GENERAL COMMENTS

1. The EA should recognize that there may be strong design constraints due to the underlying earthquakes, and that the exploration drilling needs to be undertaken in the full understanding of the seismic design levels that would be required, should the drilling justify development. The EA states that there is no alternative to going ahead with the project (2.3.1). NRCan believes that the exploration project should not go ahead unless it has been demonstrated that there is a realistic chance that the necessary seismic design levels will have an acceptable engineering solution, yet neither very approximate seismic design levels are provided (a site-specific assessment will be essential to obtain these), nor are engineering statements about coping with them made in the EA.

   The Assessment is quite inadequate in its treatment of potential environmental impacts resulting from the geological conditions in the Assessment area. Almost all of the review of the geology concerns the shelf: this may be important as the substrate for distant wild life that could be affected by the project, but is virtually irrelevant to seabed geohazard issues. There is more published information on the deep water area than is cited and there is substantial literature on related areas of relevance, including the Scotian Slope, the SW Grand Banks slope, Salar basin, and perhaps Flemish Pass.

2. Coverage of **Species at Risk** (SAR) is inadequate. In assessing interactions between marine mammals, sea turtles and fish species and activities of the drilling program (both normal activities and accidents), the report avoids directly assessing effects on SAR by stating that predictions of non-significance can be applied equally to them. The conclusion of the effects of an accidental event on species at risk as *Not Significant*, given with a high level of confidence, is questionable considering the sensitivity to harm for some of these species. It is further debatable whether the definition of *Significant Effect, as* applied throughout the report is even appropriate for the assessment of potential impacts on SR. Given their status, this is clearly not sufficient. A more thorough discussion of the potential for harm due to accidental events and a better effects analysis is recommended. The assessment should clearly identify adverse effects on listed SAR, and describe mitigation and monitoring to address the adverse effects. Where applicable, the proponent should refer to listed SAR recovery strategies/action plans to ensure that proposed mitigation is consistent with the applicable strategies/plans.

3. Throughout the document, tables present the Significance of Predicted *Residual* Environmental Effects on various VECs (regardless of whether mitigations are or are not presented), with a Level of Confidence ranking associated with each. According to the authors, this level of confidence is based on (available) scientific information, statistical analysis and professional judgment. Given the lack of available data, the lack of knowledge of long term effects from these activities and the uncertainty presented in the accompanying text, the reader assumes that in most cases, the high level of confidence (3) given for a significance rating of Not Significant (with a few exceptions), is predominantly based on professional judgment. By their own admission (Sec. 5.1.12,

page 233), making predictions is difficult due to limited available data. This is particularly true in assessing potential impacts to Species at Risk. A discussion of how this level of confidence was given, in almost all cases, is warranted. It is preferable to see a more precautionary approach exercised throughout the effects assessment and in its conclusions.

4. Seabird Monitoring Protocol

The Canadian Wildlife Service (CWS) has developed a pelagic seabird monitoring protocol that is recommended for all offshore oil and gas projects. Two versions of the protocol are available from the CWS. One version of the protocol is for individuals that have experience doing seabird surveys. These protocols are a work in progress and CWS would appreciate feedback from the observers using them in the field. A guide sheet to the pelagic seabirds of Atlantic Canada is available through CWS in Mount Pearl. A report of the seabird monitoring program, together with any recommended changes, is to be submitted to the CWS upon completion of the proposed program.

5. Air Emissions

In general, there is little consideration of air emissions and the associated environmental effects. There is no consideration of how air emissions from the proposed drilling program could interact with emissions from other projects in the study area and beyond. The EA does not estimate emissions from proposed activities and the potential to reduce these or other emissions has not been considered. Overall, the potential for effects on air quality is dismissed in the EA as negligible, but no data on background contaminant levels or expected emissions are provided to substantiate this claim. The following comments are offered to help the proponent in preparing a substantive accounting of air emissions, and a reasonable assessment of potential environmental effects and necessary mitigation and follow-up monitoring measures:

Revisions to the EA should identify expected air emissions (e.g., CO_2, CH_4, PM, SO_2, VOCs, PAHs) from project activities (i.e., up to 7 wells) in conjunction with their sources (e.g., flaring, on-board power generation, transportation, fugitive emissions). Emission estimates should use specific emission factors and referenced data, or be calculated from emissions from similar projects, where available. Professional judgment may be used where data are insufficient.

Depending on the quantity of estimated emissions, the use of numerical dispersion models to predict ambient air quality changes from project emissions may be warranted. Comparisons to baseline levels for the region and to national and provincial ambient air quality objectives for specific pollutants should be provided in revisions to the EA, where possible.

The discharge of air pollutants could contribute to the occurrence of negative effects on human health and well-being and discharge of persistent and/or toxic chemicals, especially if hazardous air pollutants are emitted. It is therefore recommended that all discharges of hazardous air pollutants that could result from project activities be documented and assessed (e.g., hazardous air pollutants could occur as a result of the incomplete combustion of hydrocarbons).

The EA should clarify how long each flaring episode during well testing could last (p. 12-13). What is the expected emission rate per day from flaring and what would be the maximum amount of emissions produced? What is the expected composition of the flare based on previous operations in the area?

Revisions to the EA should describe the potential for hydrogen sulphide to be included as a constituent of the gas stream.

It is recommended that revisions to the EA describe how best practices will be implemented so as to minimize emissions (e.g., an inspection program could reduce fugitive emissions from seals and valves). If such measures are not considered to be appropriate for the project, an explanation should be provided.

The EA should include a discussion of potential emissions resulting from malfunctions and accidental events in conjunction with estimated duration times.

6. Please ensure that the scientific names are included for all species discussed in the EA.

7. Please ensure that all personal communication and literature cited in the EA is included in the Literature Cited section (e.g. D. Fudge, page 160, S.Kuehnmund, page 166, N. Baker Stevens, page 183, MMS n.d., page 248).

SPECIFIC COMMENTS

Section 1.1, page 2

1. "The Board has officially designated ConocoPhillips to prepare the EA report on behalf of the Board". This is not an accurate statement.

Section 2.3, page 8

2. Line 4. Shouldn't EL 1082 be included in this list?

Section 2.3.3, page 9

3. The date that the licenses expire should be identified.

Section 2.3.7, page 10

4. #1, line 1. Should "are" be "were" for seismic surveys?

Section 2.3.11, page 11

5. The report should estimate the amount (m^3) of WBM, SBM, and cuttings generated for this project.

Section 2.3.12, page 13

6. Well abandonment is discussed in this section but the effects of well abandonment should be discussed in the "Effects Assessment" section of the report.

Section 2.3.13, page 13

7. In the list of potential discharges, fluid is listed as one. However, in the discussion of waste discharges in the following sections, BOP fluid is not discussed.

Section 2.3.22, page 15

8. The EA states that “combustible waste will be incinerated on the rig”. To date, there are no rigs offshore Newfoundland and Labrador that have the capability to incinerate on site. Please clarify how solid and hazardous (e.g. paint cans, oily rags) waste will be disposed.

Section 2.4, page 16

9. NRCan does not believe that most geophysical techniques will identify munitions dump hazards particularly if small and scattered over a large area of sea floor. Deep-towed or AUV sidescan sonar might work, but NRCan notes that no other deep-water site surveys on the east coast offshore have used such equipment. A deep-water ROV may be needed to confirm the lack of hazardous materials at the drill site.

10. The Laurentian Subbasin SEA document (Section 6.4) places a condition of use in the area of the identified munitions dumpsite. This should have been noted in Section 2.4 and ConocoPhillips plans regarding satisfying this condition discussed.

Section 3 and Section 6

11. The material in Section 3 is acceptable at a background level, but there are no specifics on the risk they pose to the project and the environment. The treatment of consequences in Section 6 totally lacks mention of earthquake-initiated accidents and of the mitigation efforts from the proponent that they justify.

Section 3.1.1, page 18

12. This material is poorly focused on issues of importance to the planned well sites. It is a rather elementary overview of the geology and inadequate for environmental assessment purposes.

Section 3.1.1.1, page 19

13. Line 2. “Plan” should be “Plain”.

Section 3.1.2, page 22

14. It would be more relevant to describe the deep water Quaternary sediments. Similar sediments are reviewed by Mosher et al. (2004) on the central Scotian Slope and information more specific to the drill sites can be gleaned from Piper and MacDonald (2002), Bonifay and Piper (1988) and Piper and Brunt (2006).

Section 3.1.3, page 26

15. The general description is sound, having mainly been taken from NRCan's website, as were figures 3.6 and 3.7. Figure 3.8 has been prepared by the proponent using GSC earthquake epicentres, and visually demonstrates why the occurrence of earthquakes is an issue that must be addressed. The uncertainty of the epicentres is mentioned on that figure, but the quoted values are probably too small by a factor of 2 to 3, because the

determining seismographs are very distant and all on one side of the epicentres. The uncertainty merely means that the precise location of the earthquake dots is much larger than the dot size; it does not mean that all the earthquake lie much farther away from the drill sites. NRCan concurs that while reactivation of old zones of crustal weakness, such as the Cobequid-Chedbucto or the Glooscap fault is possible, the evidence to date is not decisive. For completeness, what could also be mentioned here is the presence of some young neotectonic features on the shelf that might indicate either recent faulting, or more speculatively a large region of strong shaking, though given the level of historical seismic activity this additional information is unlikely to change the situation.

Section 3.1.3.1, page 30

16. This section is very weak in terms of the specifics of the planned wells. The 1929 earthquake showed what a major earthquake could do, in terms of sediment failure on the slope, a devastating tsunami with substantial loss of life, and some likely deformation on the shelf.

    The basis of the 2006 seismic hazard map of Canada is historically recorded earthquakes. A much lower risk is predicted by studies of the geological record of failures on the slope (see, for example, Jenner et al. 2007; Piper et al. 2003, Piper 2005, and Piper et al. 2005 for older assessments). This lower risk is to the benefit of the proponent, but needs to be properly addressed.

Section 3.1.4, page 31

17. This section is very weak. There have been major NRCan programs focusing on this issue on the east coast offshore since 1990. There does not seem to be a clear understanding of the manner in which sediment failure could impact an exploratory drilling operation, nor the consequences in terms of tsunami, nor the potential for drilling inducing failure. The proponent should be able to make the case from deep-water drilling elsewhere in the world that the risk of induced failure is low. There is sufficient geological data available to argue that in most settings, the risk of a liquefaction type local failure, such as has happened in the Gulf of Mexico, is very low (but it might occur in the few environments where thick fine sands are present). The issue needs to be discussed as to whether shallow gas is present and whether it is likely to make sediments more susceptible to failure. The experience with the Ormen Lange field in Norway needs to be briefly reviewed, particularly the assessment of their geohazard team with regard to a prolonged uncontrolled blowout of gas. Are conditions on the Laurentian Slope different from those at Ormen Lange, thus making this scenario more or less likely to cause slope failure?

18. Reference was made to NPA, unpubl. confidential data *in* LGL 2005. LGL 2005 is an EA report submitted pursuant to CEAA and is considered a public document. How is the data confidential?

Section 3.2.1, page 32

19. This section gives an overview of the types of weather patterns in the area. While it mentions the winter storms that bring severe conditions to the Atlantic Provinces and

offshore areas, there is nothing equivalent to the next section which gives peak wind speeds associated with tropical storms or hurricanes, even though storm force and hurricane-force winds (and the associated extreme waves) occur much more frequently in winter extratropical cyclones. There should also be examples of the severity of the winter extratropical cyclones. For example, during the N. Atlantic Storm of December 26-29, 2004, the Banquereau Bank buoy measured its record high significant wave height since it was first deployed in 1988, of 12.9 m, with an associated peak wave period of 17.1 s. This storm also provides an example of the extremely rapid wave growth that can occur in both extratropical and tropical cyclones in this area of the northwest Atlantic: significant wave heights grew 4 m in one hour, from 8.8 m to 12.9 m.

Section 3.2.2, page 34

20. The note at the bottom of Table 3.1, Statistics on Tropical Cyclones passing within 65 nm of Grid point 5400 45.00°N, 55.83°W (1950-2004), contains an erroneous statement. The note says that wind speed refers to the maximum sustained 1-minute mean wind recorded during the life of the tropical cyclone and not the wind speed at the time it passed near the Laurentian Sub-basin. In fact it appears that the wind speed given in the table with each tropical cyclone or hurricane is the maximum speed on the date given, which is when the cyclone centre passed closest to the point of interest. The source for data in this table was NOAA Coastal Services Centre, which is based on the HURDAT dataset. HURDAT is the official record of tropical storms and hurricanes for the Atlantic Ocean, Gulf of Mexico and Caribbean Sea, and is available from the US NOAA's Atlantic Oceanographic and Meteorological Laboratory website [http://www.aoml.noaa.gov/hrd/hurdat/Data_Storm.html]. The HURDAT values for the particular tropical cyclones listed in the table include the latitude and longitude every 6 hours along the track, along with the maximum wind speed, central pressure, direction and speed of movement, and classification at the corresponding date and time. The highest wind speed is 115 knots in Hurricane Ella, on 4 September 1978. When Hurricane Luis moved through the Project Area, maximum winds were 80 kt.

The range for the search of tropical cyclones passing near the location of interest does not include the entire Project Area. The radius of 65 nm of AES40 grid point 5400 does not include the western sections of the Project Area. A more representative description of the tropical cyclone statistics would come from examining a larger area. For example, Hurricane Michael tracked northeastward, just west of the western edge of the Project Area on 19 November 2000. The area of strongest winds (87 knots) would have moved over the Project Area. The Project Area is covered by the Banquereau Bank marine forecast area (one of the Meteorological Service of Canada's marine forecast areas). Tropical cyclone statistics for the Banquereau Bank marine forecast area are available on CD from the Environment Canada's publication "A Climatology of Hurricanes for Canada – Improving Our Awareness of the Threat", distributed in the summer of 2005. This climatology is based on NOAA's HURDAT data set. During the period 1950 to 2000, 34 tropical storms or hurricanes passed through the Banquereau Bank marine area, including 5 with wind speeds of 80 knots or more. It gives an average speed of movement for these systems, of 33 knots.

This section does not given any information about the extreme waves generated in tropical storms or hurricanes. The AES40 database, described in Section 3.2.4, Wave Climate, could have been used. Also, wave observations of tropical storms or hurricanes reported by Environment Canada's network of moored weather buoys should be used. Archived reports are available from the Marine Environmental Data Service, Fisheries and Oceans Canada. Two buoys are located near the Project Area: the Banquereau Bank buoy, ID 44139, within about 50 km of the southwestern corner of the Project Area; and the SW Grand Banks buoy, ID 44138, about 100 km east of the southeastern corner of the Project Area. For example, with the passage of Tropical Storm Florence, 13 September 2006, the SW Grand Banks buoy measured peak significant wave heights of 9.8 m with a corresponding peak wave period of 17.1 s.

Section 3.2.3, page 36

21. This section is entirely based on the AES40 wind data set, which represents a one-hour mean wind at 10 m above sea level, every 6 hours. The data set is based on a long period, over 50 years, and when input to the wave model gives modelled waves that verify fairly well with measurements. However, it should not be the only source of marine climatological wind information; observations (usually one-minute means for aviation or 10-minute means for marine reports) should be presented as well. Other sources of wind climate information include ICOADS, the International Comprehensive Ocean-Atmosphere Data Set of archived ship, rig, and buoy marine reports, and also QuikScat (satellite-sensed) winds.

    This section on Wind Conditions gives directional information, which is useful. It also gives monthly means, standard deviations, and maximum speeds, and it gives highest (one-hour mean, 10 metre) wind speeds by month and direction at the area of interest. The highest wind speed is 30 m/s. The discrepancy between this value and the previously mentioned maximum wind speeds associated with hurricanes moving through the area (which represent one-minute mean winds at 10 metres) should be addressed, but it is not.

Section 3.2.4, page 41

22. This section is entirely based on the AES40 wave data set. Again, this analysis should be enhanced by presentation of other sources of available wave data, which includes the two nearby moored buoys mentioned earlier – the Banquereau Bank buoy, ID 44139, and the SW Grand Banks buoy, ID 44138. The Marine Environmental Data Service archives the reported wave data, including significant wave height, peak wave period, maximum individual wave height, and the wave spectra. Although the period of record is shorter, and there are gaps in the data, when reports are available they are hourly and represent instrumental measurements. Some mention should be made of published validation studies of the AES40 wave height and wave period data. The highest AES40 significant wave heights are 13.0 m. It should be noted that the SW Grand Banks buoy measured a peak significant wave height of 14.1 m during a rapidly intensifying extratropical cyclone on 5 January 1989.

The MSC50 hindcast wind and wave dataset is described by Swail *et al.* in proceedings of the 9th International Workshop on Wave Hindcasting and Forecasting September 25-29, 2006 in Victoria, BC: "The MSC50 Wind and Wave Reanalysis". It is planned to have this dataset available from the Marine Environmental Data Service early this year. This will improve upon the AES40 dataset in a number of ways including higher temporal and spatial resolution, a larger model domain, inclusion of shallow water wave physics, and inclusion of additional wind information in the development of the wind fields. .

Table 3.6 gives a useful bivariate histogram of significant wave height and mean wave direction. However, as it gives frequency to the nearest hundredths, extremely infrequent events are not represented. As an example, the highest significant wave height category is 11 – 11.99 m, even though Table 3.7 gives two monthly peak values that exceed that category. Similarly Table 3.9 gives the percent frequency of occurrence of significant wave height and peak wave period: the highest category is 12 m. The wave period corresponding to the 12 m category is 15 s. It should be noted that moored buoy wave observations sometimes report peak wave periods 2 to 3 seconds longer than corresponding AES40 values during storm events.

Section 3.2.5, page 47

23. It seems appropriate to include some discussion of interannual variability and a comparison of trends in winter North Atlantic Oscillation atmospheric circulation indices and in climatological winds and waves, as is done here. However, the North Atlantic Oscillation apparently does not explain or describe a significant amount of the summer atmospheric patterns, so presentation of summer average indices may not be appropriate.

    It would be very useful to include mention of the relationship between the El Nino Southern Oscillation (ENSO) and North Atlantic tropical cyclone frequency, with reduced (enhanced) tropical cyclone frequency in El Nino (La Nina) seasons. Also it should be noted that in general over the North Atlantic Basin, and over the Canadian Atlantic waters as well, there has been an increase in frequency in tropical cyclones in the decade of the 1990's, and continuing into recent years, compared to the decades of the 1960's and 1970's (see the Climatology of Hurricanes for Canada, mentioned earlier).

Section 3.2.8, page 54

24. Line 8. Should "Figure 3.21" be "Figure 3.20"?

Section 3.4.2, page 78

25. Last paragraph, line 4. The information should be presented in metric units and not imperial units.

Section 3.4.3, page 80

26. There is a low risk of turbidity current flow down major slope valleys in the east Laurentian area (such events are discussed briefly elsewhere by Mosher et al. 2004, Baltzer et al. 1994, and Savoye et al. (1990)). This risk should be acknowledged and would need to be considered if an exploratory well were drilled on a channel floor.

Section 3.5, page 92

27. It would facilitate comparison between earlier sections describing the wind and wave climate if this section was located immediately after the section on Wave Conditions, rather than coming after several other sections. The first paragraph contains a typographical error and a wording error that have occurred before in earlier environmental assessments and have been commented in each case. This includes reference to NCEP-CSAR (should be NCEP-NCAR) and mention of "hindcast wind fields closely resembled the waves measured…." rather than "hindcast wave fields closely resembled the waves measured…" which was apparently intended. As requested earlier, some specifics should be given on the validation of wave height and peak wave period. Again, when the MSC50 Wind and Wave Reanalysis is available, as noted earlier, this should also be examined in terms of the extremal analysis. The higher resolution of the MSC50 dataset, both in time and space, may improve the results.

Section 3.5.1, page 93

28. This section does not refer to the peak winds associated with tropical storms or hurricanes that passed near the area, or discuss the differences between the values presented here and those in the earlier section. Such discussion should use the same units for wind speed. It would be useful to include examples of some of the most extreme events that have occurred in the past few decades which have been accompanied by measurements from ships, rigs, moored buoys, and satellites.

Section 3.6, page 93, and Section 3.6.1, page 96

29. The section numbering seems a bit odd, given that the title of Section 3.5 is Wind and Wave Extremal Analysis. The units of the 100-year extreme significant wave height of 13.9 m was given as m/s (3rd sentence of Section 3.6). Section 3.6.1 notes that the 100-year extreme wave height using the alternative method presented here gives a higher value, of 14.4 m. There seems to be a disagreement between the peak periods in Table 3.19 and the corresponding values plotted in Figure 3.48. The figure suggests values that would be longer; e.g.16 s instead of 14.9 s, for the wave period corresponding to the 100-year significant wave height.

The extreme values of significant wave height and corresponding peak wave period for return periods of 1, 10, 25, 50, and 100 years from the AES40 should be compared to corresponding values from the MSC50, when available, to assess the level of confidence in the values presented here.

Section 3.7.3, page 102

30. In Figure 3.53, the labeling of the x and y axes is reversed (x-axis should be "Number of sightings" and y-axis should be "Year").

Section 4.0, page 107

31. SARA species should be consistently described in separate, identified sections. This applies to Section 5.0 as well.

Section 4.1, page 107

32. It states that "Species are listed under *SARA* on Schedules 1 to 3 with only those listed as endangered or threatened on Schedule 1 having immediate legal implications." This statement is inaccurate. Although the General Prohibitions of SARA only apply to listed extirpated, endangered, and threatened species, there are immediate legal implications for all species listed on Schedule 1. Of particular relevance to this document is Section 79 of SARA, which sets out Project Review (i.e., environmental assessment) requirements for listed species. These requirements apply to all listed species and should be discussed and addressed in the EA.

33. Page 107, last paragraph: The final recovery strategy for Leatherback Turtles (Atlantic population) is currently on the SAR Public Registry.

34. In response to the last sentence on page 107, the proponent is still required to adhere to the prohibitions regarding the species found within the legislation SARA [s.32 - 36] regardless of whether there are presently prepared recovery strategies or management plans or not.

    Two additional species at risk, the Roseate Tern and Ross's Gull may be found in the Study Area. Although their occurrence would likely be extremely rare, they should be acknowledged in the EA.

Section 4.1, Table 4.1, page 108

35. Table 4.1 lists *SARA* and COSEWIC designated species "potentially occurring in the study area". The table includes shortnose sturgeon. In Canada, the shortnose sturgeon is found only in the St. John River system. They are considered freshwater amphidromous and are generally restricted to brackish and freshwater areas. The probability of encountering this species in the study area is infinitesimal.

36. Table 4.1 lists fin whale as special concern under *SARA* Schedule 3. The fin whale was recently added to Schedule 1 as Special Concern. The table should be updated. Similarly, in Section 4.9, the EA states that "The fin whale is presently being considered for addition to Schedule 1 of *SARA* as a 'Special Concern' species." This statement should also be revised.

Section 4.5.1, page 114

37. There was a study of reasonable scope of the benthos on the central Scotian Slope for Marathon prior to drilling of the Annapolis well. This covered water depths and topography more appropriate for the proposed drilling sites (the HEBBLE area is in 4800 m water depth and thus not very appropriate). The work was done by JWEL and may provide comparable information for this area.

38. Valued ecosystem components. The White Rose experience may not be particularly useful in describing the environmental conditions for this area. . White Rose was a shelf environment; the proposed drill sites are on the deep-water slope.

Section 4.5.1.1, page 115

39. A figure should be provided indicating the location of corals within the study area.

40. Shouldn't the "Existing Impacts on Corals" discussion on page 121 be in the "Effects Assessment" section and not in the "Biological Environment" section.

Section 4.6, page 122

41. Please ensure that places identified in the text are also included on figures (e.g. The Gully, Halibut Channel, Burgeo Bank).

Section 4.6.2.2, page 134

42. The **Atlantic Salmon** subsection in Section 4.6.2.2 should be titled "**Inner Bay of Fundy (iBoF) Atlantic salmon"** since this is the only stock that is currently listed under *SARA.* Doing this would allow the discussion to be limited to iBoF Atlantic salmon specifically and that they "probably do not migrate through the Project Area" as stated on page 134 of the document.

43. "Striped" wolffish is mentioned in the 4th paragraph on page 135. This is the first time it is mentioned. It should be noted that this is another name for Atlantic wolfish.

44. This section includes a sub-section entitled "**COSEWIC-Listed Species Not Presently Under SARA**" which describes cusk, porbeagle shark, and winter skate. There are several other COSEWIC listed fish species that, according to Table 4.1, potentially occur in the study area (e.g., white shark, short fin mako, blue shark, and American eel). These species should be described in this sub-section.

Section 4.7.3, page 143

45. Figures 4.3 to 48 have incorrectly spelled "Harvest" as "Havest".

Section 4.7.4, page 147

46. The text describes the data shown in Table 4.8 as 2003 to 2005 but Table 4.8 heading states 2003 to 2006. Which is it?

Section 4.7.5.1, page 158

47. 2nd paragraph, line 1. "Stone Fence" is not shown on Figure 4.1.

Section 4.7.5.3, page 162

48. 1st paragraph, page 163, line 2. The text states "There is no directed fishery for this species during the spawning (pupping) period, 1 April to 30 June, which is reflected in Figure 4.32". Figure 4.32 shows harvest in April.

Section 4.7.5.6, page 167

49. At the consultation session in Marystown in September 2006, fishers expressed concerns regarding potential impacts on monkfish (notably from seismic). Given this concern, the EA should provide some information on lifestages/abundance and commercial fishery information for this species. As well, the September 2006 meetings on the Burin

Peninsula should be discussed in the EA and the timing of all the consultation sessions identified in the text.

50. Page 171, 2nd paragraph. It is stated that "It shows that the snow crab fishery in the Project Area for the last three years has occurred predominantly in the June-August period". Figure 4.41 shows "May to August" period.

Section 4.7.7, page 179

51. Table 4.13. Where did the number "7,361" come from in the 2001 column? The total only adds up to "3,960".

Section 4.7.8, page 183

52. The numbers on Figure 4.55 are impossible to read.

Section 4.8, page 185

53. In general, the report accurately describes migratory bird resources present in the Laurentian sub-basin. Some of the information on seabird breeding population sizes provided is slightly out of date, so a list of updated references is provided below for your information. However, the general size and relative importance of these colonies has not changed greatly, so the wording of the text is generally appropriate.

    The information on winter distribution of seabirds is sparse for this area, although CWS has collected some information on recent cruises in spring and fall. Regardless, the inferences made about the winter occurrences of important species seem reasonable.

Section 4.9, page 200

54. According to Section 4.9 "Scattered sightings of right whales off Newfoundland and in the Gulf of St. Lawrence have been made in recent years, *but these are not important summering areas for these whales* (Gaskin 1991)" (emphasis added). Observations over the past decade suggest that there may be a summer aggregation area for right whales near the Gaspe Peninsula in the Gulf of St. Lawrence (N. Cadet, J.F. Blouin, pers. comm., referenced in the draft Proposed Recovery Strategy for Right Whales, u*npublished*). Whether this is an important summering area has yet to be determined. Nonetheless, the conclusion that right whales are likely to be rare in the project area is reasonable.

Section 4.9.2, page 220

55. Table 4.18. The scientific name for Harp seal should be "*Phoca*" *groenlandica*.

Section 5.0, page 226

56. Each VEC effects assessment section should be revised to include a discussion of mitigations and residual effects. Only then can a determination of significance be made. The mitigations listed in Table 7.2 (page 375) should be provided only as a summary of information presented in the document. It should not include "new" information. Also, in the discussion of environmental effects, there is little if any discussion of mitigations to be employed in the event of a spill/blowout. What mitigations are proposed? There is no mention of mitigations such as an oil spill contingency plan or spill containment

equipment on site, etc. .

57. Geohazard surveys are mentioned in the “Project Description” section (Section 2.3.7) yet are not included in the “Effects Assessment” section.

Section 5.1.2, page 228

58. Sea Turtles, lines 3 & 4. Only one of the three species potentially present in the area is considered endangered.

Section 5.1.3.1, page 228

59. It should be stated when licences expire.

Section 5.1.9, page 232

60. An estimate of likely exploration activities in the foreseeable future should be included. The C-NLOPB website should be checked for projects currently under review.

Section 5.1.11, page 233

61. Section 5.1.11 defines a significant effect as “Having a high magnitude or medium magnitude for a duration of greater than one year and over a geographic extent greater than 100 km^2”. This definition does not seem appropriate for species at risk. In some instances, even highly localized effects on at-risk species could jeopardize their survival or recovery. It is best practice to define specific criteria for determining the significance of effects to species-at-risk that reflect a higher degree of precaution than would be applied for other species and that relate to recovery goals or objectives. The proponent should refer to the Canadian Wildlife Service’s *Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada* for guidance.

Section 5.2, page 234

62. NRCan’s understanding of the key environmental risks related to the deep-water setting of the area are:

The triggering of a submarine landslide by drilling operations. The risk of this is low, but this low risk needs to be justified (by known geotechnical properties, plus experience to date of drilling wells elsewhere on the east coast Canadian and Norwegian slopes). NRCan’s understanding from the work in the Ormen Lange field in a rather similar geological setting off Norway was that the only serious induced landslide risk that they identified was from a gas blowout lasting more than 2 weeks leading to massive increase in pore pressure of potential failure horizons. Such a risk should be assessed. Natural failure in 1929 in the Assessment area, and at Ormen Lange 8000 years ago, resulted in large tsunamis, leading in the case of 1929 to severe loss of life.

Shallow water flows, which are a risk in the Gulf of Mexico slope conditions, but have not been encountered on the eastern Canadian margin. These may result in local environmental impacts on benthic communities. They may also cause hole control problems, with the resulting increase in time at the well site or increased use of particular drilling muds.

Risk of a natural earthquake and associated slope failures during drilling operations. The proponents need to address this issue in a more thorough manner , though the risk is small. NRCan has published quite a lot of work on the recurrence interval of natural slope failures on the eastern Canadian margin, most of which are probably earthquake triggered. What is the triggering mechanism is probably a moot point: the issue is what is the risk of a natural slope failure during drilling operations. NRCan's published data suggests that a small failure may occur every few thousand years, but that the return interval of large failures like that in 1929 is measured in tens of thousands of years or more.

The proponent should ensure that these risks were taken into consideration when the effects of the environment on the project were assessed.

63. It would be useful if this section described how the marine forecasts would be used by the rig operators in the event of forecast extreme conditions. What actions would be taken to mitigate the effects of extreme conditions, under different scenarios? What forecast lead times are required under the different scenarios? It would be helpful if the forecast lead times were discussed in relation to the very rapid increase of severe wave heights that have been observed in a small number of recent extreme extratropical and tropical cyclones (related to rapid intensification and/or dynamic resonance between the speed of the system and the speed of the waves).

It would be helpful if this section described the combinations of environmental loading conditions that could cause the environment to have significant effects on the project, specific to each type of platform being considered. What are the significant thresholds of wave height and wave period combinations, for example, relevant to semi-submersible platforms? Without that information, it is more difficult to assess the importance of climatological frequencies presented in earlier sections.

There is little evidence that due diligence was carried out in reaching the conclusion that the icing-related environmental loadings are likely to be relatively small and within the operational capabilities of their procedures and systems. There are published maps of potential spray icing frequency in the East Coast Marine Atlas as well as summary information on the frequency of occurrence of atmospheric icing but none of the literature is cited and the description of the actual environmental conditions in the proposed drilling area is vague.

Section 5.2.1, page 234

64. Although geohazards are mentioned and Figure 3.8 shows that earthquakes occur in the immediate vicinity of the exploration area and drill sites planned, their effects are not mentioned. The comment about "a floating rig would be relatively immune to a major slumping event such as the 1929 event" neglects the environmental risk to any bottom-founded equipment (and indeed to the rig itself), if the sea bottom were to slump immediately after an earthquake.

Section 5.2.4.1, page 236

65. It is noted with appreciation the detailed description of the physical environmental monitoring program that is planned, and the intent to send 3-hourly marine reports in real-time to MSC. That would help to improve not just the local site-specific forecasts, but also the numerical weather prediction model output and the marine forecasts issued by MSC. It would also help to improve the knowledge of the climatology of the area.

Section 5.2.4.3, page 240

66. What is the timing of the risk assessment? C-NLOPB will require sufficient time to review the report prior to the commencement of drilling activities and possibly prior to the issuance of a DPA.

Section 5.2.4.4, page 241

67. To be effective, the seabed site survey will have to be an expensive deep-towed survey to get adequate resolution. It may be that a ROV survey alone will be sufficient (see comment for Section 2.4).

Section 5.2.5, page 242

68. Last paragraph, page 242. NRCan agrees that geohazard assessment will be carried out from a specific site survey. Nevertheless, the scope of the problems (see comments on Section 3.1.4) should be identified in advance.

Section 5.3.1.1, page 245

69. Bullet 3, line 2. Insert “be” between “may” and “discharged”.

70. Bullet 5. Most of these citations deal with shallow water benthos. The recovery times for deep-water benthos (decades) and the evidence for full recovery should be justified (see also Section 5.4.2 where there is some mention of the JWEL deep-water work).

Section 5.3.1.2, page 247

71. This modeling must consider the possibility that the discharged mud and cuttings will flow down steep slopes as a density current and thus extend much further into deep water than as a result of simple advection by ambient ocean currents. This risk depends on the precise well site chosen and the rate of discharge of mud and cuttings.

72. The Lorax (2006) report should be included in the EA, either as an appendix or submitted under separate cover.

Section 5.3.4, page 249

73. There is no mention of a site survey for the munitions dumpsite. If there is to be a survey, would there be “sound” effects from the survey technique?

74. This section does not include well severance during decommissioning, during which explosive charges might be used. According to Table 5.6, this activity would produce the strongest sound level.

75. On what activities was the CEA undertaken? A listing of all the reasonably foreseeable projects should be included.

Section 5.4, page 252

76. ***The long-term or cumulative impact on deep-water benthos of dense discharges during drilling operations***. There is the potential for discharges denser than seawater (including seawater with suspended sediment and pollutants) at the well head or from the rig to flow as a density current on steep slopes (more than a few degrees) and thus move pollutants down the channel systems in the area and out onto the Sohm Abyssal Plain, where they could be further entrained into the Western Boundary Undercurrent system. The citing of recovery times for deep-water benthos from shallow water studies is inadequate. The far-field risk to deep-water benthos needs to be evaluated (similar risks existed for the Annapolis and Crimson wells, and may never have been properly evaluated; there are also similar risks from deep-water drilling elsewhere in the world). This risk is not present on the shelf, nor on low gradients such as in Orphan Basin.

Section 5.4.2, page 254

77. Middle paragraph. This is misleading. Other than Narwhal F-99, all these wells were on the shelf, not in deep water. The dispersal mechanisms and nature of the benthos is quite different in < 100 m of water and in 1700 m of water.

Section 5.4.3.1, page 263

78. The document does not address the potential effect of the deposit of cuttings on corals. Are there any located in the drill site areas? Given recent literature, are they likely to occur there? What mitigations are to be employed to ensure corals are not present? However, if corals are present, how will you ensure there will be no impact?

Section 5.5.2.5, page 280

79. The C-NLOPB Guidelines do not specify that the SPOC must be a participant in the fishing industry, please modify. .

80. Geohazard surveys are not included in the effects assessment section yet they were mentioned in the scope of project section. Are geohazard surveys to be undertaken?

Section 5.6.2, page 282

81. In addition to the stranded petrel mitigation measures outlined, operators should be aware that reporting the fate of all birds handled is a requirement of the permit. Forms are available from CWS for this purpose.

Section 5.7.1, page 290

82. Section 5.7.1 states that “Marine mammals would most likely avoid the immediate area around the drilling rig or drillship due to underwater sound generated by the rig or drillship and attendant vessels.” Some species of marine mammals are attracted to sound generated by vessels (see for example, Garrison et al, 2002, or NURC, 2006).

Section 5.7.5, page 295

83. The Effects of Ships and Boats discuss possible effects of discharges from ships, but does not discuss the possibility of ship strikes to marine mammals. Ship strikes are an identified threat for several at-risk marine mammal species.

Section 5.7.7.2, page 297

84. It concludes that effects on marine mammals from noise associated with drill ships will be *not significant*, and that the level of scientific certainty associated with this conclusion is *high*. Given the paucity of data on the hearing abilities of baleen whales (acknowledged in the EA), it seems debatable whether there can be a high degree of scientific certainty around the effects prediction.

Section 5.7.9, page 303

85. 1st paragraph, line 1. "Given the amount of commercial shipping and *fishing activity*…". It was previously stated that there was not a lot of fishing activity in the area. Please clarify.

Section 5.8.2, page 307

86. According to section 5.8.2, ramp-up will be stopped if a sea turtle is observed within 500m of the airgun. The proponent should be aware that shut-down requirements apply to Species at Risk, listed as Endangered under SARA, and include Leatherback Turtles. Therefore, it is a requirement that airgun arrays be shut-down if, at any time, an endangered SAR is observed within 500 m of the airgun array. .

Section 5.9, page 307

87. According to Section 5.9, "eight marine animal species that potentially occur in the Study Area are listed as either endangered or threatened on Schedule 1 of *SARA* (i.e., officially 'at risk' according to Canadian law)." Under *SARA*, 'Species at Risk' means "an extirpated, endangered or threatened species or a species of special concern." In accordance with this definition, species of special concern are considered officially at risk under Canadian law. As noted above, as per Section 79 of SARA, all at-risk species, including species of special concern are subject to special project review requirements. It would be appropriate to include species of special concern as part of the Species at Risk VEC discussed in Sections 5.9 and 6.6.7.

88. Section 5.9, which assesses effects on at-risk species, simply concludes that the general effects predictions for marine mammals, sea turtles, and fish also apply to at-risk species in these categories, without any detailed analysis. This is not consistent with best practice. Because of their vulnerability, impacts to species-at-risk may be considered more significant than equivalent impacts to species that are not at risk. As discussed above, the EA should define specific criteria for determining the significance of effects to species-at-risk. There are computer models for these impacts which are freely-available and which would allow some assessment of the risk caused by the increased number of larger vessels moving through the study area. This would be particularly beneficial for evaluating impacts on SARA listed marine species. This also applies to Section 6.6.7.

Section 6.1.5.4, page 319

89. Since 2006, the C-NLOPB provides weekly spill statistics on its website. However, prior to that, spill statistics for exploration and production activities were also available on the C-NLOPB website and in its Annual Reports. These data should have been used in discussing spill data.

Section 6.1.8, page 322

90. "No medium spill or larger spills have occurred on the Scotian Shelf…". A discussion of spill events should include spill data from the NL offshore area.

Section 6.3, page 324

91. 2nd paragraph. "The spills of interest from the ConocoPhillips Project…" does not include batch spills of SBM or SB Fluids. These should be considered in the discussion of accidental events associated with exploration drilling as they have occurred with past drilling operations in the Grand Banks.

Section 6.4, page 328

92. A copy of the spill trajectory modeling report (SL Ross 2006) should have been submitted with the EA report.

Section 6.6, page 329

93. This section should have included a few figures to illustrate the area that may be affected by a blow-out or spill

Section 6.6.3, page 348

94. There is no special mention of potential effects on species under moratorium (Cod, American Plaice, etc.) and how the proposed activities might impact on recovery efforts for these species.

Section 6.6.4.5, page 355

95. Table 6.25. The VEC is "seabird" not "fish and fish habitat".

Section 6.6.6, page 364

96. Given the evidence presented in Section 6.6.6, the conclusion that effects on sea turtles from an offshore oil release "could range from negligible to low magnitude" seems questionable, especially for at-risk turtle species. There is some indication, based on studies cited in the EA (e.g., Hall et al., 1993), that exposure to oil may increase sea turtle mortality. This conclusion is supported by the research of Lutcavage et al. (1995) who conclude that:

"Experiments on the physiologic and clinicopathologic effects of oil showed that major body systems in marine turtles are adversely affected by short exposure to weathered oil. The laboratory oil slicks simulated conditions occurring during contact with weathered oil, but freshly spilled oil could prove to be considerably more harmful. Additionally, sea turtles pursue and swallow tar balls, and there is no firm evidence that they are able to detect and avoid oil (Odell and MacMurray 1986). Sea turtles are among the

endangered or threatened marine species that may be most at risk in the event of an oil spill. For turtles such as the Kemp's ridley, which is barely holding on to survival, a serious encounter with oil could threaten survival of the species".

Section 7.5, page 380

97. 1st paragraph. The Guidelines should be properly cited and referenced.

98. This is a list of monitoring activities. The need for and requirements of follow-up programs should also be discussed. CEAA defines a Follow Up Program as one for verifying the accuracy of an EA and for determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project. The discussion should also include any requirement for compensation monitoring as compensation is considered mitigation.

ADDITIONAL INFORMATION

A list of references summarizing icing conditions off the east coast is below. Most of these references can be found in the C-CORE library.

Brown, R.D. and T.A. Agnew, 1985: Characteristics of marine icing in Canadian waters. Proceedings International Workshop on Offshore Winds and Icing, T.A. Agnew and V.R. Swail, Eds., Halifax, 78-94.

Brown, R.D. and P. Roebber, 1985: The Ice Accretion Problem in Canadian Waters Related to Offshore Energy and Transportation Canadian Climate Centre Report No. 85-13, Downsview, 295 pp (unpublished manuscript).

Brown, R.D. and P. Mitten, 1988: Ice accretion on drilling platforms off the east coast of Canada. Proceedings Polartech '88 Conference, Trondheim, Vol. 2, 409-421.

Chung, K.K. and E.P. Lozowski, 1996: Offshore Drilling Platform Icing: A Review. Final Report to National Energy Board of Canada, 117 pp.

Mortsch, L.D., T. Agnew, A. Saulasleja and V.R. Swail, 1985: Marine Climatological Atlas - Canadian East Coast. Canadian Climate Centre Report No. 85-11, 343 pp (unpublished manuscript).

Zakrzewski, W.P., R. Blackmore and E.P. Lozowski, 1987: Mapping the ice growth rates on sea-going ships in waters east of Canada. Proceedings 2nd Canadian Workshop on Operational Meteorology, Halifax, 77-99.

Also, the RIGICE marine icing model was upgraded by Ed Lozowski at the University of Alberta in 2004 and should be publicly available to any consultant who wishes to use it for EA purposes.

An icing bibliography is also attached for further references.

REFERENCES PROVIDED BY NR CAN

Baltzer, A., Cochonat, P. and Piper, D.J.W., 1994. In situ geotechnical characterisation of sediments on the Scotian Slope, eastern Canadian continental margin. Marine Geology, v. 120, p. 291-308.

Bonifay, D. and Piper, D.J.W., 1988. Probable Late Wisconsinan ice margin on the upper continental slope off St. Pierre Bank, eastern Canada. Canadian Journal of Earth Sciences, v. 25, p. 853-865.

Jenner, K.A., Piper, D.J.W., Campbell, D.C. and Mosher, D.C., 2007. Lithofacies and origin of late Quaternary mass transport deposits in submarine canyons, central Scotian Slope, Canada. Sedimentology. Feb 07 issue, available on line at: http://www.blackwellpublishing.com/journal.asp?ref=0037-0746

Mosher, D.C., Piper, D.J.W., Campbell, D.C., and Jenner, K.A., 2004. Near surface geology and sediment-failure geohazards of the central Scotian Slope. American Association of Petroleum Geologists Bulletin, v. 88, p. 705-723.

Piper, D.J.W. 2005. Late Cenozoic evolution of the continental margin of eastern Canada. Norwegian Journal of Geology, v. 85, p. 231-244.

Piper, D J W and Brunt, R A., 2006. High-resolution seismic transects of the upper continental slope off southeastern Canada; Geological Survey of Canada, Open File 5310, 77 p.

Piper, D.J.W. and MacDonald, A.W.A., 2002. Timing and position of late Wisconsinan ice margins on the upper slope seaward of the Laurentian Channel. Geog. phys. Quat. 55, 131-140.

Piper, D.J.W., MacDonald, A.W.A., Ingram, S., Williams, G.L. & McCall, C., 2005. Late Cenozoic architecture of the St Pierre Slope. Canadian Journal of Earth Sciences, v. 42, p. 1987-2000.

Piper, D.J.W., Mosher, D.C., Gauley, B.J., Jenner, K. & Campbell, D.C., 2003. The chronology and recurrence of submarine mass movements on the continental slope off southeastern Canada. In: Locat, J. & Mienert, J., Submarine mass movements and their consequences. Kluwer, Dordrecht, 299-306.

Savoye, B., Cochonat, P. and Piper, D.J.W., 1990. Seismic evidence for a complex slide near the wreck of the Titanic: model of an instability corridor for non-channeled gravity events. Marine Geology, v. 91, p. 281-298.

REFERENCES PROVIDED BY CWS

Leach's Storm-Petrel:

Robertson, G. J., J. Russell and D. Fifield. 2002. Breeding population estimates for three Leach's Storm-petrel colonies in southeastern Newfoundland, 2001. Canadian Wildlife Service Technical Report Series No. 380. Atlantic Region.

Stenhouse, I. J., G. J Robertson and W. A. Montevecchi. 2000. Herring Gull *Larus argentatus* predation on Leach's Storm-Petrels *Oceanodroma leucorhoa* breeding on Great Island, Newfoundland. Atlantic Seabirds 2: 35-44.

Northern Fulmar:

Stenhouse, I. J., and W. A. Montevecchi. 1999. Increasing and expanding populations of breeding Northern Fulmars in Atlantic Canada. Waterbirds 22: 382-391.

Manx Shearwater:
Robertson, G. J. 2002. Current status of the Manx Shearwater, *Puffinus puffinus*, colony on Middle Lawn Island, Newfoundland. Northeastern Naturalist 9: 317-324.