.

Revised EA Report Check: Adequate - However the paragraph now conflicts with Table 5.2

Original Comment: § 7.1.5.3 - Ketten and Bartol (2005) and other more recent references included in the topic of sea turtle hearing would be useful inclusions in this assessment.

Proponent Response: Ketten and Bartol 2005 has been added to the EA Report to provide a reference on the hearing range of sea turtles.

Revised EA Report Check: Adequate response however the reference could not be found in the EA Report.

Original Comment: § 7.2.4 - Table 7.8 – Suggests that mortality resulting in collision with vessel is reversible? Please be advised that it is unlawful to kill harm, harass, capture or take an individual of a species that is listed as Endangered or Threatened under SARA unless permitted. This measure assists in protecting species, as the loss of an individual could be significant for a certain species (e.g. blue whale).

Proponent Response: The results of mortality from a vessel collision have been changed to irreversible due to the fact that the loss of an individual from certain species could lead to negative population level effects.

Revised EA Report Check: Adequate response, however Section 7.2.2.4 or Table 7.8 was not updated in the EA Report.

Original Comment: § 8.7.1.1 - The EA states (p.402) "…Perhaps the species of greatest concern would be redfish as the Project Area overlaps a potential redfish mating area. Redfish typically mate in the fall; however, eggs are hatched within the female and are not extruded until the following April to July (Section 5.2.1.7). An oil spill would not affect redfish larvae, as the potential larvae extrusion area is outside (to the north, in the Cabot Strait) of the Study Area (Figure 5.56)." However, this paragraph suggests the project area overlaps a potential redfish mating area, then goes on to suggest a potential larval extrusion area is outside the Study area. Is this speculation or is there a publication to reference for these claims? It is also possible that the project area is also a potential larval extrusion area.

Proponent Response: A reference has been added to support the redfish larval extrusion area.

Revised EA Report Check: Adequate - However the reference provided was from another consultants EA report (i.e., LGL Limited. 2007. Western Newfoundland and Labrador Offshore Area Strategic Environmental Assessment amendment. Prepared for the Canada-Newfoundland and Labrador Offshore Petroleum Board.) This is not an original citation; it is the original citation that should have been provided.

Original Comment: - Supporting Document - Modeling in Support of Corridor Resources Old Harry Exploratory Drilling Environmental Assessment. In general, the scenarios in this document were not clearly described. The subsurface transport of dispersed oil (majority of the total oil) was not sufficiently modeled. The model only considered the re-entrained oil from surface in a 30m layer and did not consider the dispersion into water column during the rise of oil while oil was released from 470m. Overall, the results were not clearly presented.
Notably, the document did not take the expertise gained from the oil spill in the Gulf of Mexico into consideration for the Gulf of St. Lawrence which shares a good deal of similarities. We do not have the specific oil category that is to be extracted in the Gulf of St. Lawrence. However, the indications show that we expect it to be on the lighter side of the crude, close to the category of the one in the Gulf of Mexico. In short, the nature of the crude and the physical setting of both areas, a semi-enclosed sea, make it appropriate to use the expertise gained in the Gulf of Mexico to project the potential risks in the Gulf of St. Lawrence. As such, it is recommended to project the potential risks in the Gulf of St. Lawrence using the results of the oil spill in the Gulf of Mexico.

Proponent Response: See Section 2.1.2 in the SL Ross report (SL Ross 2011a, updated 2012) for a description of the behaviour of the oil and gas from a shallow water subsea blowout. In general, significant entrainment of oil in the water column is unlikely during its rise to the surface in the gas bubble driven plume. The behaviour of a shallow water blowout (minimal hydrate formation) will be different from a deep water event (extensive hydrate formation) such as the Deep Water Horizon event in the Gulf of Mexico. The formation of gas hydrates depletes the hydrocarbon plume of the high energy natural gas and the driving buoyancy of the plume is essentially lost. In the case of a shallow water blowout, the gas is preserved in the plume and the high energy bouyancy effect is maintained. The overall impact is that the hydrocarbon plume travels very rapidly to the sea surface with little or no oil dispersed into the water column during its rise to the surface.

The expected oil to be encountered at Old Harry is a very light 45-56 degree API oil/condensate (see response for DFO-06), in contrast to the much heavier oil encountered at Macondo (~35 degree API oil). The Old Harry site is located in 470 m water depth, which is much shallower that the 1520 m of water depth at the Macondo site. A subsea blowout at the Old Harry site is expected to behave like a shallow water event with minimal hydrate formation whereas hydrate formation at Macondo was likely extensive.

Revised EA Report Check: The use of the top 30 meters of the surface waters to dilute the oil is not warranted by observations: 1. Based on a report from United States Coast Guard (2005) fact sheet on small diesel fuel spills, the authors extended the conclusions to open ocean crude oil

spill conditions (see Sec. 8.5 of revised EA); 2. The authors used the mixed layer of the surface waters in the Gulf of St. Lawrence to conclude that the oil would mix over the whole mixing layer. It is true that the surface mixed layer is 30 meters (Drinkwater and Gilbert 2004), but there are two conditions that are not met in case of oil spill. The difference of density of the observed waters over 30 meters is very small. It ranges typically from 1.023 to 1.025 (g/cm3) (SGDO), while the density of oil ranges from 0.790 to 0.837 (g/cm3) (Table 2.14 of revised EA). It is much more difficult to mix a larger difference in density. Mixing oil of density 0.8 (g/cm3) with water of density of 1.023 (g/cm3) would not occur under a typical storm and the oil would reach a shoreline before it would mix thoroughly over 30 meters; 3. The second condition that is not met is that the mixed layer is the result of a number of storms over a season. It is not instantaneous. The top layer of the waters stays on the top until a storm mixes the waters.

Original Comment: - 2. OIL SPILL SCENARIOS AND MODELING INPUTS, Regarding the trajectories of the oil spill, the trajectories presented in the document are unrealistic and do not serve the purpose. They should be redone with realistic winds and surface currents. The model used to generate the surface current fields (Tang et al. 2008) is a good one. However, the oil-spill trajectories are calculated using seasonal mean surface water velocities (2.3.3. Water Currents on page 16). This choice of currents is completely unrealistic. There are no tides, no wind induced currents, and no influence of the surface outflow from fresh water runoff. The latter part is surprising given that the seasonal mean surface currents were used. Since in a typical oil spill, all of these components are present, the trajectories should be calculated with the hourly outputs of the model driven with realistic winds from Meteorological Service of Canada outputs. Within this section, a blow out from the surface is illustrated. However, a blowout from the bottom is not illustrated. The Gulf of Mexico spill did not behave as a text book spill as the blow out was from the bottom; it was not at the surface. Some of the oil did not reach the surface, and a good portion of it stayed near the bottom. There is a need to determine where that oil would go using the hourly bottom currents of the ocean model. The document should therefore track the oil spills using near bottom currents.

Proponent Response: The surface water current data utilized provides the seasonal average trends in water movement in the region. When this is combined with the 52 years of MSC50 wind data used in the trajectory assessments the variation in trajectories possible from the drilling location are well represented for the purposes of environmental impact assessment, especially for a spill of non-persistent light oil/condensate. Tidal variations would also not significantly alter the probable footprint of the oil spills. With respect to the wind data used, the MSC50 hind cast wind set used in the modeling is a long term data set with good spatial resolution over the entire Atlantic region. The data was developed by the Climate Research Division of Environment Canada and the Federal Program of Energy Research and Development. In the research paper describing the data set, the authors state that “The wind and wave data are considered to be of sufficiently high quality to be used in the analysis of long return period statistics, and other engineering applications”. As such, we contend that this data set is the best available for offshore spill trajectory and behavior modeling. The use of land-based weather data from a single weather station, suggested by the reviewer, does not necessarily accurately portray the winds offshore. Sub-surface water currents were not considered in the subsea oil release because the strong, buoyant gas-bubble plume that would result from a shallow subsea release (see response to DFO-309) would overwhelm such currents and result in minimal

deflection of the developed plume (see page 8 and 9 of full spill modeling report for additional description of the models used). For example, a sea bottom current of 3 kts (~0.15 m/s) is significantly weaker than the vertical velocities that can be acheived in a gas bubble plume (2-10 m/s). A description of the likely behaviour of the oil and gas from a subsea blowout from this project is provided in section 2.1.2 of the SL Ross oil fate modelling report ((SL Ross 2011a, updated 2012) (see also response to Comment #371). A shallow water blowout from the seabed is illustrated in Figure 3 of the report. Due to the strong buoyancy effect of the natural gas in the hydrocarbon plume for a shallow water subsea blowout, all of the oil is predicted to reach the surface.

Revised EA Report Check: The trajectories of the oil spill are not calculated under realistic conditions. The main forces are tidal currents and hourly observed winds. Neither was used - only Seasonal mean surface water velocity and climate averaged surface winds (Sec. 2.3.3 (Water Current) and Sec. 2.3.5 (Wind) of Oil Spill Fate Report Update). The assessment that: Tidal currents were not considered in the assessment since their oscillatory movement results in little long-term net movement of surface oil is unrealistic. It is the interaction of hourly winds and tidal currents on the surface oil that provides a realistic trajectory.

Original Comment: - 2.1.2 Subsea Blowouts 5, the name of the model for this study is given here, but a description of the formulation, capability, and limitation of the model is not provided. It is unclear if the processes described in section 2.1.2 have been fully or partially included in SLROSM. Justifications need to be provided on why this model (SLROSM) was used instead of other models (published and probably more advanced models, such as Deep Blow by SINTEF, OILMAPDEEP by ASA, or CDOG by Clarkson University). It is important to demonstrate that the selected model is technically sound for the proposed modeling work.

Figure 3 – the illustration of vertical profile is inaccurate. With the presence of currents, the plume will be deflected rather than straight upwards.

Proponent Response: SLROSM utilizes the algorithms developed by Fannelop and Sjoen for shallow subsea blowouts as identified in the report on page 10. These are the same algorithms used by SINTEF in their shallow water discharge model and this approach has been validated against the IXTOC blowout event, a more representative blowout for this spill scenario than the Deep Water Horizon event.

Supplementary modelling completed by ASA (submitted to C-NLOPB on September 21, 2012) to compare the oil mass balance for surface, evaporated and entrained oil for two different oil specifications (Cohasset crude and diesel) shows that oils with similar properties have similar on-water persistence predictions when using SLROSM and OILMAP.

With respect to Figure 3, because of the strong gas bubble plume, the oil would rise to the surface very quickly, and there would be minimal deflection of the plume by subsea cross-currents. Any potential minimal deflection would not result in a significant change in the surface oil footprint (a few hundreds of metres at most).

Revised EA Report Check: While the Table provides a brief description of the oil spill model (SLROSM), the related content was not included in the revised document. Regarding the justification for selecting the SLROSM model instead of SINTEF, OILMAPDEEP, and CDOG it is noted that the other models were used for deep waters, whereas the SLROSM is validated in shallow water cases. The authors should point out any limits of the model due to water depth as the water depth at the area is 400-500 m.

Original Comment: - 2.3.3 Water Currents, It was stated that surface water current was used in the modeling. The surface only case is fine for the surface spill scenarios, but it is insufficient in modeling subsurface blowout. Although the 470m depth was classified as shallow in terms of hydrate formation it is deep enough that the subsurface current can play an important role to deflect and affect the plume behaviors. The deep/subsurface currents are particularly important for the study of dispersed oil transport process in the water column. The deep current is important considering the drill site is in a channel.

Proponent Response: The extensive experience of SL Ross with oil spill modelling over 25 years indicates that the strong gas bubble plume will bring oil to the surface quickly and there would be minimal deflection of the plume by subsea cross-currents (a few hundreds of metres at most). Any minor deflection of the gas bubble plume by cross-currents will result in only minor changes in the surface foot print of oil.

Because of the strong gas bubble plume, the oil would rise to the surface very quickly and there would be little loss of oil to the surrounding waters.

Revised EA Report Check: The original comment was that using only the surface current is not sufficient to describe the spill behavior in the water column. The deep current is important as well especially considering the drill site is in a channel. The model calculation should include the current in the subsurface layer. The authors responded that the gas bubble would rise to surface very quickly and there would be little loss of oil to the surrounding waters according to 25-year modelling experience. The response did not answer the velocity, magnitude and implications of ignoring the subsurface current at this study site. The subsurface current may be important because the direction of the surface current is opposite to that at the deep layer at the study site of the report according to numerical results of Wu and Tang (2011). It is recommended that the authors recalculate the model using the deep layer current field.

Original Comment: 3. MODELING RESULTS - The duration of the trajectories presented in the document is unrealistic. The choice to stop the trajectories at a given level of ppm concentration is not documented. It is implied that all oil spills will be dispersed and absorbed in the environment at that level. In fact, a greater spill would make the oil go further and eventually reach a coastline. The document did not consider this issue which is a serious flaw.
It is recommended to use the results from the ocean model under the proper conditions and ensure that the duration is long enough to show the coastline potentially at risk.

Proponent Response: The reviewers indicated that the choice to stop the trajectories at a given level of concentration in the water column was not documented. The extent of the sub-surface dispersed oil plumes was stopped at 0.1 ppm (the concentration considered no longer harmful to

marine life) as indicated on page 24 along with references for justification.

For the batch diesel spills of fixed volume (1000 and 10,000 litres), the dispersed oil in the upper 30 m of the water column was tracked until the oil concentration dropped to 0.1 ppm. For the subsea and surface blowouts, the models were run for one month (30 days) and the dispersed oil in the upper 30 m of the water column was tracked until the oil concentration dropped to 0.1 ppm. The light Cohasset crude oil/condensate will evaporate or disperse to a concentration of 0.1 ppm before impacting any coastline no matter how long the models are run.

Revised EA Report Check: The use of the top 30 meters of the surface waters to dilute the oil is not warranted by observations: 1. Based on a report from United States Coast Guard (2005) fact sheet on small diesel fuel spills, the authors extended the conclusions to open ocean crude oil spill conditions (see Sec. 8.5 of revised EA); 2. The authors used the mixed layer of the surface waters in the Gulf of St. Lawrence to conclude that the oil would mix over the whole mixing layer. It is true that the surface mixed layer is 30 meters (Drinkwater and Gilbert 2004), but there are two conditions that are not met in case of oil spill. The difference of density of the observed waters over 30 meters is very small. It ranges typically from 1.023 to 1.025 (g/cm3) (SGDO), while the density of oil ranges from 0.790 to 0.837 (g/cm3) (Table 2.14 of revised EA). It is much more difficult to mix a larger difference in density. Mixing oil of density 0.8 (g/cm3) with water of density of 1.023 (g/cm3) would not occur under a typical storm and the oil would reach a shoreline before it would mix thoroughly over 30 meters; 3. The second condition that is not met is that the mixed layer is the result of a number of storms over a season. It is not instantaneous. The top layer of the waters stays on the top until a storm mixes the waters.

Original Comment: 3.1 Batch Diesel Spill Fate Modeling – The modeling was conducted in average wind conditions, what about under worst case scenarios without wind? This scenario is missing. It is stated that "The subsurface oil also diffuses laterally as it is moved away from the spill site by the prevailing surface water currents". Again, this is very confusing that subsurface oil is dispersed by surface current. It is stated that "It has been assumed that the oil will mix in the upper 30 m of water as this is the minimum surface water mixing depth reported in the literature for the region (Drinkwater & Gilbert 2004)". Why assume the mixing depth while there are models available to simulate the 3D (including vertical) transport behaviors? This simplification (30m mixing) may cause overestimate of concentration in some areas and underestimations in other areas.

Proponent Response: Statistical wind data was used for Environmental Assessment purposes. Average weather conditions were modelled to provide the most likely behavior of these small diesel spills to meet the requirements of the EA. As the dispersed oil cloud moves with the prevailing currents, it also diffuses and dilutes as it moves with the water body. The 30 m mixing depth provides a reasonable estimate of in-water oil concentration for Environmental Assessment purposes.

Revised EA Report Check: The trajectories of the oil spill are not calculated under realistic conditions. The main forces are tidal currents and hourly observed winds. Neither was used - only Seasonal mean surface water velocity and climate averaged surface winds (Sec. 2.3.3 (Water Current) and Sec. 2.3.5 (Wind) of Oil Spill Fate Report Update). The assessment that:

Tidal currents were not considered in the assessment since their oscillatory movement results in little long-term net movement of surface oil is unrealistic. It is the interaction of hourly winds and tidal currents on the surface oil that provides a realistic trajectory.

Original Comment: 5.1 Introduction - The title is "dispersed oil plume trajectories", however, this section only covers the re-entrained oil from above surface release as mentioned in page 33 "In these simulations, the quantity of oil that would be released from six hours of a continuous above sea blowout has been introduced on the surface at the exploration site as a batch spill every six hours over month-long periods" The behaviour of near bottom release and mass in the water column will be entirely different and are not covered here.

Proponent Response: As described in the response to DFO-311, all oil released at the seabed for a shallow water, subsea blowout will travel quickly to the surface with the strong gas/water/oil plume (that is driven by the rising gas bubbles) to the surface (i.e. it is likely that no oil would trapped near the bottom or in the water column). All of the oil would rise to the surface and either evaporate or disperse. The dispersed plume trajectories were tracked until the concentration dropped to 0.1 ppm.

Revised EA Report Check: The behaviours of the spill near the bottom and even over the whole water column has not been addressed.

Original Comment: 5.2 Typical Monthly Dispersed Oil Plume Trajectories - The document states, "The initial movement of the dispersed oil plume is assumed to be due to a combination of winds and surface water currents. The prevailing surface water currents alone are assumed to drive the dispersed oil plume once the surface slick is depleted." As discussed before, once the oil is entrained into water column, surface current should not be used, as the high amplitude of surface current may cause over flushing/dilution and underestimate oil concentration.

Proponent Response: Oil concentration estimates based on a completely mixed, upper ocean mixing region provide adequate estimates of in-water oil concentration for Environmental Assessment purposes. Any additional resolution, either temporally or spatially, would be of limited use given the spatial and temporal knowledge of the resources that the dispersed oil could impact.

Revised EA Report Check: Information to support using surface water currents to represent the whole water column was not included.