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Environmental Stewardship Branch  
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May 24, 2013

Ms. Elizabeth Young  
Canada-Newfoundland and Labrador  
Offshore Petroleum Board  
Fifth Floor, TD Place  
140 Water Street  
St. John's, NF A1C 6H6

Dear Ms. Young:

**RE: Old Harry Prospect – Oil Spill Trajectory Modelling**

**EAS 2011-074E**

Environment Canada (EC) is writing in response to your letter of transmittal dated April 3, 2013, conveying the Proponent's response to our comments of January 25, 2013, regarding the oil spill modelling in support of the Old Harry Prospect Exploratory Drilling Program. EC also reviewed the Proponent's response to our April 25, 2012 comments. Our review of that response is also attached.

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<sup>2</sup> to over 1200 km<sup>2</sup> 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&lg=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

20 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.<sup>11</sup> Natural dispersion is dependent on both the oil properties and the amount of sea energy.<sup>12</sup> 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.

I trust that this will be of assistance in your review of this project. 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 and recommend that the Board exercise its authority under the Canadian Environmental Assessment Act and proceed with the course of action it sees fit.

Yours truly,

I.R. Geoffrey Mercer  
Regional Director  
Environmental Protection Operations Directorate  
Atlantic

cc Jeffrey Corkum  
Michael Hingston  
Carl Brown  
Marc Bernier

Attachment

Canada

[www.ec.gc.ca](http://www.ec.gc.ca)



**Environment Canada Comments**  
**EA Report – Old Harry Exploratory Drilling Program 2012-2014**  
**Information Response #1**

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**Table of Concordance comment #300**

- This section shows confusion between tropical and extratropical cyclones. It seems the text was not updated when the figures for extratropical storm tracks in the previous EA were replaced. The captions for Figures 4.21 and 4.24 are incorrect: they say extratropical instead of tropical storm tracks.

EA recommends revision of this section to correct errors.

**Table of Concordance comment #304**

- TOC Comment 304 (EC 28). This section only uses hindcast (modelled) mean winds at a single point in the open Gulf. Additional data that would help to describe 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).

**Table of Concordance comment #319**

- 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 2012/13 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/glaces-ice/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.

**Table of Concordance comment #397**

- ✓ The description of the sea ice in the text has been adequately corrected.

- X 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).
- X 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.

#### **Table of Concordance comment #398**

- X See the second bullet in the CIS review of comment #397. The Figure was replaced as requested, but not with a Figure from the CIS Atlas.

#### **Table of Concordance comment #399**

- X 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. See the second bullet in the CIS review of comment #397.

#### **Table of Concordance comment #400**

- ✓ Most of the paragraphs have been paraphrased and correctly referenced.
- X 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.

**Table of Concordance comment #401**

- ✓ The references have been corrected to the 1981-2010 edition of the CIS Atlas as requested.

**Table of Concordance comment #402**

- ✓ It appears this sentence has been removed from the EA text, eliminating any problems with it.

**Table of Concordance comment #403**

- ✓ The chart was correctly replaced as requested.

**Table of Concordance comment #404**

- ✓ The chart was correctly replaced as requested.

**Table of Concordance comment #405**

- ✓ The sentence was corrected as requested.

**Table of Concordance comment #406**

- ✓ The missing chart was correctly added and the figure numbers in the text and in the captions were corrected as requested.

**Table of Concordance comment #407**

- X 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.

**Table of Concordance comment #499 + #501**

- ✓ The text that was originally copied word-for-word from the CIS Atlas has been paraphrased and properly referenced as requested.

**Table of Concordance comment #502**

- ✓ The information was paraphrased as requested and the reference was corrected to 2002.

**Table of Concordance comment #514**

- ✓ The iceberg section was expanded to include most of the additional information provided.

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**B. 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.

**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)."

**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)."